UNIVERSITY OF KERALA

B. TECH DEGREE COURSE

(2020 SCHEME)

SYLLABUS

FOR

SEMESTER III&IV

Branch: Information Technology

SEMESTER –III

Semester-III

SLOT	Course No.	COURSES	L-T-P	Hours	Credit
A	MAT203	DISCRETE MATHEMATICAL STRUCTURES	3-1-0	4	4
B	ITT201	DATA STRUCTURES	3-1-0	4	4
C	ITT203	DIGITALSYSTEM DESIGN	3-1-0	4	4
D	ITT205	PROBLEM SOLVING USING PYTHON	3-1-0	4	4
E 1\2	EST200	DESIGN & ENGINEERING	2-0-0	2	2
	HUT200	PROFESSIONAL ETHICS	2-0-0	2	2
F	MCN201	SUSTAINABLE ENGINEERING	2-0-0	2	-
S	ITL201	DATA STRUCTURES LAB	0-0-3	3	2
T	ITL203	PROGRAMMING AND SYSTEM UTILITIES LAB	0-0-3	3	2
R\M	VAC	REMEDIAL/MINOR COURSE	3-1-0	4*	4
		TOTAL		**30**	**22/26**

MAT 203	DISCRETE MATHEMATICAL STRUCTURES	CATEGORY	L	T	P	CREDITS
		BSC	3	1	0	4

Preamble:

The purpose of this course is to create awareness in students about the basic terminologies used in advanced courses in Computer Science and develop rigorous logical thinking for solving different kinds of problems in Computer Science. This course helps the learner to apply the theory and applications of elementary Counting Principles, Propositional Logic, Predicate Logic, Lattices, Generating Functions, Recurrence Relations and Algebraic Structures eventually in practical applications.

Prerequisite: A sound background in higher secondary school Mathematics

Course Outcomes: After the completion of the course the student will be able to

CO#	CO
CO1	Check the validity of predicates in Propositional and Quantified Propositional Logic using truth tables, deductive reasoning and inference theory on Propositional Logic **(Cognitive Knowledge Level: Apply)**
CO2	Solve counting problems by applying the elementary counting techniques - Rule of Sum, Rule of Product, Permutation, Combination, Binomial Theorem, Pigeonhole Principle and Principle of Inclusion and Exclusion **(Cognitive Knowledge Level: Apply)**
CO3	Classify binary relations into various types and illustrate an application for each type of binary relation, in Computer Science (**Cognitive Knowledge Level: Understand)**
CO4	Illustrate an application for Partially Ordered Sets and Complete Lattices, in Computer Science **(Cognitive Knowledge Level: Apply)**
CO5	Explain Generating Functions and solve First Order and Second Order Linear Recurrence Relations with Constant Coefficients **(Cognitive Knowledge Level: Apply)**
CO6	Illustrate the abstract algebraic systems - Semigroups, Monoids, Groups, Homomorphism and Isomorphism of Monoids and Groups **(Cognitive Knowledge Level: Understand)**

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓	✓								✓
CO2	✓	✓	✓	✓								✓
CO3	✓	✓	✓	✓		✓						✓
CO4	✓	✓	✓	✓		✓						✓
CO5	✓	✓	✓	✓								✓
CO6	✓	✓	✓	✓								✓

Abstract POs defined by National Board of Accreditation			
PO#	**Broad PO**	**PO#**	**Broad PO**
PO1	Engineering Knowledge	**PO7**	Environment and Sustainability
PO2	Problem Analysis	**PO8**	Ethics
PO3	Design/Development of solutions	**PO9**	Individual and team work
PO4	Conduct investigations of complex problems	**PO10**	Communication
PO5	Modern tool usage	**PO11**	Project Management and Finance
PO6	The Engineer and Society	**PO12**	Life long learning

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination Marks (%)**
	Test 1 (%)	**Test 2 (%)**	
Remember	30	30	30
Understand	30	30	30
Apply	40	40	40
Analyze			
Evaluate			
Create			

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
150	50	100	3

Continuous Internal Evaluation Pattern:

Attendance	**10 marks**
Continuous Assessment Tests (Average of Series Tests 1& 2)	**25 marks**
Continuous Assessment Assignment	**15 marks**

Internal Examination Pattern:

Each of the two internal examinations has to be conducted out of 50 marks. First series test shall be preferably conducted after completing the first half of the syllabus and the second series test shall be preferably conducted after completing remaining part of the syllabus. There will be two parts: Part A and Part B. Part A contains 5 questions (preferably, 2 questions each from the completed modules and 1 question from the partly completed module), having 3 marks for each question adding up to 15 marks for part A. Students should answer all questions from Part A. Part B contains 7 questions (preferably, 3 questions each from the completed modules and 1 question from the partly completed module), each with 7 marks. Out of the 7 questions, a student should answer any 5.

End Semester Examination Pattern:

There will be two parts; Part A and Part B. Part A contains 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 full questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carries 14 marks.

Syllabus

Module – 1 (Fundamentals of Logic)

Mathematical logic - Basic connectives and truth table, Statements, Logical Connectives, Tautology, Contradiction. Logical Equivalence - The Laws of Logic, The Principle of duality, Substitution Rules . The implication - The Contrapositive, The Converse,The Inverse.

Logical Implication - Rules of Inference. The use of Quantifiers - Open Statement, Quantifier. Logically Equivalent – Contrapositive, Converse , Inverse , Logical equivalences and implications for quantified statement, Implications , Negation .

Module - 2 (Fundamentals of Counting Theory)

The Rule of Sum – Extension of Sum Rule . The Rule of Product - Extension of Product Rule . Permutations. Combinations. The Binomial Theorem (without proof). Combination with Repetition. The Pigeon hole Principle. The Principle of Inclusion and Exclusion Theorem (Without Proof) - Generalization of the Principle. Dearangements.

Module - 3 (Relations and Functions)

Cartesian Product - Binary Relation. Function – domain , range-one to one function, Image-restriction. Properties of Relations- Reachability Relations, Reflexive Relations, Symmetric Relations, Transitive relations, Anti-symmetric Relations, Partial Order relations, Equivalence Relations, Irreflexive relations.

Partially ordered Set – Hasse Diagram, Maximal-Minimal Element, Least upper bound (lub), Greatest Lower bound(glb) (Topological sorting Algorithm- excluded). Equivalence Relations and Partitions - Equivalence Class.

Lattice - Dual Lattice , Sub lattice , Properties of glb and lub , Properties of Lattice , Special Lattice , Complete Lattice, Bounded Lattice, Completed Lattice , Distributive Lattice.

Module - 4 (Generating Functions and Recurrence Relations)

Generating Function - Definition and Examples , Calculation techniques, Exponential generating function. First order linear recurrence relations with constant coefficients – homogeneous, non-homogeneous Solution. Second order linear recurrence relations with constant coefficients, homogeneous, non-homogeneousSolution.

Module - 5 (Algebraic Structures)

Algebraic system-properties- Homomorphism and Isomorphism. Semi group and monoid – cyclic monoid , sub semi group and sub monoid, Homomorphism and Isomorphism of Semi group and monoids. Group- Elementary properties, subgroup, symmetric group on three symbols ,The direct product of two groups, Group Homomorphism, Isomorphism of groups, Cyclic group.Right cosets - Left cosets. Lagrange's Theorem.

Text Book

1. Discrete and Combinatorial Mathematics (An Applied Introduction),Ralph P Grimaldi,B V Ramana , 5th Edition,Pearson

Reference Books

1) Kenneth H. Rosen, Discrete Mathematics and Its Applications with Combinatorics and Graph Theory, Seventh Edition, MGH,2011
2) Trembly J.P and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata Mc Graw Hill Pub. Co. Ltd., New Delhi,2003.
3) Bernard Kolman, Robert C. Busby, Sharan Cutler Ross, "Discrete Mathematical Structures", Pearson Education Pvt Ltd., New Delhi,2003
4) Kenneth H .Rosen, "Discrete Mathematics and its Applications", 5/e, Tata Mc Graw Hill Pub. Co. Ltd, New Delhi2003
5) Richard Johnsonbaugh, "Discrete Mathematics", 5/e, Pearson Education Asia, NewDelhi, 2002.
6) Joe L Mott, Abraham Kandel, Theodore P Baker,"Discrete Mathematics for Computer Scientists and Mathematicians", 2/e, Prentice-Hall India,2009.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Show that RVM, RVS, ¬M, ¬S cannot exist simultaneously(without using truth table)
2. Represent the following statement in symbolic form "Not every city in Canada Is clean".

