Purbanchal University

Faculty of Engineering, Biratnagar, NEPAL

Fifth Semester's Course Structure & Syllabus

Program: Bachelor in Computer Engineering

Effective from 2021 (2078) Batch

Year-III **Semester-V**

S.N.	Course code	Subject	Credit Hours	L	T	P	Total	Internal		Final		Total
								Th.	P	Th.	P	
1		Algorithm Analysis and Design	3	3	1	-	4	40	-	60	-	**100**
2		Computer Architecture and Design	3	3	1	2	6	40	25	60	-	**125**
3		Numerical methods	3	3	1	3	7	40	30	60	20	**150**
4		Operating system	3	3	1	3	7	40	30	60	20	**150**
5		Engineering Economics	3	3	1	-	4	40	-	60	-	**100**
6		Research Methodology	2	2	1	-	3	20	-	30	-	**50**
7		Project-II	3	1	-	3	4	60		40		**100**
		Total	**20**	**18**	**7**	**11**	**35**					**775**

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

Algorithm Analysis and Design
Code: BCE----

Year: III **Semester: V**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Cr	L	T	P			Duration	Marks	Duration	Marks	
3	3	1	--	40	--	3	60	-	-	100

Course Objective: The objective of this course is to enhance the concept of algorithm and study various techniques to design algorithms, establish their correctness, study their efficiency and memory needs.

1. Introduction and Fundamentals of Algorithm Analysis **(6 hours)**

1.1. Algorithm definition and basic properties, Pseudocode Convention, Recursive Algorithms
1.2. Performance Analysis
  1.2.1. Space Complexity (Definition and example problems)
  1.2.2. Time Complexity (Definition and example problems)
  1.2.3. Asymptotic notations (O, Θ and Ω)
1.3. Recurrence relations and its application
1.4. Solving Recurrence relations
  1.4.1. Iterative Method, Substitution Method and Master theorem

2. **Divide and Conquer Algorithms** **(10 hours)**
   2.1. General Method
   2.2. Searching: Binary Search
      - Definition, Algorithm with example problems and time complexity
   2.3. Sorting: Merge, Quick and Selection
      - Definition, Algorithm with example problems and time complexity
   2.4. Strassen's Matrix Multiplication
      - Definition, Algorithm with example problems and time complexity
   2.5. Convex Hull (Graham's Scan, Quick Hull)

3. **Greedy Algorithms** **(6 hours)**
   3.1. General Method
   3.2. Knapsack Problem (Fractional, 0/1)
      - Algorithm and Example problems
   3.3. Job Sequencing problem with deadlines
      - Algorithm and Example problem
   3.4. Minimum Cost Spanning Trees (Definition, Algorithm with example problems and time complexity)
      3.4.1. Prim's Algorithm
      3.4.2. Kruskal's Algorithm
   3.5. Dijkstra Shortest path algorithm (Definition, Algorithm with example problems and time complexity)

4. **Dynamic Programming** **(6 hours)**
   4.1. General Method
   4.2. Multistage Graph Problem

- Definition with example problems and time complexity

4.3. All Pairs Shortest path (Floyd-Warshall Algorithm)

- Definition with example problems and time complexity

4.4. 0/1 Knapsack Problem

4.5. Traveling Salesperson Problem

- Definition and Algorithm with example problems

5. Backtracking **(6 hours)**

5.1. Concept of backtracking (Recursion vs. Backtracking)

5.2. n-Queens problem (4 Queens, 8 Queens)

- Definition and Algorithm with example problems

5.3. Graph Coloring

5.4. Hamiltonian Cycles

- Definition and Algorithm with example problems

6. **Branch and Bound** **(5 hours)**

6.1. General Method

6.2. 0/1 Knapsack Problem

- Definition and Algorithm with example problems

6.3. Traveling Salesperson Problem

- Definition and Algorithm with example problems

7. **Introduction to Complexity theory** **(6 hours)**

7.1. Concept of tractable and intractable problem

7.2. Complexity classes (P, NP, NP-Hard, NP-Complete),

7.3. Cook's theorem, Satisfiability problem
7.4. NP-Complete Problem (Clique, Vertex Cover Problem)

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.	Topic		Subtopic	Depth								Hour	Remarks
				D	Des	DR/DSG	I	Alg	H/P	A	N		
1	**Introduction and Fundamentals of Algorithm Analysis**	1.1	Algorithm definition and basic properties, Pseudocode Convention, Recursive Algorithms	**D**								**6 hrs.**	
		1.2	Performance Analysis		**Des**								
		1.2.1	Space Complexity	D							**N**		
		1.2.2	Time Complexity	D							**N**		
		1.2.3 1.3	Asymptotic notations. Recurrence relations and its application		**Des**								
		1.4	Solving Recurrence relations								**N**		
		1.4.1	Iterative Method, Substitution Method and Master theorem								**N**		

	Divide and Conquer Algorithms	2.1	General Method		**Des**							**10 hrs**	
		2.2	Searching: Binary Search		**Des**			**Alg**					
		2.3	Sorting: Merge, Quick and Selection					**Alg**					
		2.4	Strassen's Matrix Multiplication				**I**	**Alg**					
		2.5	Convex Hull (Graham's Scan, Quick Hull)				**I**				**N**		
3	**Greedy Algorithms**	3.1	General Method		**Des**							**6 hrs**	
		3.2	Knapsack Problem (Fractional, 0/1)		**Des**			**Alg**			**N**		
		3.3	Job Sequencing problem with deadlines		**Des**						**N**		
		3.4	Minimum Cost Spanning Trees		**Des**			**Alg**					
			3.4.1 Prim's Algorithm										
			3.4.2 Kruskal's Algorithm										
		3.5	Dijkstra Shortest path algorithm		**Des**			**Alg**			**N**		
4	**Dynamic Programming**	4.1	General Method		**Des**							**6 hrs**	
		4.2	Multistage Graph Problem		**Des**			**Alg**			**N**		
		4.3	All Pairs Shortest path (Floyd-Warshall Algorithm)		**Des**			**Alg**			**N**		
		4.4	0/1 Knapsack Problem		**Des**			**Alg**			**N**		

		4.5	Traveling Salesperson Problem		**Des**						**N**		
5	**Backtracking**	5.1	Concept of backtracking (Recursion vs. Backtracking)	**D**								**6 hrs**	
		5.2	n-Queens problem (4 Queens, 8 Queens)		**Des**			**Alg**					
		5.3	Graph Coloring		**Des**								
		5.4	Hamiltonian Cycles		**Des**			**Alg**			**N**		
6	**Branch and Bound**	6.1	General Method	**D**								**5 hrs**	
		6.2	0/1 Knapsack Problem		**Des**			**Alg**			**N**		
		6.3	Traveling Salesperson Problem		**Des**			**Alg**			**N**		
7	**Introduction to Complexity theory**	7.1	Concept of tractable and intractable problem	**D**								**6 hrs**	
		7.2	Complexity classes (P, NP, NP-Hard, NP-Complete),		**Des**								
		7.3	Cook's theorem, Satisfiability problem			**DR**	**I**						
		7.7	NP-Complete Problem (Clique, Vertex Cover Problem)		**Des**	**DR**							

Marks Distribution

Chapter	Hours	Tentative Marks distribution
1	6	upto 8
2	10	upto 12
3	6	upto 8
4	6	upto 8
5	6	upto 8
6	5	upto 8
7	6	upto 8
Total	**45**	**60**

References:

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, Orient Longman Universities Press (2008)
2. T.H.Cormen, C.E.Leiserson, R.L.Rivest, C. Stein, "Introduction to Algorithms", 2nd Edition, Prentice-Hall India (2001)
3. Sara Baase and Allen Van Gelder, "Computer Algorithms, Introduction to Design and Analysis", 3rd Edition, Pearson Education (2009)
4. Gilles Brassard, Paul Brately, "Fundamentals of Algorithmics", Pearson (1996)

Model Question 2024
PURBANCHAL UNIVERSITY

B.E Computer / Final

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

BCE……Algorithm Analysis and Design

Attempt all questions.