Course Outcome 2 (CO2):

1. How many possible arrangements are there for the letters in MASSASAUGA in which4 A' s are together?
2. Find the number of integers between 1 and 1000 inclusive, which are not divisible by 5, 6 or 8

Course Outcome 3 (CO3):

1. If A = {1, 2, 3, 4}, give an example of a relation R that is reflexive and symmetric but not transitive.
2. Let Z be the set of integers ,R is a relation called "CongruenceModulo3"defined by R = { (x,y) /x ε Z,y ε Z, x - y is divisible by 3 } . Show that R is an equivalence relation.

Course Outcome 4 (CO4):

1. Assume A ={ a, b, c}. Let P(A) be its power set and '≤ ' be the subset relation on the power set. Draw the Hasse diagram of (P(A),≤).
2. What is meant by Bounded Lattice ? Give an example.

Course Outcome 5 (CO5):

1. Solve $a_r - 3a_{r-1} - 4a_{r-2} = 3^r$ using Generating function method; Given $a_0 = 1$, $a_1 = 2$.
2. Find the generating function for the sequence 1, 3, 3^2, 3^3…….

Course Outcome 6 (CO6):

1. Prove that the group { 1,-1, i, -i } is cyclic with generators i and–i.
2. State and prove Lagrange's Theorem.

Model Question Paper

QP CODE:

RegNo:_____

_____ **PAGES : 3**

Name:_____

THIRD SEMESTER B.TECH DEGREE EXAMINATION, MONTH & YEAR

Course Code: MAT 203

Course Name: Discrete Mathematical Structure

Max.Marks :100 Duration: 3Hrs

PART A

Answer all Questions. Each question carries 3 Marks

1. Show the following implication without constructing the truth table: (P ^ Q) =>P→Q
2. Write the negation of the following statement. " If I drive, then I will not walk"
3. What is pigeon hole principle? Explain. If you select any five numbers from 1 to 8 then prove that at least two of them will add up to 9.
4. In how many ways can the letters of the word ALLAHABAD be arranged?
5. Show that the divisibility relation ' / ' is a partial ordering on the set Z^+.
6. Consider the functions given by f(x) = 2x+3 and g(x) = x^2. Find (g o f) and (f og).
7. What is meant by exponential generating function? Explain.
8. Provide one example of linear homogeneous recurrence relation. Mention the degree also.
9. What is a monoid ? Explain.
10. Let (A, .) be a group. Show that $(ab)^{-1} = b^{-1}a^{-1}$

(10 x 3 = 30 Marks)

PART B

(Answer any one Question from each Module. Each question carries 14 Marks)

11.

(a) Show that S VR is tautologically implied by (PVQ) ^(P→R) ^(Q→S)

(6 marks)

(b) Show that from

(ii) $(\exists x)(F(x) \wedge S(x)) \rightarrow (y)(M(y) \rightarrow W(y))$.

(iii) $(\exists y)(M(y) \wedge \sim W(y))$ the conclusion $(x)(F(x) \rightarrow \sim S(x))$follows.

(8 marks)

OR

12.

(a) Show that $(x)(P(x) \vee Q(x)) \Rightarrow ((x)P(x) \vee (\exists x) Q(x))$ using indirect method of proof .

(6 marks)

(b) Discuss indirect method of proof . Show that the following premises are inconsistent

(i) If Jack misses many classes through illness, then he fails high school.

(ii) If Jack fails high school, then he is uneducated.

(iii) If Jack reads a lot of books, then he is not uneducated.

(iv) Jack misses many classes through illness and reads a lot of books.

(8 marks)

13.

(a) Explain binomial theorem. Determine the coefficient of x^9y^3 in the expansion of $(x+y)^{12}$, $(x+2y)^{12}$ and $(2x- 3y)^{12}$ using binomial theorem.

(6 marks)

(b) How many 5 digit numbers can be formed from the digits 1,2,3,4,5 using the digits without repetition ?

(i) How many of them are even?

(ii) How many are even and greater than 30,000?

(8 marks)

OR

14.

(a) There are 8 guests in a party. Each guest brings a gift and receives another gift in return. No one is allowed to receive the gift they bought. How many ways are there to distribute the gifts?

(6 marks)

(b) Six papers are set in an examination of which two are mathematical. Only one examination will be conducted in a day. In how many different orders ,can the papers be arranged so that

(i) Two mathematical papers are consecutive?

(ii) Two mathematical papers are not consecutive?

(8 marks

15.

(a) Let A = { 1,2,3,4,...11,12} and let R be the equivalence relation on A x A defined by (a,b) R (c,d) iff a+d = b+c. Prove that R is an equivalence relation and find the equivalence class of (2 ,5)

(8 marks)

(b) What is a chain lattice ? Explain. Also show that every chain is a distributive lattice.

(6 marks)

OR

16.

(a) Suppose f(x) = x+2 , g(x) = x-2, and h(x) = 3x for x ε R , where R is the set of real numbers. Find (g o f) , (f o g) , (f o f) and (g og)

(8 marks)

(b) Let R and S be two relations on a set A . If R and S are symmetric, Prove that(R∩S) is also symmetric.

(6 marks)

17.

(a) Solve the recurrence relation $a_r - 7a_{r-1} + 10a_{r-2} = 0$ for $r \geq 2$; Given $a_0 = 0$; $a_1 = 41$ using generating functions

(8 marks)

(b) Solve the recurrence relation $a_r - 4a_{r-1} + 4a_{r-2} = (r+1)^2$ using generating function.

(6 marks)

OR

18.

(a) Solve $a_n - 3a_{n-1} + 2$; $a_0 = 1$ $n \geq 1$, using generating functions.

(8 marks)

(b) Use generating function to solve the following recurrence relation $a_n = 2a_{n-1} + 2^n$; with $a_0 = 2$.

(6 marks)

19.

(a) Prove that the set 'Q' of rational numbers other than 1 forms an abelian group with respect to the operation ' * ' defined by a * b = a+b-ab.

(8 Marks)

(b) Show that the direct product of two group is a group.

(6Marks)

OR

20.

(a) Show that the subgroup of a cyclic group is cyclic.

(8 Marks)

(b) Let (A,*) be a group. Show that (A,*) is an abelian group if and only if $a^2 * b^2 = (a*b)^2$ for all 'a' and 'b' in A

(6 Marks)

No	Contents	No of Lecture Hrs
Module – 1 (Fundamentals of Logic) (9 hrs)		
1.1	Mathematical logic, Basic Connectives and Truth Table	1
1.2	Statements, Logical Connectives, Tautology, Contradiction	1
1.3	Logical Equivalence, The Laws of Logic	1
1.4	The Principle of duality, Substitution Rules	1
1.5	The implication, The Contrapositive, the Converse , the Inverse	1
1.6	Logical Implication,Rules of Inference, Logical Implication	1
1.7	The use of Quantifiers, Open Statement, Quantifier, Negation	1
1.8	Logically Equivalent, Contrapositive, The Converse, The Inverse	1
1.9	Logical Implications	1
Module - 2 (Fundamentals of Counting Theory) (9hrs)		
2.1	The Pigeon-hole Principle	1
2.2	The Rule of Sum	1
2.3	Extension of Sum Rule	1
2.4	The Rule of Product	1
2.5	Extension of Product Rule , Permutations	1
2.6	Combinations, Combination with repetition	1
2.7	The Binomial Theorem	1
2.8	The Principle of Inclusion and Exclusion Theorem (Without Proof) Generalization of the Principle	1
2.9	Derangements	1
Module - 3 (Relations and Functions) (9hrs)		
3.1	Cartesian Product, Binary Relation, Function, Domain, Range , One to One Function Image - Restriction	1
3.2	Properties, Reachability Relations, Reflexive Relations, Symmetric Relations, Transitive relations, Antisymmetric Relations.	1

3.3	Partial Order relations	1
3.4	Equivalence Relation, Irreflexive Relations.	1
3.5	Partially ordered Set, Hasse Diagram.	1
3.6	Maximal-Minimal Element, Least Upper bound, Greatest Lower Bound	1
3.7	Equivalence Relations and Partitions ,Equivalence Class	1
3.8	Lattice- Dual Lattice, sub lattice , Properties of glb and lub	1
3.9	Properties of Lattice , Special Lattice , Complete Lattice, Bounded Lattice, Completed Lattice, Distributive Lattice	1
Module - 4 (Generating Functions and Recurrence Relations) (9 hrs)		
4.1	Generating Function , Definition and Examples	1
4.2	Exponential Generating Function.	1
4.3	First Order Linear Recurrence Relations with Constant Coefficients (Lecture I)	1
4.4	First Order Linear Recurrence Relations with Constant Coefficients (Lecture II)	1
4.5	Homogeneous Solution	1
4.6	Non homogeneous Solution	1
4.7	Second order linear recurrence relations with constant coefficients	1
4.8	Homogeneous Solution	1
4.9	Non homogeneous Solution	1
Module - 5 (Algebraic Structures)(9 hrs)		
5.1	Algebraic System- Properties, Homomorphism and Isomorphism	1
5.2	Semi group , Monoid, Cyclic monoid	1

5.3	Sub semigroup and sub monoid	1
5.4	Homomorphism and Isomorphism of Semigroup, Monoids and Groups	1
5.5	Elementary Properties, Subgroup, Symmetric group on three symbols	1
5.6	The direct Product of two Groups	1
5.7	Group Homomorphism, Isomorphism, Cyclic group	1
5.8	Right coset, Left coset	1
5.9	Lagrange's Theorem	1

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
ITT201	DATA STRUCTURES	PCC	3	1	0	4

Preamble: The syllabus is prepared with the view of preparing the Engineering Graduates capable of understanding essential concept of data structures, designing algorithms to perform operations involving these data structures and to choose appropriate data structures to solve real world problems.

Prerequisite: programming in C

Course Outcomes: After the completion of the course the student will be able to

CO_No.	Course Outcome(CO)	Bloom's Category
CO 1	**Summarize** different categories of data Structures	Level 2 : Understand
CO 2	**Identify different** parameters to analyze the Performance of an algorithm.	Level3 :Apply
CO 3	**Explain** the significance of dynamic memory management Techniques.	Level 2 : Understand
CO 4	**Design** algorithms to perform operations with Linear and Nonlinear data structures	Level3 :Apply
CO 5	**Illustrate** various technique to for searching, Sorting and hashing	Level 2 : Understand
CO 6	**Choose** appropriate data structures to solve real world problems efficiently.	Level3 :Apply

Mapping of course outcomes with program outcomes

COs	PROGRAMME OUTCOMES (PO)											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	2	-	-	1	-	-	-	-	-	1
CO 2	3	2	2	2	1	1	-	-	-	-	-	1
CO 3	3	3	3	2	1	1	-	-	-	-	-	1
CO 4	3	3	3	2	1	1	-	-	-	-	-	1
CO 5	3	2	2	1	1	-	-	-	-	-	-	1
CO 6	3	3	3	2	1	1	-	-	-	-	-	1

3/2/1: high/medium/low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember	10	10	10
Understand	20	20	20
Apply	20	20	70
Analyse			
Evaluate			
Create			

Mark distribution

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 10marks

Continuous Assessment Test(2numbers) : 25 marks

Assignment/Quiz/Course project : 15marks

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contain 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 14 marks.

Sample Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Differentiate CDT and ADT
2. Classify classical data structures
3. Compare array and linked list
4. Represent single and double dimensional array
5. Describe any three applications of array

Course Outcome 2 (CO2):

1. Identify the needs of algorithm analysis
2. Select two parameters to do the performance analysis of an algorithm
3. Identify 3 possible cases of time complexity

Course Outcome 3 (CO3):

1. Classify linked list
2. Illustrate different operations on singly, doubly and circular linked list
3. Represent linked list in memory (static and dynamic).

4. Summarize different dynamic memory management schemes.
5. Demonstrate the first fit , best fit , worst fit and next fit allocation of given process queue and free list

Process queue	85 K	35 K	70 K	100 K

	80K	130K	90 K	40 K
Free list				

Course Outcome 4 (CO4):

1. Design the algorithms to perform PUSH()and POP() and STATUS() operations on stack using array and linked list
2. Apply Stack data structure in infix to postfix conversion, expression evaluation, recursion and delimiter matching.
3. Design the algorithms for pre-order, in-order and post-order traversal on binary trees
4. Develop the algorithms for ENQUEUE(), and DEQUEUE() operations on queue data structures
5. Construct the algorithms for graph traversal(BFS,DFS)

Course Outcome 5 (CO5):

1. Classify Sorting Techniques (internal and external, n2 and nlogn)
2. Compare Linear and binary search
3. Illustrate bubble, selection and insertion sort.
4. Describe quick and merge sort
5. Represent the following values in the given order in a hash table (Size of hash table is 7 and hash function used is h(k)=k mod 7) for each of the scenario.
   19, 26, 13, 48, 17
   a) When collisions are handled by linear probing
   b) When collisions are handled by double using second hash function h=5-(k mod5)

Course Outcome 6 (CO6):

1. Develop an application program which is to be used in Ticket counter, where First person gets ticket first and go out first, using suitable data structure.
2. Make use of suitable data structure to store the details of pass percentage of the college in chronological order of years (oldest to newest) and retrieve the information in reverse chronological order of years, using suitable data structure.

Model Question Paper

PARTA **(10*3=30)**

(Each Question carries 3 Marks)

1. Classify Sorting Techniques
2. Differentiate CDT and ADT
3. Classify linked list
4. Compare First fit and Next Fit Algorithms
5. Design the algorithms to perform PUSH() and POP()
6. Summarize operations Queue data structure
7. List out the features of binary tree
8. Explain binary sorting
9. Define hashing
10. Illustrate separate chaining with an example

PARTB **(5*14=70)**

11. Classify classical data structures

OR

12. Illustrate Quick sort with the help of an example

13. Illustrate different operations on singly linked list

OR

14. Demonstrate the first fit , best fit , worst fit and next fit allocation of given process queue and free list

Process queue	85 K	35 K	70 K	100 K

	80K	130K	90 K	40 K
Free list				

15. Apply Stack data structure in infix to postfix conversion

OR

16. Develop the algorithms for ENQUEUE(), and DEQUEUE() operations on queue data structures

17. Construct the algorithms for graph traversal(BFS,DFS)

OR

18. Explain 3 types of binary tree traversal

19. Explain Any 3 types of hash functions

OR

20. Represent the following values in the given order in a hash table (Size of hash table is 7 and hash function used is h(k)=k mod 7) for each of the scenario.

19, 26, 13, 48, 17

a) When collisions are handled by linear probing

b) When collisions are handled by double using second hash function h=5-(k mod5)

Syllabus

Module 1: Introduction to data structures (9 Hours)
Data Structures-Introduction and Overview- Arrays, Algorithm/Program Development, Searching and Sorting.
Module 2: Linked lists (10 Hours)
Linked lists, singly linked list, Doubly linked list, Circular linked list, Applications of linked list, Dynamic Memory management.
Module 3 : Stacks and Queues (9 Hours)
Stack, Applications of stacks, Queues, Types of queues
Module 4 : Trees and graphs (10 Hours)
Trees, Binary Tree Traversals, Binary tree Applications, Graph, and Graph Applications.
Module 5 : Hash Table (7 Hours)
Hash Tables, Different Hash Functions, Collision Resolution Techniques, closed hashing and Open Hashing (Separate Chaining).