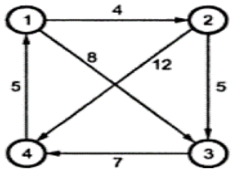
Group A
Very Short Questions (4*2=8)

1. Define the term ‘Principle of Optimality’?
2. State fractional Knapsack Problem.
3. Define Recurrence relation?
4. State Cook’s theorem.

Group B
Short Questions (7*4=28)

1. Explain asymptotic notations used for analyzing efficiency of an algorithm.

2. Solve T (n) = ***2T (n/4)*** + √***n*** using Master theorem method.
3. Explain Graham's Scan Algorithm to compute Convex Hull with respect to DAC method.
4. Analyze Floyd-Warshall algorithm for all pair shortest path problem of the given problem



5. Write algorithm to place 4-queen's in non-attacking position on 4 × 4 chess-board. Also draw its state space search tree.
6. Explain class P, class NP, NP-Hard and NP complete with suitable examples.
7. Define Hamiltonian cycle problem, with its algorithm and a short example.

Group C
Long Questions (3*8=24)

1. Write any two characteristics of Greedy Algorithms. Find optimal Job list that can be executed in sequence with their deadlines so as to maximize the profits for the given information. Given, 5 jobs with profit "Pi" and deadline "Di". **Job = {1, 2, 3, 4, 5}, Pi = {20, 10, 5, 15, 1}, Di = {2, 1, 3, 2, 3}**

2. Explain with algorithm and an example, how 0/1 Knapsack problem can be solved using Branch and Bound technique.
3. Write an algorithm for solving non-fractional Knapsack problem using dynamic programming approach and also use it find the optimal solution to the Knapsack instance, **n= 4, m= 5, (w_1, w_2, w_3, w_4) = (2, 1, 3, 2) and (P1, P2, P3, P4) = (12, 10, 10, 15).**

Program: B. E. computer

Subject: Computer Architecture and Design

Code: ******

Year: III

Semester: V

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Cr	L	T	P			Duration	Marks	Duration	Marks	
3	3	1	2	40	25	3	60	--	-	125

Course Objective:

This course includes concepts of instruction set architecture, organization or micro-architecture, and system architecture. To provide the basic computer and micro-programmed control unit, memory and I/O organization of a typical computer system and benefits of pipelined systems.

1. Introduction (3 Hrs.)

1.1 Computer organization and architecture
1.2 Structure and Function
1.3 Computer components and Functions
1.4 Structure of IAS machine
1.5 Interconnection structure
1.6 Bus interconnection

2. Register Transfer and Micro-operations (5 Hrs.)

2.1. Micro-operation, Register Transfer Language, Register Transfer, Control Function
2.2. Arithmetic Micro-operations: Binary Adder, Binary Adder-Subtractor, Binary Incrementer, Arithmetic Circuit
2.3. Logic Micro-operations, Hardware Implementation, Applications of Logic Micro-operations.
2.4. Shift Micro-operations: Logical Shift, Circular shift, Arithmetic Shift, Hardware Implementation of Shifter.

3. Basic Computer Organization and Design (6 Hrs.)

3.1 Instruction Code, Operation Code, Stored Program Concept
3.2 Registers and memory of Basic Computer, Common Bus System for Basic Computer.
3.3 Instruction Cycle of Basic computer, Determining Type of Instruction, Memory Reference Instructions, Input-Output Instructions, Program Interrupt & Interrupt Cycle.
3.4 Description and Flowchart of Basic Computer

4. Central Processing Unit (3 Hrs.)

4.1 Major Components of CPU, CPU Organization

4.2 Instruction Formats, Addressing Modes, Data Transfer and manipulation, Program Control, Subroutines: Call and Return, Program interrupt, Types of Interrupt

4.3 RISC vs CISC, Characteristics & Pros and Cons of RISC and CISC, Overlapped Register Windows

5. Control Unit (6 Hrs.)

5.1. Micro-program and Hardwired Control Unit

5.2 Control Word, Microprogram, Control Memory, Control Address Register, Sequencer

5.3 Address Sequencing, Conditional Branch, Mapping of Instructions, Subroutines, Microinstruction Format, Symbolic Microinstructions

5.4 Design of Control Unit

6. Pipelining (5 Hrs.)

6.1. Parallel Processing, Multiple Functional Units, Flynn's Classification

6.2. Pipelining: Concept and Demonstration with Example, Speedup Equation, Floating Point addition and Subtraction with Pipelining

6.3. Instruction Level Pipelining: Instruction Cycle, Three & Four-Segment Instruction Pipeline, Data Dependency, Pipeline Conflicts and Solutions

6.4. Vector Processing, Applications, Vector Operations, Matrix Multiplication

7. Computer Arithmetic (6 Hrs.)

7.1 Fixed Point representation, Representing Negative Numbers, Floating Point Representation and Operations, Arithmetic with Complements, Overflow, Detecting Overflow

7.2 Addition and Subtraction with Signed Magnitude Data, Addition and Subtraction with Signed 2's Complement Data

7.3 Booth's Multiplication and Division Algorithms, Restoring and Non-Restoring Division algorithms, Divide Overflow

8. Memory Organization (4 Hrs.)

8.1 Memory Hierarchy, Memory Characteristics

8.2 Associative Memory: Read and Write Operations, Associative Mapping, Direct Mapping, Set-Associative Mapping

8.3 Cache memory and Principles: Locality of Reference, Hit & Miss Ratio, Mapping, Write Policies

8.2 Memory mapping function

9. Input Output Organization (4 Hrs.)

9.1 Input-Output Interface: I/O Bus and Interface Modules, I/O vs. Memory Bus, Isolated vs. Memory-Mapped I/O

9.2 Asynchronous Data Transfer: Strobe, Handshaking

9.3 Modes of Transfer: Programmed I/O, Interrupt-Initiated I/O, Direct memory Access

9.4 Priority Interrupt: Polling, Daisy-Chaining, Parallel Priority Interrupt
9.5 Direct Memory Access, Input-Output Processor, DMA vs. IOP

10. Multiprocessor (3 Hrs.)

10.1 Multiprocessor Characteristics
10.2 Interconnection Structures: Time-Shared Common Bus, Multiport Memory, Crossbar Switch, Multistage Switching Network, and Hypercube interconnection
10.3 Inter-processor communication and synchronization

Laboratory Works:

The laboratory work includes implementing and simulating the algorithms, studied in the course, by using high level languages like C or VHDL. The laboratory works should include at least following concepts;

- Simulate features like overflow, data representation by using VHDL
- Simulate design of different units by using VHDL
- Simulate pipelining by using VHDL
- Implement algorithms for computer arithmetic using high level language like C or C++

Text Books:

1. M. Morris Mano, "Computer System Architecture", Prentice-Hall of India, Pvt. Ltd., Third edition, 2007

References:

1. William Stallings, "Computer Organization and Architecture", Prentice-Hall of India, Pvt. Ltd., Seventh edition, 2005.
2. Vincent P. Heuring and Harry F. Jordan, "Computer System Design and Architecture", Prentice-Hall of India, Pvt. Ltd., Second edition, 2003.