Text Books

T1. Samanta D., Classic Data Structures, Prentice Hall India, 2/e, 2009.

T2. Ellis horowitz, SartajSahni, Fundamentals of Data structures, GalgotiaBooksource

Reference Books

R1. Horwitz E., S. Sahni and S. Anderson, Fundamentals of Data Structures in C, University Press (India), 2008.

R2. Aho A. V., J. E. Hopcroft and J. D. Ullman, Data Structures and Algorithms, Pearson Publication,1983**.**

R3. Tremblay J. P. and P. G. Sorenson, Introduction to Data Structures with Applications, Tata McGraw Hill, 1995.

R4. Peter Brass, Advanced Data Structures, Cambridge University Press, 2008

R5. Lipschuts S., Theory and Problems of Data Structures, Schaum's Series, 1986.

R6. Wirth N., Algorithms + Data Structures = Programs, Prentice Hall,2004.

R7. Hugges J. K. and J. I. Michtm, A Structured Approach to Programming, PHI, 1987.

R8. Martin Barrett, Clifford Wagner, And Unix: Tools For Software Design, John Wiley, 2008 reprint.

Course Contents and Lecture Schedule

	Module 1: Introduction to data structures	**9hrs**
1.1	**Data Structures-Introduction and Overview**: Definitions, Concept of data structure, classifications of data structure- ADT and CDT- Linear and nonlinear.	1
1.2	**Arrays:** definition, Representation of Single/Two dimensional arrays, Applications of array – searching –Sorting - Sparse Matrix- conversion of sparse matrix into 3 tuple form.	2
1.3	**Algorithm/Program Development:** Analysis of algorithms. Space Complexity, Time Complexity - Best case, worst case, average case. **Searching** : linear and binary search – Complexity Analysis (Detailed analysis is not required)	2
1.4	**Sorting**: classifications- Internal sorting – External sorting, N^2 Sorting : Selection, bubble and insertion- Complexity analysis (Detailed analysis is not required)	2
1.5	N $\log_n$ Sorting : Quick Sort and Merge Sort (Recursive Algorithms)- Complexity Analysis (Detailed analysis is not required)	2
	Module 2: Linked lists	**10 hrs**
2.1	**Linked lists**: static and dynamic representation, Classification -Singly linked list- Doubly linked list- Circular linked list, array and linked list. **Singly linked list**: Operations on Singly linked list- Traversal-Insertion-deletion, copying -searching - Merging.	2
2.2	**Doubly linked list**: Operations on doubly linked list- Insertion-deletion.	2
2.3	**Circular Linked list** : Operations on circular linked list-Insertion and deletion	2
2.4	**Applications of linked list**: Polynomial representation and manipulation (addition)- Dynamic Memory management.	2
2.5	**Dynamic Memory management**: Fixed sized and variable sized memory allocation and de-allocation. First-fit, best-fit and worst-fit allocation schemes and problems.	2
	Module 3: Stacks and Queues	**9 hrs**
3.1	**Stack:** Definition, Schematic Diagram of stack, Array and Liked list representation of stack , operations on stack using array and linked list (PUSH(),POP(),STATUS()) .	2
3.2	**Applications of stacks**: Infix to postfix conversion- post fix evaluation, string reversal, delimiter matching.	3
3.3	**Queues**: Definition, Schematic Diagram of queue, Array and Liked list representation of queue , operations on queue using array and linked list (EQUEUE(),DEQUEUE(),STATUS()) .	2
3.4	**Types of queue** : circular queue-priority queue- doubly ended queue	2

	Module 4: Trees and graphs	**10 hrs**
4.1	**Trees:** Basic terminologies, Binary Trees, Properties of binary trees, linear and linked representations, Complete and full Binary Tree.	2
4.2	**Binary Tree Traversals**: Preorder -In order and post order (Recursive, non-recursive)-problems	1
4.3	**Binary tree Applications:** Expression tree creation, heap trees (concepts), Binary search tree – creation, insertion and deletion and search operations	3
4.4	**Graph**: Terminologies, set representations, linked/adjacency list representation, Adjacency matrix linear representation **Graph traversal**: Breadth First Search (BFS), Depth First Search (DFS) - related problems.	2
4.5	**Graph Applications:** Shortest Path Problem-Dijkstras Algorithm	2
	Module 5: Hash Table	**7 hrs**
5.1	**Hash Tables**-Hash Functions- Features of hash function.	1
5.2	**Different Hash Functions:** Division Method- Multiplication Method - Mid Square Method, Folding Method- related problems.	2
5.3	**Collision Resolution Techniques:** Closed hashing (Linear probing) and Open Hashing (Separate Chaining) . Closed hashing(Linear probing) -Drawbacks- Remedies - Radom Probing – Double hashing/Re-hashing –Quadratic Probing, problems to create hash tables using linear probing and Random probing, double hash and quadratic probing.	3
5.4	Open Hashing (Separate Chaining)	1

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
ITT203	DIGITAL SYSTEM DESIGN	PCC	3	1	0	4

Preamble: The syllabus is prepared with the view of preparing the Engineering Graduates capable of understanding the basic digital logic design and implementation. All students of computing should acquire some understanding and appreciation of a computer system's functional components, their characteristics, their performance, and their interactions.

Prerequisite: NIL

Course Outcomes: After the completion of the course, the student will be able

CO No.	Course Outcome(CO)	Bloom's Category
CO 1	To perform base conversion and arithmetic operations in various number systems.	Apply
CO 2	To design digital circuits using simplified Boolean functions	Create
CO 3	To develop simple design of combinational circuits	Apply
CO 4	To develop simple design of sequential circuits	Apply
CO 5	To interpret the generalization of synchronous and asynchronous sequential circuits	Understand

Mapping of course outcomes with program outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3			3	-	-	-	-	-	-	-	2
CO 2	3	3	3	3	-	-	-	-	-	-	-	2
CO 3	3	3	3	3	-	2	-	1	-	-	-	2
CO 4	3			3	-	-	-	-	-	-	-	2
CO 5	3	3	3	3	2	2	-	1	-	-	-	2

3/2/1: high/medium/low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination Marks
	Test 1(Marks)	Test 2 (Marks)	
Remember	10	5	20
Understand	15	10	20
Apply	10	10	25
Analyse	10	10	15
Evaluate	5	10	10
Create		5	10

Mark distribution

Total Marks	**CIE**	**ESE**	**ESE Duration**
150	50	100	4 hours

Continuous Internal Evaluation Pattern:

Attendance : 10marks
Continuous Assessment Test(2numbers) : 25 marks
Assignment/Quiz/Course project : 15marks

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contain 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 14 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1): To understand the basic concepts of Number systems

1. Convert the given number from decimal number system to binary, octal, and hexadecimal number system.
2. Perform Arithmetic operations on different number system.
3. Represent the different coding schemes.

Course Outcome 2 (CO2): To design digital circuits using simplified Boolean functions

1. Simplify the given expression using Postulates of Boolean algebra.

2. Convert a given expression to standard and canonical forms.
3. Simplify the given expression using Karnaugh Map or Quine –McClusky minimization technique.

Course Outcome 3 (CO3): To analyze and design combinational circuits

1. Analyse a given circuit and explain the results obtained by the circuit.
2. Design a Carry look ahead adder.
3. Design a four-bit magnitude comparator.

Course Outcome 4 (CO4): To understand the basics of sequential circuits

1. Understand the functioning of Latches and Flip Flops.
2. Design Master-Slave Flip Flops.
3. Understand the basics of different types of Flip Flops.