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.	Topic		Subtopic	Depth								Hours	Remarks
				D	Des	DR/DSG	I	Alg	H/P	A	N		
1	**Introduction**	1.1	Computer organization and architecture	√	√							**3hr**	
		1.2	Structure and Function		√								

		1.3	Computer components and Functions		√	√							
		1.4	Structure of IAS machine		√								
		1.5	Interconnection structure		√								
		1.5	Bus interconnection		√	√							
2	**Register Transfer and Microoperations**	2.1	Microoperation, Register Transfer Language, Register Transfer, Control Function	√								**5hr**	
		2.2	Arithmetic Microoperations: Binary Adder, Binary Adder-subtractor, Binary Incrementer, Arithmetic Circuit	√	√	√							
		2.3	Logic Microoperations, Hardware Implementation, Applications of Logic Microoperations.		√		√						
		2.4	Shift Microoperations: Logical Shift, Circular shift, Arithmetic Shift, Hardware Implementation of Shifter.		√						√		
3	**Basic Computer Organization and Design**	3.1	Instruction Code, Operation Code, Stored Program Concept	√	√							**6hr**	
		3.2	Registers and memory of Basic Computer, Common Bus System for Basic Computer.	√	√								
		3.3	Instruction Cycle of Basic computer, Determining Type of Instruction, Memory Reference Instructions, Input-Output Instructions, Program Interrupt & Interrupt Cycle.		√	√	√						
		3.4	Description and Flowchart of Basic Computer	√	√								
4		4.1	Major Components of CPU, CPU Organization	√	√		√					**3hr**	

	Central Processing Unit	4.2	Instruction Formats, Addressing Modes, Data Transfer and manipulation, Program Control, Subroutines: Call and Return, Program interrupt, Types of Interrupt		√		√				√		
		4.3	RISC vs CISC, Characteristics & Pros and Cons of RISC and CISC, Overlapped Register Windows	√	√								
5	**Control Unit**	5.1	Microprogram and hardwired control unit	√	√							**6hr**	
		5.2	Control Word, Microprogram, Control Memory, Control Address Register, Sequencer	√	√								
		5.3	Address Sequencing, Conditional Branch, Mapping of Instructions, Subroutines, Microinstruction Format, Symbolic Microinstructions	√	√						√		
		5.4	Design of Control Unit		√	√							
6	**Pipelining**	6.1	Parallel Processing, Multiple Functional Units, Flynn's Classification	√	√							**5hr**	
		6.2	Pipelining: Concept and Demonstration with Example, Speedup Equation, Floating Point addition and Subtraction with Pipelining	√	√	√					√		
		6.3	Instruction Level Pipelining: Instruction Cycle, Three & Four-Segment Instruction Pipeline, Data Dependency, Pipeline Conflicts and Solutions	√	√						√		

		6.4	Vector Processing, Applications, Vector Operations, Matrix Multiplication	√	√						√		
7	**Computer Arithmetic**	7.1	Fixed Point representation, Representing Negative Numbers, Floating Point Representation, Arithmetic with Complements, Overflow, Detecting Overflow	√	√						√	**6hr**	
		7.2	Addition and Subtraction with Signed Magnitude Data, Addition and Subtraction with Signed 2's Complement Data	√	√						√		
		7.3	Booth's Multiplication and Division Algorithms, Restoring and Non-Restoring Division algorithms, Divide Overflow	√	√			√			√		
8	**Memory Organization**	8.1	Memory Hierarchy, Memory Characteristics		√		√					**4hr**	
		8.2	Associative Memory: Read and Write Operations, Associative Mapping, Direct Mapping, Set-Associative Mapping		√		√						
		8.3	Cache memory and Principles: Locality of Reference, Hit & Miss Ratio, Mapping, Write Policies		√		√						
		8.4	Memory mapping function		√		√						
9	**Input Output Organization**	9.1	Input-Output Interface: I/O Bus and Interface Modules, I/O vs. Memory Bus, Isolated vs. Memory-Mapped I/O		√							**4hr**	
		9.2	Asynchronous Data Transfer: Strobe, Handshaking	√	√								

		9.3	Modes of Transfer: Programmed I/O, Interrupt-Initiated I/O, Direct memory Access		√								
		9.4	Priority Interrupt: Polling, Daisy-Chaining, Parallel Priority Interrupt	√	√								
		9.5	Direct Memory Access, Input-Output Processor, DMA vs. IOP	√	√								
10	**Multiprocessor**	10.1	Multiprocessor Characteristics	√	√							**3hr**	
		10.2	Interconnection Structures: Time-Shared Common Bus, Multiport Memory, Crossbar Switch, Multistage Switching Network, and Hypercube interconnection	√	√	√	√						
		10.3	Inter-processor communication and synchronization	√	√	√	√						

Marks Distribution

Chapter	Hours	Tentative Marks distribution
1	3	2,4
2	5	2,4
3	6	2,4,8
4	3	2,4
5	6	2,4,8
6	5	2,4
7	6	2,4,8
8	4	2,4
9	4	2,4
10	3	2,4
Total	**45**	**60**

Model Question
PURBANCHAL UNIVERSITY

B.E Computer / Final
Time: 3:00 hrs. Full Marks: 60 / Pass Marks: 24
BEG…… Computer Architecture and Design

Attempt all questions.

Group A
Very Short Questions (4*2=8)

1. What is Computer Architecture? Clarify with examples. [2]
2. What are multiprocessor characteristics? [2]
3. What is the importance of cache memory? [2]
4. What is pipelining and parallel processing? [2]

Group B
Short Questions (7*4=28)

1. With neat diagram explain about IAS machine in brief. [4]
2. What is instruction cycle? Explain instruction cycle with interrupt in brief [1+3]
3. List different types of shift micro-operation. Explain any two of them. [1+3]
4. What is addressing modes? Also explain any two of them. [1+3]
5. Explain read and write operations of associative memory. [4]
6. Explain Three & Four-Segment Instruction Pipelining. [1+3]
7. Differentiate between RISC and CISC architecture. [4]

Group C
Long Questions (3*8=24)

1. Write algorithm for Booth's multiplication. Also explain Restoring and Non-Restoring Division algorithms. [3+5]
2. Explain Cache Memory and its Principles in detail. [8]
3. Write short notes (any TWO): [4+4]

a. Crossbar Switch and Multistage Switching Network
b. CPU Organization
c. DMA

Engineering Economics

Year: III **Semester: V**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Cr	L	T	P			Duration	Marks	Duration	Marks	
3	3	1		40		3	60	-	-	100

Course Objective:

The objective of this course is to provide the students knowledge of the basic tools and methodology of economic studies for evaluation engineering project in private industry, in the public sector and in the utilities area.

Course Content:

1.0 Introduction **(3 hrs)**

1.1 Business and accounting terminology
1.2 Principles of Engineering Economics
1.3 Cash flow diagram
1.4 Economic systems

2.0 Cost Classification and Analysis (5 hrs)

2.1 The elements of cost
2.2 Classification of cost: overhead cost, prime cost
2.3 Cost variance analysis
2.4 Job and process costing

3.0 Interest and the Time Value of Money (6 hrs)

3.1 Introduction- Time value of money
3.2 Simple interest and compound interest
3.3 Factors and its types
3.4 Linear and geometric gradient series
3.5 Nominal and effective interest rates
3.6 Continuous compounding

4.0 Basic Methodologies of Engineering Economic Studies (7 hrs)

4.1 Minimum attractive rate of return
4.2 Present worth, Annual worth and Future worth method
4.3 Internal rate of return method and its drawbacks
4.4 External rate of return method
4.5 Cost/Benefit analysis

4.6 The payback (pay-out) period method

5.0 Investment Decisions: (8 hrs)

5.1 Comparison of alternatives having same useful life
5.2 Comparison of alternatives having different useful life
5.3 Comparison of alternatives using the capitalized worth method
5.4 Definition of mutually exclusive, contingent and independent investment alternatives in terms of combinations of projects

5.5 Comparison of mutually exclusive, contingent and independent alternative

6.0 Replacement analysis (5 hrs)

6.1 Introduction
6.2 Approaches of comparing defender and challenger
6.3 Economic service life of challenger and defender
6.4 Replacement analysis for long service life
6.4.1 Required assumptions and decision framework
6.4.2 Replacement analysis under Finite and Infinite Planning Horizon

7.0 Risk Analysis: (4 hrs)

7.1 Projects operating under conditions of certainty
7.2 Projects operating under conditions of uncertainty
7.3 Break even analysis
7.4 Decision tree
7.5 Sensitivity analysis

8.0 Taxation System and depreciation: (4 hrs)

8.1 Taxation law in Nepal
8.2 Value Added Tax (VAT)
8.3 Depreciation rates for buildings, equipment, furniture, etc
8.4 Methods of depreciation: Straight line, Declining balance, Sinking fund, Sum of year digit, MACRS methods of depreciation

9.0 Inflation: (3 hrs)

9.1 Introduction
9.2 Inflation measurement
9.3 Equivalence calculation under inflation
9.4 Impact of Inflation

Note: Interest chart cannot be used in Exam

References:

- E.P. DeGramo, W.G. Sullivan and J.A. Bontadelli, 8th Edition, Macmillan Publishing Company, 1988
- N.N. Borish and S.Kaplan, "Economic Analysis: For Engineering and Managerial Decision Making", McGraw-Hill.

Evaluation Scheme: Marks Division

Question Type	No. of Questions	Marks	Total Marks
Short	4	2	8

Medium	7	4	28
Long	3	8	24
Total			60

Detailed Course Contents:

Ch. No.	Topic		Subtopic	Depth								Hour
				SD	D	DR	I	E	A	EX	N	
1	Introduction	1.1	Business and accounting terminology	√	√							3
		1.2	Principles of Engineering Economics	√	√				√			
		1.3	Cash flow diagram	√	√				√			
		1.4	Economic systems	√	√				√			
2	Cost Classification and Analysis	2.1	The elements of cost	√	√							5
		2.2	Classification of cost: overhead cost, prime cost	√	√				√		√	
		2.3	Cost variance analysis	√	√				√		√	
		2.4	Job and process costing	√	√				√		√	
3	Interest and the Time Value of Money	3.1	Introduction- Time value of money	√	√				√			6
		3.2	Simple interest and compound interest	√	√				√		√	

Ch. No.	Topic		Subtopic	Depth								Hour
				SD	D	DR	I	E	A	EX	N	
		3.3	Factors and its types	√	√	√			√		√	
		3.4	Linear and geometric gradient series	√	√	√			√		√	
		3.5	Nominal and effective interest rates	√	√	√			√		√	
		3.6	Continuous compounding	√	√				√		√	
4	Basic Methodologies of Engineering Economic Studies	4.1	Minimum attractive rate of return	√	√							7
		4.2	Present worth, Annual worth and Future worth method	√	√	√			√		√	
		4.3	Internal rate of return method and its drawbacks	√	√			√	√		√	
		4.4	External rate of return method	√	√			√	√		√	
		4.5	Cost/Benefit analysis	√	√			√	√		√	
		4.6	The payback (pay-out) period method	√	√			√	√		√	

Ch. No.	Topic		Subtopic	Depth								Hour
				SD	D	DR	I	E	A	EX	N	
5	Investment Decisions:	5.1	Comparison of alternatives having same useful life	√	√			√	√		√	**8**
		5.2	Comparison of alternatives having different useful life	√	√			√	√		√	
		5.3	Comparison of alternatives using the capitalized worth method	√	√			√	√		√	
		5.4	Definition of mutually exclusive, contingent and independent investment alternatives in terms of combinations of projects	√	√			√	√		√	
		5.5	Comparison of mutually exclusive, contingent and independent alternative	√	√			√	√		√	
6	Replacement analysis	6.1	Introduction	√	√							**5**
		6.2	Approaches of comparing defender and challenger	√	√				√			
		6.3	Economic service life of challenger	√	√				√			

Ch. No.	Topic		Subtopic	Depth								Hour
				SD	D	DR	I	E	A	EX	N	
			and defender									
		6.4	Replacement analysis for long service life	√	√			√	√		√	
		6.4.1	Required assumptions and decision framework	√	√				√			
		6.4.2	Replacement analysis under Finite and Infinite Planning Horizon	√	√			√	√		√	
7	Risk Analysis:	7.1	Projects operating under conditions of certainty	√	√			√	√		√	4
		7.2	Projects operating under conditions of uncertainty	√	√			√	√		√	
		7.3	Break even analysis	√	√			√	√		√	
		7.4	Decision tree	√	√			√	√		√	
		7.5	Sensitivity analysis	√	√			√	√		√	

Ch. No.	Topic		Subtopic	Depth								Hour
				SD	D	DR	I	E	A	EX	N	
8	Taxation System and depreciation:	8.1	Taxation law in Nepal	√	√				√			4
		8.2	Value Added Tax (VAT)	√	√				√			
		8.3	Depreciation rates for buildings, equipment, furniture, etc	√	√				√			
		8.4	Methods of depreciation: Straight line, Declining balance, Sinking fund, Sum of year digit, MACRS methods of depreciation	√	√			√	√		√	
9	Inflation:	9.1	Introduction	√	√							3
		9.2	Inflation measurement	√	√				√			
		9.3	Equivalence calculation under inflation	√	√			√	√		√	
		9.4	Impact of Inflation	√	√			√	√		√	

Final Examination Scheme:		
Chapters	Marks	Remarks
1	4	Th
2	6	Th/N
3	8	Th + N
4	18	Th + N or Th/N
5		
6	4	Th + N or Th/N
7	8	Th + N or Th/N
8	8	Th + N or Th/N
9	4	Th + N
Total	60	Th: Theory/N: Numerical
Note: There might be minor deviation in mark distribution. Mandatory: Evaluation should be based on solving approach and steps.		