Course Outcome 5(CO5): To analyze and design synchronous and asynchronous sequential circuits

1. Analyse a given circuit and explain the results obtained by the circuit.
2. Implement a serial adder using a shift register.
3. Design and construct a 4-bit ring counter with only one flip-flop is clear at any particular time and all other flip-flops are set. Give its timing diagram.
4. Using an example, show the Race-Free State Assignment in an asynchronous sequential circuit.

Model Question Paper

Course Code: ITT203
Course Name: DIGITAL SYSTEM DESIGN

Max. Marks: 100 Duration: 3 Hours

PART A
Answer all questions, each carries 3 marks.

1. Convert $(76.75)_{10}$ to binary, octal and hexadecimal.
2. Determine the base of the numbers in the operation; **58/4**=15.
3. Simplify the Boolean expression to minimum number of literals.
   $\boldsymbol{F=\overline{BC}+A\overline{B}+AB\overline{C}+AB\overline{C}\overline{D}+\overline{A}B\overline{C}D+A\overline{B}CD}$
4. Find the complement of the Boolean function $\boldsymbol{F=\overline{A}+ABC}$. And prove that $\boldsymbol{F+\overline{F}=1}$ and $\boldsymbol{F.\overline{F}=0}$.
5. Design a 4-to-2 line priority encoder.

6. Explain the difference between a latch and a flip-flop.

7. Give the characteristics equations for D, JK and T flip-flops.

8. Discuss in detail about Race condition.

9. With a neat diagram, discuss about SISO.

10. Design a 4-bit ring counter.

PART B
Answer all questions, each carries 14 marks.

11. a) Using Booth algorithm, perform multiplication of (-14) and (-7). (5)

    b) Represent the unsigned decimal numbers 572.36 and 382.71 in BCD. Show the necessary steps to form their sum and difference. (9)

OR

12. a) (i) Find the decimal equivalent of $(A40F)_{16}$
    (ii) Find the 16's complement of$(A40F)_{16}$
    (iii) Convert to binary$(A40F)_{16}$
    (iv) Finds the 2's complement of the result in(iii) (8)

    b) Perform addition, subtraction, multiplication, and division of the following binary numbers without converting them to decimal : 1000110and 110. (6)

13. a) For the Boolean function
    F = w′xy′+ xy′z + x′y′z + w′xy + wx′y + wxy

    (i) Draw the logic diagram, using the original Boolean expression.
    (ii) Simplify the Boolean algebra to a minimum number of literals.
    (iii) Obtain the truth table of the function from the simplified expression and show that it is the same as the original Boolean expression. (9)

    b) Prove that $A+\overline{A}B = A + B$ using Boolean postulates. (5)

OR

14. a) Simplify the following functions using Quine- McClusky method:
    f (a,b,c,d) = Σm (2, 3, 4, 5, 13, 15) + Σd (8, 9,10,11). (7)

    b) Using K-map simplify following Boolean expression & give implementation of same using gates F(A,B,C,D) =Σ(2,4,8,15)+ΣD(0,3,9,12) (7)

15. a) Design a combinational circuit to implement a 4-bit carry look-ahead adder. (7)

    b) Design a 4-bit code-converter to convert BCD to gray code. (7)

OR

16. a) Implement the Boolean function f(w,x,y,z) = Σm(0,1,5,6,7,9,12,15) using 8-to-1 multiplexer. (7)
    b) Implement a 2-bit Magnitude comparator and write down its design procedure. (7)

17. a) For the following state table

Present State	Next State		Output	
	x=0	x=1	x=0	x=1
a	b	c	0	0
b	d	f	1	0
c	b	e	0	0
d	f	h	1	0
e	b	e	0	0
f	g	a	1	1
g	a	h	0	0
h	g	e	1	1

i. Draw the corresponding state diagram.
ii. Tabulate the reduced state table.
iii. Draw the state diagram corresponding to the reduced state table.
iv. Design the sequential circuit using flip-flops. [Hint : Unused states may be considered, as don't cares.] (9)

b) Design D Flip Flop by using SR Flip Flop and draw the timing diagram. (5)

OR

18.a) Explain the state reduction in the sequential circuits using an example. (9)

b) Draw the circuit of JK flips flop using NAND gates and explain its operation. (5)

19. a) Implement a four-bit universal shift register. Explain its design. (7)

b)What do you mean by ripple counter? Design and implement a BCD ripple counter. (7)

OR

20.a) Tabulate the PLA programming table for the four Boolean functions list below. Minimize the numbers of product terms.

$A(x, y, z) = \Sigma_m(1, 3, 5,6)$
$B(x, y, z) = \Sigma_m(0, 1, 6,7)$
$C(x, y, z) = \Sigma_m(3, 5)$
$D(x, y, z) = \Sigma_m(1, 2, 4,5, 7)$ (9)

b) What are the operations that can be performed on a RAM? (5)

Syllabus

Module 1: NUMBER SYSTEM (9 Hours)
Number Systems – Decimal, Binary, Octal, Hexadecimal - conversion from one system to another – Representation of negative numbers using 2's compliment. Arithmetic Operations – Addition, Subtraction, Multiplication, Division of Binary numbers, Booths algorithm for multiplication, Representation of negative numbers, Representation of floating point numbers. Representation of BCD numbers, BCD Addition, Binary Codes – Gray codes– excess 3 code- Character Coding Schemes – ASCII, EBCDIC.
Module 2: BOOLEAN ALGEBRA & LOGIC GATES (9 Hours)
Boolean Algebra - Postulates of Boolean algebra - Canonical and Standard Forms - SimplificationofBooleanFunctionsusingKarnaughMap-Product-of-SumsSimplification — Don't-Care Conditions – Quine –McClusky minimization technique – Basic Gates- Universal Gates.
Module 3: COMBINATIONAL LOGIC (9 Hours)
Combinational Circuits – Analysis and Design Procedures - Binary Adder-Sub tractor (Half & Full) - Carry look ahead adder, BCD adder, code converter, - Magnitude Comparator - Decoders – Encoders Parity Generator– Multiplexers – DE multiplexers –Implementation of Boolean functions using MUX.
Module 4: SEQUENTIAL LOGIC CIRCUITS (9 Hours)
Sequential Circuits - Storage Elements: Latches , Flip-Flops – RS, JK, D, T, Triggering of flip-flops, Master-Slave- Analysis of Clocked Sequential Circuits- Design Procedure-using JK,D &T.
Module 5: COUNTERS AND SHIFT REGISTERS (9 Hours)
Registers - Shift Registers – SISO, PIPO, SIPO, PISO- Universal shift registers, Counters- Design of Counters- Synchronous & Asynchronous Counters — up-down counter, Decade counter, BCD counter, Johnson counter, Ring counter ,Memory & Programmable logic- RAM, ROM, PLA,PAL

Text Books

1. Mano M. M. and Michael D. Ciletti, *Digital Design*, 4/e, Pearson Education,2013.
2. Thomas L. Floyd, *Digital Fundamentals*, 11th Edition, Pearson Education,2015.
3. N. N. Biswas, *"Minimization of Boolean Functions,"* in *IEEE Transactions on Computers*, vol. C-20, no. 8, pp. 925-929, Aug. 1971. doi:10.1109/T-C.1971.223373

Reference Books

1. Charles H Roth ,Jr, Lizy Kurian John, *Digital System Design using VHDL*,2/e, Cengage Learning
2. Mano M. M. and Michael D. Ciletti, Digital Design with an Introduction to the Verilog HDL, 5/e, Pearson Education,2013.
3. Tokheim R. L., Digital Electronics Principles and Applications, 7/e, Tata McGraw Hill, 2007.
4. Rajaraman V. and T. Radhakrishnan, *An Introduction to Digital Computer Design*, 5/e, Prentice Hall India Private Limited,2012.
5. Leach D, Malvino A P, Saha G, *Digital Principles and Applications*, 8/e, McGraw Hill Education,2015.
6. M. Morris Mano, *Computer System Architecture*, 3/e, Pearson Education, 2007.