Chapter wise marks division in final examination:

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

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

PURBANCHAL UNIVERSITY
SEMESTER FINAL EXAMINATION – 2024 (MODEL QUESTION)

LEVEL: B. E. Civil/Comp/Elex)
SUBJECT: Engineering Economics FULL MARKS: 60
TIME: 03:00 hrs PASS MARKS: 24

Attempt all questions

Group A (2*4=8)

1. Define cash flow and cash flow diagram.
2. Differentiate between prime cost and overhead cost.
3. Define IRR and MARR
4. Differentiate between private sector project and public sector project.

Group B (4*7=28)

5. Based on the following information, Calculate (a) total material cost variance and (b) total wage variance

	Standard	***Actual***
Production (units)	600	500
Direct material (kg)	1800	1740
Direct material cost (Rs)	52000	44000
Direct labor hours	1700	2000
Direct labor cost (Rs)	34000	46000

6. Determine the simple payback period and discounted payback period of following cash flow.

Period	0	1		2	3	4	5
Cash flow	-12500	4000		4000	4000	4000	6500

7. Find the rate of inflation of per year when price of a product has increased from 5,00,000 to 6,30,000 over the period of 3 years.

8. Differentiate between Uniform Series Compound Amount Factor and Capital Recovery Factor

9. Explain the procedure for the replacement analysis when the planning horizon is in infinite.

10. Explain on Beak even analysis

OR

Consider the investment project with the following Net Cash Flows.

Year	Net Cash Flow
0	-150000
1	X
2	65000
3	X

What would be the value of 'X' if the project's IRR is 10%?

11. What is a Decision Tree? Discuss its application in risk analysis? [4]

OR

12. Define VAT. Explain taxation system in Nepal. [4]

Group C (8*3=24)

13. Evaluate the project by B/C ratio using AW formulation for the project with the following cash flow. First investment = Rs 3, 50,000. Project life = 8 years, Salvage value = Rs 50,000, Annual O & M cost = Rs 35,000, Interest rate=10%. The benefits from the project at the end of 1st year is, Rs. 2,75,000 and goes on decreasing each year by Rs 25,000 for the 8 year period.

OR

Consider two alternatives X and Y. They have useful life of 5 and 8 years respectively. Their tabulated cash flow is shown below. Suppose the expected period of required service for X and Y is only 6 years and MARR = 10% per year. Show which alternative is more desirable using co-terminated assumption.

Activities	Alternatives	
	X	Y
Initial investment(Rs.)	40000	60000
Annual revenue (Rs.)	15000	20000
Annual Expenses	5000	7000
Salvage value (Rs.)	10000	150000

14. Perform the sensitivity analysis by investing the PW of the following project of a machine over a range of **±40%** in [i] initial investment, [ii] annual net revenue, [iii] interest rate, and [iv] useful life.
    Initial investment = 1150 Net annual revenue = 300
    Salvage Value = 100 Useful life = 6 years
    MARR = 12%
    Draw also sensitivity diagram.

OR

Suppose that a taxpayer places in service a $10,000 asset that is assigned to the 6 year class (say, a new property class) with half year convention. Develop the MACRS deductions assuming a 200% declining balance rate switching to straight line.

15. A lady is planning to retire in 20 years. She wishes to deposit a regular money every 3 months until she retires so that, beginning 1 year following her retirement, she will receive annual payments of $35,000 for the next 15 years. How much must she deposit if the interest rate is 8% compounded monthly?

*****

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

Programme: B. E. computer
Subject: Operating system
Code: BCE**CO**

Year: III Part: I

Teaching schedule Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Cr	L	T	P			Duration	Marks	Duration	Marks	
3	3	1	3	40	30	3	60	-	20	150

Objective: On completion of this course, students will acquires the concept of operating system and design and implement them

Course Contents:

Chapter no	Topic	Subtopic	Hour
1	Introduction to Operating system	1.1.1 OS objective and functions 1.1.2 OS as a user /computer interface 1.1.3 OS as a resource manager 1.1.4 Evaluation of OS 1.1.5 Types of OS(Batch processing, serial processing, multiprogramming,	**4 hrs**

		multiprocessing, time sharing and real time) 1.1.6 Architecture of OS (Simple structure, layered structure) 1.1.7 Kernel of operating system, function of kernel, types of kernel(monolithic, and microkernel only) and shell	
2.	Process synchronization and interprocess communication	2.1 Introduction to process 2.1.1 Process concepts, the process model, process state process transition(process lifecycle) and process control block(PCB) 2.1.2 Implementation of process 2.1.3 Threads, types of thread (user level and kernel level),multithreading 2.1.4 system call , types of system call 2.2 Inter Process Communication (IPC) 2.2.1 Race conditions 2.2.2 Critical sections 2.2.3 Mutual Exclusion with busy waiting	**`12 hrs**

		2.2.4 Sleep and wakeup 2.2.5 Semaphores *2.2.6.* Monitors 2.2.7 Message passing 2.3 Classical IPC problems(dinning philosophers problem, bounded buffer problem, sleeping Barber Problem)	
3.	**CPU scheduling**	*3.1 Types of scheduler, scheduling objective, scheduling criteria,* *3.2* Types of scheduling: Preemptive ,non preemptive scheduling 3.3 Scheduling algorithm: First come first service, Shortest job first (preemptive and non preemptive), priority scheduling (preemptive and non preemptive) and Round robin scheduling.	**5 hrs**
4.	**Input/Output and disk scheduling**	4.1 Principle of I/O hardware 4.2 Principle of I/O software 4.3 Device controller, device driver,clocks and Terminals	**5 hrs**

		4.4. Input/output disk and disk performance parameters 4.5 Disk scheduling 4.5.1 FCFS scheduling 4.5.2 SSTF scheduling 4.5.3 SCAN scheduling 4.5.4 Circular SCAN scheduling 4.5.5 Look and C-look scheduing	
5.	**Deadlocks**	5.1 Introduction to deadlock and deadlock in resources allocation 5.1.1 Necessary condition for a resource deadlock 5.1.2 Resource allocation graph 5.2 Deadlock handling strategies 5.2.1 Deadlock prevention 5.2. 2 Deadlock avoidance (Banker's algorithm) 5.2.3 Deadlock detection and recovery(Ostrich Algorithm)	**5 hrs**
6.	**Memory Management**	6.1 Fixed and variable partition systems	**6 hrs**

		6.2 Bit maps 6.3 Memory management with link list(First fit, best fit,next fit, quick fit and buddy system) 6.4. Multiprogramming memory management techniques 6.5 Virtual memory(paging technique, segmentation and demand paging) *6.6. Swapping and page replacement algorithm(FIFO,LRU,Optimal page replacement)*	
7.	**File systems**	8.1 Files and directories 8.2 File access mechanism, File allocation method 8.3 File sharing and locking	**3 hrs**
8.	**Case studies**	Linux, windows,Mac, IOS, Android OS, Distributed OS, Network OS	**5 hrs**

Laboratory:

There shall be laboratories exercise covering the following topics:-

i. Implementation of process (creation of process, child process parent process).
ii. Implementation of system call
iii. Inter process communication (Implementation Race condition, Semaphore, monitor)
iv. Implementation of (share memory, message passing)
v. Implementation of Dinning philosopher's problem
vi. Process scheduling (shortest Job First, priority scheduling, Round Robin)

vii. Implementation deadlock and Banker's algorithm
viii. Memory management
ix. Implementation of Disk scheduling algorithm(FCFS, SSTF,SCAN)

References:

- Tanenbaum A.S, "Operating systems: Design and Implementation", (prentice Hall)
- Stallings, William, "Operating system: Internals and design principles" , (prentice Hall)
- Operating System Concepts, "Operating system Concepts", (Addision- Wesley)

Detailed Course Contents:

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

Ch No.	Topic		Subtopic	Depth								Hour	Remarks
				D	Des	DR/DSG	I	Alg	H/P	A	N		
1	**Operating system overview and structure**	1.1	OS objective and functions	**D**	Des		I					**4 hrs**	
		1.2	OS as a user /computer interface		**Des**								
		1.3	OS as a resource manager		**Des**								

		1.4	Evaluation of OS		**Des**								
		1.5	Serial processing ,batch processing, multiprogramming, multiprocessing, time sharing and real time processing	**D**	**Des**		**I**			**A**			
		1.6	Simple structure and layered structure of OS		**Des**								
		1.7	Kernel of operating system, function of kernel, types of kernel(monolithic, and microkernel only) and shell	**D**	**Des**					**A**			
2	**Process synchronization and interprocess communication**		Process concepts, the process model,	D	Des		**I**					**12 hrs**	
		2,2	process state process transition and process control block(PCB)	D	Des		**I**						
		2.3	Threads,types of thread (user level and kernel level)	D	Des								
		2.4	System call and type of system call	D	Des		**I**						
		2.5	Inter Process Communication (Race conditions,Critical sections and Mutual exclusion with busy	D	Des		**I**						

			waiting.)										
		2.6	Semaphores, Monitors and message passing	D	Des		**I**		P				
		2.7	Classical IPC problems(dinning philosophers problem, bounded buffer problem, sleeping Barber Problem)	D	Des		I		P				
3	**CPU scheduling**	3.1	Types of scheduler, scheduling objective, scheduling criteria	D								**5 hrs**	
		3.2	Types of scheduling, Preemptive vs non preemptive scheduling	**D**	**Des**		I						
		3.3	Scheduling algorithm: First come first service, Shortest job first (preemptive and non preemptive), priority scheduling (preemptive and non preemptive) and Round robin scheduling.	**D**	**Des**		I				N		
4	**Input/Output and disk**	4.1	Principle of I/O hardware, Principle of I/O software, Clocks	**D**	DES							**5 hrs**	

	scheduling		and Terminals										
		4.2	Input/output disk and disk performance parameters	**D**	Des	**DR**					N		
		4.3	Disk scheduling • FCFS scheduling • SSTF scheduling • SCAN scheduling Circular SCAN scheduling • Look and C-look scheduing	**D**	Des						**N**		
5	**Deadlocks**	5.1	5. Introduction to deadlock and deadlock in resources allocation 5.1.1 Necessary condition for a resource deadlock 5.1.2 Resource allocation graph	**D**			**I**					**5 hrs**	

		5.2	Deadlock handling strategies	**D**			**I**						
		5.2.1	Deadlock prevention	**D**			**I**						
		5.2.2	Deadlock avoidance (Baker's algorithm)	**D**			**I**				N		
		5.2.3	Deadlock detection recovery	**D**			**I**						
6	**Memory Management**	6.1	Fixed and variable partition systems									**6 hrs**	
		6.2	Bit maps	**D**									
		6.3	Memory management with link list(First fit, best fit,next fit, quick fit and buddy system)	**D**			**I**						
		6.4	Fixed and variable partition systems	**D**									
		6.5	Multiprogramming memory management techniques	**D**			**I**				N		
		6.6	Virtual memory(paging, segmentation and demand paging)	**D**			**I**				N		
		6.7	*Swapping and page replacement algorithm(FIFO,LRU,Optimal page replacement)*	**D**			**I**						
8.	**File system**	9.1	Files and directories	**D**	Des							**3 hrs**	
		9.2	File access mechanism	**D**	D		**I**						
		9.3	File allocation method with linked list	**D**	Des		**I**						

		9.3	File sharing and locking										
9.	**Case studies**		Linux, windows,Mac, IOS, Android OS	*Report submission and presentation of case study*								**5 hrs**	

Chapter	**marks**
Chapter 1	5
Chapter 2	15+3
Chapter 3	8
Chapter 4	6
Chapter 5	7
Chapter 6	8
Chapter 7	4
Chapter 8	4

Model question 2080 for new syllabus operating system

Subject: Operating System **Full marks: 60**
Programme: B.E. Computer **Pass marks: 24**

Subject Code: BCE…. CO
Year/part: III/I

Attempt all questions selecting seven questions from group B and three questions from group C

Group A (very short question)

1. Define race condition with example. [2]
2. What are the performance criteria for CPU? [2]
3. List five services provided by an operating system. [2]
4. Define clock and terminals. [2]

Group B (short questions)

5. Define "Process" and explain the difference between Process and Program. [4]
6. Describe the role of an operating system as resource as manager. [4]
7. Processes P1, P2 , P3 are the processes with their arrival time, burst time and priorities listed in table below:

Process	Arrival	Burst Time (in	priority

	Time	milliseconds)	
P1	0	10	3
P2	1	5	2
P3	2	2	1

8. Discuss the necessary conditions for deadlock with example. [4]

10. Given memory partitions of 100KB, 400KB,200KB, 300KB and 500KB(in order), how would each of the first fit, best fit and worst fit algorithm place processes of 212KB, 112KB and 426KB(in order)? Which algorithm makes the most efficient use of memory? [4]

11. How many page faults will occurs for the following reference string having 3 frame using LRU algorithm.
The reference string is 7,0,1,2,0,3,0,4,2,3,0,3 [4]

12. Define RTOS. Differentiate between RTOS and GPOS. **[2+2]**

13. Describe the different file allocation methods. [4]

Group C (Long questions)

12. Let us consider a system with 5 processes P0 to P4 and three resource types A, B, and C. Resource type A has 10 instances, resource type B has 5 instances, and resource type C has 7 instances. Suppose that, at time T0, the following snapshots of the system has been taken:

	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P0	0	1	0	7	5	3	3	3	2
P1	2	0	0	3	2	2			
P2	3	0	2	9	0	2			
P3	2	1	1	2	2	2			
P4	0	0	2	4	3	3			

i) What are the contents of need matrix?
ii) Is the system in safe state? If yes, then what are the safe sequences?
iii) What will happen if process p1 requests one additional instance of type A and two instance of resource type C.? [8]

13. Differentiate between binary semaphore and counting semaphore. Discuss the solution for reader/ writer problem. [3+5]
14. What is monitor? Write solution of dinning philosopher problem's using monitor. [2+6]
15. How logical address is mapped with physical address by paging technique. Explain with suitable example. [8]

Numerical Methods

Year: III **Semester: II**

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:** Lecturer **T:** Tutorial **P:** Practical

Course Objective:

After completion of this course, the students will be able to solve the engineering problems by using the theory of numerical Computational procedures

Course Content:

1. Introduction (3 hrs)
- 1.1. Introduction and Importance of Numerical Method
- 1.2. Approximation and Errors in computation
- 1.3. Uses and Importance of Computer programming in Numerical Methods
- 1.4. Application of Numerical Computing in Civil Engineering

2. Solution of non – Linear equation (8 hrs)
- 2.1. Iterative methods and stopping criteria
- 2.2. Bisection method & its Convergence
- 2.3. Newton- Raphson method and its convergence
- 2.4. Secant method and its convergence
- 2.5. Fixed Point method
- 2.6. Evaluation of polynomials using Horner's Rule

3. Curve Fitting (8 hrs)
- 3.1 Interpolation
  - 3.1.1 Linear interpolation
  - 3.1.2 Lagrange interpolation
  - 3.1.3 Newton's Gregory Forward and Backward interpolation
  - 3.1.4 Newton's Divided Difference interpolation
  - 3.1.5 Central Interpolation (Gauss Forward/ Backward Formulae)

3.2. Regression

3.2.1 Least Squares Regression
3.2.2 Fitting Transcendental Equations.
3.2.3 Fitting a polynomial function

3.3. Spline Interpolation (Cubic Spline)

4. Numerical Differentiation & Integration (7 hrs)

4.1 Differentiating continuous function
4.1.1 Forward Difference Quotient
4.1.2 Backward Difference Quotient
4.1.3 Central Difference quotient
4.2 Newton cotes methods of integration
4.2.1 Trapezoidal rule and composite trapezoidal rule
4.2.2 Simpson's 1/3 rule & its composite
4.2.3 Simpson's 3/8 rule.
4.3 Romberg integration
4.4 Gaussian integration (Gaussian – Legendre 2 point and 3 point Formula)

5. Linear Algebraic Equations (8 hrs)

5.1 Elimination Approach
5.1.1 Basic Gauss Elimination
5.1.2 Gauss Elimination with partial pivoting
5.1.3 Gauss Jordon method
5.1.4 Finding inverse matrix using Gauss Jordan Method
5.1.5 LU decomposition methods
5.1.5.1 Do Little Method
5.1.5.2 Crout's Method
5.2 Iterative method
5.2.1 Jacobi method
5.2.2 Gauss- Seidal method
5.3 Eigen values and Eigen vectors using power method

6. Solution of ordinary differential equations (7 hrs)

6.1 Euler's method
6.2 Heun's method
6.3 Fourth order Runge-Kutta method
6.4 Systems of differential equations using Heun's method
6.5 2nd order differential equations using Heun's method

7. Solutions of partial differential equations (4 hrs)

7.1 Elliptic equations

7.1.1 Laplace's equations (standard five point formula with iterative method)
7.1.2 Poisson's equations (finite difference formula with iterative method))
7.2 Parabolic Equations (Solution of heat equation by Bender –Schmidt recurrence method)
7.3 Hyperbolic Equations (Solution of wave equation by finite difference method)

Laboratories:

1. Bisection method, N-R method
2. Secant method & Horner's rule
3. Lagrange interpolation
4. Linear Regression
5. Basic Gauss elimination method
6. Finding inverse matrix using Gauss Jordan
7. Trapezoidal rule ,Simpson's 1/3 rule, Simpson's 3/8 rule
8. Solution of differential equation using Euler's , Heun's and R-K method

References

1. E. Balagurusamy " Numerical Methods '' Tatal Mc Graw Hill
2. Dr. B.S. Grewal, "Numerical Methods in Engineering and Science", Khanna Publication
3. S.Yakwitz and F. szidarouszky " An Introduction to Numerical Computations " 2nd Edition Macmillan Publishing co , New York
4. C.F Gerald and P.o. Wheatley " Applied Numerical Analysis ",4th Edition, Addipon wesley publishing co. New york .

**Latest edition will be preferable.*

Evaluation Scheme: Marks Division

Question Type	No. of Questions	Marks	Total Marks
Group A	6	4	24
Group B	6	6	36
Total			60

Detailed Course Contents of Numerical Methods:

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		Sub-Topic	Depth								Hour	Remarks
				D	Des	DR/ DSG	I	Alg	H/ P	A	N		
1	**Introduction**	1.1	Introduction and Importance of Numerical Method	**D**	**Des**							**3 hrs**	
		1.2	Approximation and Errors in Computations	**D**	**Des**						**N**		
		1.3	Uses and Importance of Computer programming in Numerical Methods	**D**	**Des**								
		1.4	Application of Numerical Computing in Civil Engineering	**D**	**Des**								
2	**Solution of non – Linear equation**	2.1	Iterative methods and stopping criteria	**D**	**Des**							**8 hrs**	
		2.2	Bisection method & its Convergence		**Des**			**Alg**	**P**		**N**		

		2.3	Newton-Raphson method and its convergence		**Des**			**Alg**	**P**		**N**		
		2.4	Secant method and its convergence		**Des**			**Alg**	**P**		**N**		
		2.5	Fixed Point method		**Des**			**Alg**	**P**		**N**		
		2.6	Evaluation of polynomials using Horner's Rule					**Alg**	**P**		**N**		
3	**Curve Fitting**	3.1.1	Linear interpolation		**Des**						**N**	**8 hrs**	
		3.1.2	Lagrange interpolation		**Des**			**Alg**	**P**		**N**		
		3.1.3	Newton's Gregory forward backwad interpolation		**Des**						**N**		
		3.1.4	Newton's divided difference interpolation		**Des**						**N**		
		3.1.5	Central Interpolation (Gauss Forward/ Backward Formulae)		**Des**						**N**		

		3.2.1	Least squares Regression		**Des**			**Alg**	**P**		**N**		
		3.2.2	Fitting Transcendental Equations.		**Des**						**N**		
		3.2.3	Fitting a polynomial function		**Des**						**N**		

4	**Numerical Differentiation & integration** **4.1** Differentiating continuous function **4.2** Newtoncotes methods of integration	4.1.1	Forward Difference Quotient		**Des**						**N**	**7 hrs**	
		4.1.2	Backward Difference Quotient		**Des**						**N**		
		4.1.3	Central Difference quotient		**Des**						**N**		
		4.2.1	Trapezoidal rule and its composite		**Des**			**Alg**	**P**		**N**		
		4.2.2	Simpson's 1/3 rule and its composite		**Des**			**Alg**	**P**		**N**		
		4.2.3	Simpson's 3/8 rule.		**Des**			**Alg**	**P**		**N**		
		4.3	Romberg integration		**Des**						**N**		
		4.4	Gaussian integration		**Des**						**N**		
5	**Linear Algebraic Equations:** **5.1** Elimination Approach	5.1.1	Basic Gauss Elimination		**Des**			**Alg**	**P**		**N**	**8 hrs**	
		5.1.2	Gauss Elimination with partial pivoting		**Des**						**N**		
		5.1.3	Gauss Jordon method		**Des**						**N**		
		5.1.4	Finding inverse matrix using Gauss Jordonmethod		**Des**			**Alg**	**P**		**N**		