7. Harris D. M. and, S. L. Harris, *Digital Design and Computer Architecture*, 2/e, Morgan Kaufmann Publishers,2013

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**NUMBER SYSTEM**	**9 Hours**
1.1	Number Systems – Decimal, Binary, Octal, Hexadecimal - conversion from one system to another – Representation of negative numbers using 2's compliment.	3 hours
1.2	Arithmetic Operations – Addition, Subtraction, Multiplication, Division of Binary numbers, Booths algorithm for multiplication, representation of negative numbers, Representation of floating point numbers.	4 Hours
1.3	Representation of BCD numbers , BCD Addition Binary Codes – Gray codes – excess 3 code- Character Coding Schemes – ASCII, EBCDIC	2 Hours
2	**BOOLEAN ALGEBRA & LOGIC GATES**	**9 Hours**
2.1	Boolean Algebra - Postulates of Boolean algebra - Canonical and Standard Forms	2 Hours
2.2	Simplification of Boolean Functions using Karnaugh Map - Product-of-Sums Simplification — Don't-Care Conditions	2 Hours
2.3	Quine –McClusky minimization technique	2 Hours
2.4	Basic Gates-Universal Gates.	3 Hours
3	**COMBINATIONAL LOGIC**	**9 Hours**
3.1	Combinational Circuits – Analysis and Design Procedures - Binary Adder-Subtractor - Carry look ahead adder, BCD adder	3 Hours
3.2	Code converter, - Magnitude Comparator - Decoders – Encoders – Multiplexers	3 Hours
3.3	Parity Generator– Multiplexers – DE multiplexers – Implementation of Boolean functions using MUX.	3 Hours
4	**SEQUENTIAL LOGIC CIRCUITS**	**9 Hours**
4.1	Sequential Circuits - Storage Elements: Latches , Flip-Flops – RS, JK, D, T, Triggering of flip-flops, race condition- Master-Slave	3 Hours
4.2	Analysis of Clocked Sequential Circuits	3 Hours
4.3	State Reduction and Assignment - Design Procedure- using JK,D & T	3 Hours
5	**COUTERS AND SHIFT REGISTERS**	**9 Hours**
5.1	Registers - Shift Registers – SISO, PIPO, SIPO, PISO- Universal shift registers	2 Hours
5.2	Design of Counters- Synchronous & Asynchronous Counters — up-down counter.	3 Hours
5.3	Counters-, Decade counter, BCD counter, Johnson counter, Ring Counter	2 Hours
5.4	Memory & Programmable logic-RAM, ROM, PLA,PAL	2 Hour

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
ITT205	PROBLEM SOLVING USING PYTHON	PCC	3	1	0	4

Preamble: The syllabus is prepared with the view of preparing the Engineering Graduates capable of writing readable PYTHON programs to solve computational problems that they may have to solve in their professional life. The course content is decided to cover the essential programming fundamentals which can be taught within the given slots in the curriculum. This course has got 3 lecture hours and 1 tutorial hour per week for learning and practicing programming using PYTHON. The instructor is supposed to give homework/assignments to write simple programs in the rough record as and when the required theory part is covered in the class. The programs that require time and effort can be done in the Lab sessions. The students are expected to come prepared with the required program written in the rough record for the lab classes.

Prerequisite: NIL

Course Outcomes: After the completion of the course the student will be able to

CO No.	Course Outcomes	Bloom's Category
CO 1	Write programs using Python and learn its execution environment	Understand
CO 2	Apply programs to implement various computational tasks which requires loops and conditional statements	Apply
CO 3	Write programs using functions and packages	Understand
CO 4	Apply programs to implement the concept of file handling using Python	Apply
CO 5	Design object oriented programs to implement daily life problems and their solutions	Apply

Mapping of course outcomes with program outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	1	1	1	-	-	-	-	-	-	-	-	-
CO 2	2	2	1	1	-	-	-	-	-	-	-	-
CO 3	3	2	2	2	2	-	-	-	-	-	-	1
CO 4	1	1	1	2	1	-	-	-	-	-	-	1
CO 5	3	1	3	2	1	1	-	-	-	-	-	1

3/2/1: High/Medium/Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember	10	10	25
Understand	20	20	35
Apply	20	20	40
Analyse			
Evaluate			
Create			

Mark distribution

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 10marks
Continuous Assessment Test(2numbers) : 25 marks
Assignment/Quiz/Course project : 15marks

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contain 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 14 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):
Describe identifiers, variables, keywords, expressions and statements, Operators and operands.
Describe the expression evaluation in Python.
Describe the syntax of control statements in Python.
Write programs to solve problems using various control structures.
Differentiate between Break and Continue.

Course Outcome 2 (CO2):
Build applications of various string manipulations by using methods and functions available with string module in python.

Build applications of various List operations, including matrix representation.
Build applications of Tuple and various Tuple operations.
Build applications of Dictionary and its related operations, functions and methods.

Course Outcome 3(CO3):

Describe function definition and function access in python.
Differentiate between parameters and arguments.
Differentiate between type conversion and coercion.
Describe mathematical & lambda functions in Python.
Explain the concept of composition of functions in Python.
Explain Recursion and its implementation in Python.
Explain the concepts of modules and packages in Python. How and why import method is used.
Write programs to solve problems using the concept of functions and recursion.

Course Outcome 4 (CO4):

Apply the concept of file operations including opening, writing to and reading from files, and writing variables using Python.
Build applications to demonstrate the concept of Pickling.
Build programs to demonstrate the concept of Exception Handling in python.

Course Outcome 5 (CO5):

Build classes using python & Access class variables.
Build programs in Python to demonstrate the use of instances as arguments and return values.
Build programs in Python to demonstrate the concept of Constructors, class attributes and destructors.
Model the concept of Inheritance using Python.

Model Question paper

Course Code: ITT 205

Course Name: Problem Solving Using Python

Max.Marks:100 **Duration: 3Hours**

PART A

Answer all Questions. Each question carries 3 Marks

1. Write a python program to find the sum of all odd terms in a group of n numbers entered by the user.
2. What is the use of *pass* statement in Python?
3. Write a Python code to check whether two strings are equal or not.
4. Write a Python code to search an element in a list.
5. List the advantages of using functions in a program.
6. State the use of dump method with suitable example.

7. Write a function exists() which returns True if the given file exists and False if it does not.
8. Why exceptional handling is required in programming?
9. Describe the concept of Constructor with an example.
10. Explain the purpose of _init__ () method in Python.

(10x3=30)

Part B

Answer any one Question from each module. Each question carries 14 Marks

11. **(a)** Write a Python program to find the largest and second largest of n numbers. Assume n>=3 and all the numbers are distinct. No sorting algorithm should be used. (7)

(b) What are arithmetic operators used in Python? Explain each using an example(7)

OR

12. **(a)** Write a Python program to print the odd composite numbers between m and n, where m and n are positive integers greaterthan1. (8)

(b) Define the following
i) Atoms
ii) Identifiers
iii) Literals (6)

13. **(a)** Write a Python code to add two matrices using list. (6)

(b) Write a Python program to reverse a string and print whether its palindrome or not. (8)

OR

14. **(a)** How to create Dictionary in Python? Write a Python program to read and display a sparse matrix using dictionary. (7)

(b) Write a program to
i) convert all small letters in a string into capital letters
ii) find the occurrence of a given substring. (7)

15.(a) Compare the built-in functions int() and str()with examples. (4)

(b) Write a program using function to display a multiplication table of n*n size, for any given 'n'. (5)

(c) Write a program using function to display a find the binomial coefficient, ${}^{n}c_{r}$. (5)

OR

16 (a). What is recursion? Write a recursive function to find the factorial of a number. (6)

(b) Write a program using function to check the type of a triangle by getting the values from the user. (8)

17. (a) How exceptions are handled in Python? Illustrate with example. (10)

(b) Write a program to read numbers sorted in one file and store the sorted numbers in another file after deleting duplicates. (4)

OR

18. (a). Describe the use of try-except method in Python with suitable Illustrations. (6)