		5.1.5	LU decomposition methods:										
	5.2 Iterative method		Do Little method Crout's Method		**Des** **Des**						**N** **N**		
		5.2.1	Gauss Jacobi		**Des**						**N**		
		5.2.2	Gauss- Seidal method		**Des**						**N**		
		5.3	Eigen values and eigen vectors using power method		**Des**						**N**		
6	**Solution of ordinary**	**6.1**	Euler's Method		**Des**			**Alg**	**P**		**N**	**7 hrs**	
		6.2	Heun's method		**Des**			**Alg**	**P**		**N**		
		6.3	Fourth order Runge-kutta method		**Des**			**Alg**	**P**		**N**		

	differential equations	**6.4**	Systems of differential equations using Heun's method		**Des**						**N**		

		6.5	2nd order differential equations using Heun's method		**Des**						**N**		
7	**Solutions of partial differential equations:**	**7.1**	Elliptic equations	**D**	**Des**						**N**	**4 hrs**	
		7.2	Parabolic Equations	**D**	**Des**						**N**		
		7.3	Hyperbolic Equations	**D**	**Des**						**N**		

Final Examination Scheme:

Chapters	Marks	Remarks	Hour
1	4	Th / N	3
2	4+6	Convergence/Algorithm/Program+ N	8
3	4+6	Algorithm/Program + N or N+N	8
4	4+6	Algorithm/Program + N or N+N	7
5	4+6	Algorithm/Program + N or N+N	8
6	4+6	Algorithm/Program + N or N+N	7
7	6	N	4
Total	60	Th: Theory/N: Numerical	45

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

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Chapter wise marks division in final examination:

Chapter	Group A (4Marks)	Group B (6Marks)
1	1	
2	1	1
3	1	1
4	1	1
5	1	1
6	1	1
7		1

Note: The total (14 marks) of Program and Algorithm of the Methods mentioned in the lab must only be asked in the final examination..

PURBANCHAL UNIVERSITY
SEMESTER FINAL EXAMINATION – 2024 (MODEL QUESTION)

LEVEL: B. E. (Civil)
SUBJECT: Numerical Methods FULL MARKS: 60
TIME: 03:00 hrs PASS MARKS: 24

Attempt all questions

Group A (6*4=24)

1. Write the application of numerical computing in Civil Engineering. Find the roundoff error in storing the number 752.6835 considering four significant digits. [2+2]

2. Write the algorithm to find the root of non linear equation using N-R method.

3. Fit a straight line to the following set of data

x	1	2	3	4	5
y	3	4	5	6	8

4. Use Gauss legendre 3-point formula to evaluate the following integral

$$\int_2^4 (x^4 + 1)dx$$

5. Use Gauss Jordan Method to solve the following system

   2a+4b-6c= -8
   a+3b+c=10
   2a-4b-2c= -12

6. Write a program to solve the ordinary differential equation using R-K method.

Group B (6*6=36)

7. Find the square root of 0.75 using Fixed point method.

8. Given the following set of data points, estimate the value of f(1.5) using Newton's divided difference method.

x	1	2	3	4	5
f(x)	0	7	26	63	124

9. Write the algorithm and program to evaluate the intregral using Trapezoidal rule.

10. Find the largest eigenvalue and the corresponding eigenvector of the following matrix using power method

$$\begin{bmatrix} 1 & 2 & 0 \\ 2 & 1 & 0 \\ 0 & 0 & -1 \end{bmatrix}$$

11. Solve the following equation for y(0.2)
    $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} - 3y = 6x$
    Given y(0)=0, y'(0)=1. Use Heun's method and take h=0.2

12. Solve the Laplace equation: uxx + uyy=0 in the region $0 \leq x \leq 3$, $0 \leq y \leq 3$ where u(0,y)=10,u(x,0)=20, u(3,y)=25, u(x,3)=30. Take h=1and use Gauss Seidal iteration method to solve the set of equations.

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Research methodology

Year: III

Semester: V

Teaching Schedule(hours/week)			Examination scheme				
Theory	Tutorial	Practical	Internal evaluation		External evaluation		Total
2	1	-	Theory	Practical	Theory	practical	50
			20	-	30	-	

Course Objectives:

1. To familiarize students with the principles and practices of research methodology in engineering.
2. To develop students' skills in formulating research questions and designing research studies.
3. To equip students with knowledge of various data collection methods and instrumentation techniques relevant to engineering research.
4. To introduce students to statistical analysis methods commonly used in engineering research.
5. To cultivate an understanding of ethical considerations and professionalism in engineering research.
6. To enhance students' abilities in writing research proposals, reports, and presenting research findings effectively.

Course contents

1. **Introduction to Research Methodology – 3 LH**

- Importance of research in engineering
- Overview of the research process

- Types of research (quantitative, qualitative, mixed-methods)
- Role of research in innovation and problem-solving in engineering

2. Research Design - 5 LH

- Formulating research questions and hypotheses in engineering
- Types of research designs (experimental, observational, case studies)
- Sampling techniques in engineering research
- Validity and reliability considerations in engineering research design

3. Data Collection Methods - 5 LH

- Surveys and questionnaires in engineering studies
- Experimental methods and design of experiments
- Case studies and their relevance to engineering investigations
- Use of sensors, data acquisition systems, and instrumentation in engineering research

4. Data Analysis Techniques - 5 LH

- Descriptive statistics for engineering data analysis
- Inferential statistics commonly used in engineering research
- Introduction to statistical software packages for engineering data analysis (e.g., Excel, SPSS)
- Introduction to engineering-specific data analysis tools and techniques

5. Measurement and Instrumentation - 4 LH

- Principles of measurement in engineering
- Types of measurement instruments used in engineering research (sensors, meters, probes)
- Calibration and validation of measurement instruments in engineering experiments
- Data logging and analysis techniques for sensor data in engineering research

6. Research Ethics and Professionalism – 4 LH

- Ethical considerations specific to engineering research
- Professional standards and codes of conduct in engineering research
- Intellectual property rights and patent issues in engineering research
- Responsibilities of engineers in conducting and reporting research ethically

7. Report writing - 4 LH

- Structure and components of engineering research papers and reports
- Technical writing skills for engineering research documents
- Effective presentation techniques for engineering research findings
- Peer review process and publication ethics in engineering research

References:

- Kothari,CR: Reseach Methodology: Methods and Techniques; Wiley Eastern Ltd, 1993.
- Prem R. Panta: " Social Science Research"
- Sekaran, U., & Bougie, R. (2016). Research Methods for Business: A Skill Building Approach. John Wiley & Sons.
- Creswell, J. W., & Creswell, J. D. (2017). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. Sage Publications.
- Leedy, P. D., & Ormrod, J. E. (2014). Practical Research: Planning and Design. Pearson.

Purbanchal University

Faculty of Engineering, Biratnagar, Nepal

Syllabus

Level: Bachelor

Program: Bachelor in Computer Engineering

Subject: Project II

Year: III **Semester:** V

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
3	1	-	3	4	-	-	-	30			

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

Course Objective/s:

After completion this course, students will be able to apply the concept of system design, Database and Programming language required for developing a computer information system for real life situation.

Contents:

Students will work individually or in group on a project of their choice, mostly related to development of a computer information system for life industrial situation.

In some cases students will be asked to visit software development firms/Company where they will involve themselves in using system analysis and design and Free Open Source Programming tools required during software development process.

At the end of the semester they will be required to document their reports, which will be individually, assessed by their advisors.

Every student will have to appear for a viva-voce at the end of the semester.