(b) Write a Python code to read a text file, copy the contents to another file after removing the blank lines. (8)

19. (a). Write a Python code to create a class named 'Member' having the following members: Data members Name, Age, Phone number, Address, Salary. It also has a method named 'printSalary' which prints the salary of the members. Two classes 'Employee' and 'Manager' inherits the 'Member' class. The 'Employee' and 'Manager' classes have data members 'specialization' and 'department' respectively. Now, assign name, age, phone number, address and salary to an employee and a manager by making an object of both of these classes and print the same. (8)

(b) Create a class person with attributes Name, age, salary and a method display() for showing the details. Create two instances of the class and call the method for each instance. (6)

OR

20. (a) Define the terms class, attribute, method and instance with the help of an example. (4)

(b) Write a Python program to find out the total mark of a student using multiple inheritance. Declare a Student class. Student class should have the member functions for accept and display student details. Declare a Sports class to accept and display sports marks of the student. Derive a class statement from both the classes. This class should have the member functions to accept marks of three subjects and add those marks with sports marks and display the result. (10)

(14 x 5=70)

Syllabus

Module1	**9 hours**
Introduction To Python: Understanding Python-identifiers, variables, keywords, expressions and statements, evaluation of expressions, Operators and operands, operator precedence, indentation. **Python Program Flow Control:** Decision making- if, if..else, elif. Loops - for, while, for...else, while...else, Control statements using pass, continue, break.	
Module2	**9 hours**
Strings and lists – string traversal, string slices and comparison with examples, The string module, character classification. List- List values, accessing elements, list membership, Lists and for loops, List operations, List slices, List deletion, Matrices. Tuples - mutability and tuples, tuple assignment, Tuples as return values, Tuple operations. Dictionaries – operations and methods.	
Module3	**9 hours**
Python Functions, Modules and Packages: Function definition, calling functions, parameters and arguments, the return statement, type conversion and coercion, composition of functions, Lambda function, mathematical functions, user-defined functions, Recursion, Modules- Built-in modules, creating modules, import statement. Packages in Python - importing modules from a package.	

Module4	**9 hours**
Python Files and exceptions: Python file handling, open, write, read text files, writing variables, Directories in Python, Pickling, Exception Handling.	
Module5	**9 hours**
Python Object Oriented Programming: Introduction to classes and objects - class definition, attributes, instances, sameness, instances as arguments and return values. Constructor, class attributes and destructors, Inheritance.	

Text Books

1. Allen Downey, Jeffrey Elkner, Chris Meyers, " How to think like a Computer Scientist-Learning with Python", Green Tea Press, First edition,2002.
2. MarkLutz,"LearningPython:PowerfulObject-OrientedProgramming",O"ReillyMediaInc.,5th,2013

Reference Books

1. Kenneth A. Lambert, B. L. Juneja, "Fundamentals of Python", Cengage Lerning India Pvt. Ltd.,2015.
2. S.A.Kulkarni, "Problem Solving and PYTHON Programming", 2nd edition, Yes Dee Publishing Pvt Ltd,2018
3. Mark Summerfield,"Programming in Python 3: A Complete Introduction to the Python Language", Pearson Education,2nd,2018
4. Yashavant Kanetkar,Aditya Kanetkar ,"Let Us Python ",BPB Publications, 1st Edition, 2019
5. Allen Downey, "Learning with Python", Dreamtec Press, 1st Edition,2015
6. https://docs.python.org/3/reference/

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Introduction To Python:**	**9 hours**
1.1	Understanding Python-identifiers, variables, keywords, expressions and statements.	2
1.2	Evaluation of expressions, Operators and operands, operator precedence, indentation	1

1.3	Python Program Flow Control: Decision making- if, if..else, elif.	2
1.4	Loops - for, while, for...else, while...else	2
1.5	Control statements using pass, continue, break.	2
2	**Strings and lists:**	**9 hours**
2.1	String traversal, string slices and comparison with examples	1
2.2	The string module, character classification.	1
2.3	List- List values, accessing elements, list membership, Lists and for loops, List operations, List slices, List deletion	2
2.4	Matrices	1
2.5	Tuples- mutability and tuples, tuple assignment, tuples as return values, Tuple operations.	2
2.6	Dictionaries – operations and methods.	2
3	**Python Functions, Modules And Packages:**	**9 hours**
3.1	Function definition, calling functions, parameters and arguments, the return statement.	1
3.2	Type conversion and coercion, composition of functions	1
3.3	Lambda function, mathematical functions	1
3.4	user-defined functions	1
3.5	Recursion	1
3.6	Modules -Built-in modules	1
3.7	Creating modules, import statement.	1
3.8	Packages in Python - importing modules from a package.	2
4	**Python Files and exceptions:**	**9 hours**
4.1	Python file handling, open, write, read text files	4
4.2	Writing variables	1
4.3	Directories in Python	1
4.4	Pickling	1
4.5	Exception Handling.	2

5	**Python Object Oriented Programming:**	**9 hours**
5.1	Introduce classes and objects	1
5.2	Class definition, attributes, instances, sameness	1
5.3	Instances as arguments and return values.	1
5.4	Constructor	2
5.5	Class attributes and destructors	2
5.6	Inheritance	2

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
EST 200	DESIGN AND ENGINEERING		2	0	0	2

Preamble:

The purpose of this course is to

i) introduce the undergraduate engineering students the fundamental principles of design engineering,

ii) make them understand the steps involved in the design process and

iii) familiarize them with the basic tools used and approaches in design.

Students are expected to apply design thinking in learning as well as while practicing engineering, which is very important and relevant for today. Case studies from various practical situations will help the students realize that design is not only concerned about the function but also many other factors like customer requirements, economics, reliability, etc. along with a variety of life cycle issues.

The course will help students to consider aesthetics, ergonomics and sustainability factors in designs and also to practice professional ethics while designing.

Prerequisite:

Nil. The course will be generic to all engineering disciplines and will not require specialized preparation or prerequisites in any of the individual engineering disciplines.

Course Outcomes:

After the completion of the course the student will be able to

CO 1	Explain the different concepts and principles involved in design engineering.
CO 2	Apply design thinking while learning and practicing engineering.
CO 3	Develop innovative, reliable, sustainable and economically viable designs In corporating knowledge in engineering.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	1					1			1		
CO 2		2				1		1				2
CO 3			2			1	1		2	2		1

Assessment Pattern INFORMATION TECHNOLOGY

Continuous Internal Evaluation (CIE) Pattern:

Attendance	:	10 marks
Continuous Assessment Test (2 numbers)	:	25 marks
Assignment/Quiz/Course project	:	15 marks

End Semester Examination (ESE) Pattern: There will be two parts; Part A and Part B.
Part A : 30 marks
part B : 70 marks
Part A contains 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions.
Part B contains 2 case study questions from each module of which student should answer any one. Each question carry 14 marks and can have maximum 2 sub questions.

Mark distribution

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember	5	5	10
Understand	10	10	20
Apply	35	35	70
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

Course Level Assessment Questions

Course Outcome 1 (CO1): Appreciate the different concepts and principles involved in design engineering.

1. State how engineering design is different from other kinds of design

2. List the different stages in a design process.

3. Describe design thinking.

4. State the function of prototyping and proofing in engineering design.

5. Write notes on the following concepts in connection with design engineering 1) Modular Design, 2) Life Cycle Design , 3) Value Engineering, 4) Concurrent Engineering, and 5) Reverse Engineering

6. State design rights.

Course Outcome 2 (CO2) Apply design thinking while learning and practicing engineering.

1. Construct the iterative process for design thinking in developing simple products like a pen, umbrella, bag, etc.

2. Show with an example how divergent-convergent thinking helps in generating alternative designs and then how to narrow down to the best design.

3. Describe how a problem-based learning helps in creating better design engineering solutions.

4. Discuss as an engineer, how ethics play a decisive role in your designs

Course Outcome 3(CO3): Develop innovative, reliable, sustainable and economically viable designs incorporating different segments of knowledge in engineering.

1. Illustrate the development of any simple product by passing through the different stages of design process

2. Show the graphical design communication with the help of detailed 2D or 3D drawings for any simple product.

3. Describe how to develop new designs for simple products through bio-mimicry.

Model Question paper

Reg No.:_____ Name:_____

THIRD/FOURTH SEMESTER B.TECH DEGREE EXAMINATION

Course Code: EST 200

Course Name: DESIGN AND ENGINEERING

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each question carries 3 marks
Use only hand sketches

(1)Write about the basic design process.

(2) Describe how to finalize the design objectives.

(3) State the role of divergent-convergent questioning in design thinking.

(4) Discuss how to perform design thinking in a team managing the conflicts.

(5) Show how engineering sketches and drawings convey designs.

(6)Explain the role of mathematics and physics in design engineering process.

(7) Distinguish between project-based learning and problem-based learning in design engineering.

(8) Describe how concepts like value engineering, concurrent engineering and reverse engineering influence engineering designs?

(9) Show how designs are varied based on the aspects of production methods, life span, reliability and environment?

(10) Explain how economics influence the engineering designs?

(10x3 marks =30 marks)

Part B

Answer any ONE question from each module. Each question carry 14 marks

Module 1

(11) Show the designing of a wrist watch going through the various stages of the design process. Use hand sketches to illustrate the processes.

or

(12)Find the customer requirements for designing a new car showroom. Show how the design objectives were finalized considering the design constraints?

Module 2

(13)Illustrate the design thinking approach for designing a bag for college students within a limited budget. Describe each stage of the process and the iterative procedure involved. Use hand sketches to support your arguments.

or

(14)Construct a number of possible designs and then refine them to narrow down to the best design for a drug trolley used in hospitals. Show how the divergent-convergent thinking helps in the process. Provide your rationale for each step by using hand sketches only.

Module 3

(15) Graphically communicate the design of a thermo flask used to keep hot coffee. Draw the detailed 2D drawings of the same with design detailing, material selection, scale drawings, dimensions, tolerances, etc. Use only hand sketches.

or

(16)Describe the role of mathematical modelling in design engineering. Show how mathematics and physics play a role in designing a lifting mechanism to raise 100 kg of weight to a floor at a height of 10 meters in a construction site.

Module 4

(17) Show the development of a nature inspired design for a solar powered bus waiting shed beside a highway. Relate between natural and man-made designs. Use hand sketches to support your arguments.

or

(18)Show the design of a simple sofa and then depict how the design changes when considering 1) aesthetics and 2) ergonomics into consideration. Give hand sketches and explanations to justify the changes in designs.

Module 5

(19)Examine the changes in the design of a foot wear with constraints of 1) production methods, 2) life span requirement, 3) reliability issues and 4) environmental factors. Use hand sketches and give proper rationalization for the changes in design.

or

(20)Describe the how to estimate the cost of a particular design using ANY of the following: i) a website, ii) the layout of a plant, iii) the elevation of a building, iv) an electrical or electronic system or device and v) a car.

Show how economics will influence the engineering designs. Use hand sketches to support your arguments.

(5x14 marks =70 marks)

Syllabus

Module 1

Design Process:- Introduction to Design and Engineering Design, Defining a Design Process-:Detailing Customer Requirements, Setting Design Objectives, Identifying Constraints, Establishing Functions, Generating Design Alternatives and Choosing a Design.

Module 2

Design Thinking Approach:-Introduction to Design Thinking, Iterative Design Thinking Process Stages: Empathize, Define, Ideate, Prototype and Test. Design Thinking as Divergent-Convergent Questioning. Design Thinking in a Team Environment.

Module 3

Design Communication (Languages of Engineering Design):-Communicating Designs Graphically, Communicating Designs Orally and in Writing. Mathematical Modeling In Design, Prototyping and Proofing the Design.

Module 4

Design Engineering Concepts:-Project-based Learning and Problem-based Learning in Design.Modular Design and Life Cycle Design Approaches. Application of Bio-mimicry,Aesthetics and Ergonomics in Design. Value Engineering, Concurrent Engineering, and Reverse Engineering in Design.

Module 5

Expediency, Economics and Environment in Design Engineering:-Design for Production, Use, and Sustainability. Engineering Economics in Design. Design Rights. Ethics in Design

Text Books

1) YousefHaik, SangarappillaiSivaloganathan, Tamer M. Shahin, Engineering DesignProcess, Cengage Learning 2003, Third Edition, ISBN-10: 9781305253285,

2) Voland, G., Engineering by Design, Pearson India 2014, Second Edition, ISBN 9332535051

Reference Books

1.Philip Kosky, Robert Balmer, William Keat, George Wise, Exploring Engineering, Fourth Edition: An Introduction to Engineering and Design, Academic Press 2015, 4th Edition, ISBN: 9780128012420.

2. Clive L. Dym, Engineering Design: A Project-Based Introduction, John Wiley & Sons, New York 2009, Fourth Edition, ISBN: 978-1-118-32458-5

3. Nigel Cross, Design Thinking: Understanding How Designers Think and Work, Berg Publishers 2011, First Edition, ISBN: 978-1847886361

4. Pahl, G., Beitz, W., Feldhusen, J., Grote, K.-H., Engineering Design: A Systematic Approach, Springer 2007, Third Edition, ISBN 978-1-84628-319-2

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Module 1: Design Process**	
1.1	Introduction to Design and Engineering Design. *What does it mean to design something? How Is engineering design different from other kinds of design? Where and when do engineers design? What are the basic Vocabulary in engineering design? How to learn and do engineering design.*	1
1.2	*Defining a Design Process*-: Detailing Customer Requirements. *How to do engineering design? Illustrate the process with an example. How to identify the customer requirements of design?*	1
1.3	*Defining a Design Process*-: Setting Design Objectives, Identifying Constraints, Establishing Functions. *How to finalize the design objectives? How to identify the design constraints? How to express the functions a design in engineering terms?*	1
1.4	*Defining a Design Process*-: Generating Design Alternatives and Choosing a Design. *How to generate or create feasible design alternatives? How to identify the "best possible design"?*	1
1.5	Case Studies:- Stages of Design Process. *Conduct exercises for designing simple products going through the different stages of design process.*	1
2	**Module 2: Design Thinking Approach**	
2.1	Introduction to Design Thinking *How does the design thinking approach help engineers in creating innovative and efficient designs?*	1
2.2	Iterative Design Thinking Process Stages: Empathize, Define, Ideate, Prototype and Test. *How can the engineers arrive at better designs utilizing the iterative design thinking process (in which knowledge acquired in the later stages can be applied back to the earlier stages)?*	1
2.3	Design Thinking as Divergent-Convergent Questioning. *Describe how to create a number of possible designs and then how to refine and narrow down to the 'best design'.*	1
2.4	Design Thinking in a Team Environment. *How to perform design thinking as a team managing the conflicts ?*	1
2.5	Case Studies: Design Thinking Approach. *Conduct exercises using the design thinking approach for*	1

	designing any simple products within a limited time and budget	
3	**Module 3: Design Communication (Languages of Engineering Design)**	
3.1	Communicating Designs Graphically. *How do engineering sketches and drawings convey designs?*	1
3.2	Communicating Designs Orally and in Writing. *How can a design be communicated through oral presentation or technical reports efficiently?*	1
	First Series Examination	
3.3	Mathematical Modelling in Design. *How do mathematics and physics become a part of the design process?*	1
3.4	Prototyping and Proofing the Design. *How to predict whether the design will function well or not?*	1
3.5	Case Studies: Communicating Designs Graphically. *Conduct exercises for design communication through detailed 2D or 3D drawings of simple products with design detailing, material selection, scale drawings, dimensions, tolerances, etc.*	1
4	**Module 4: Design Engineering Concepts**	
4.1	Project-based Learning and Problem-based Learning in Design. *How engineering students can learn design engineering through projects?* *How students can take up problems to learn design engineering?*	1
4.2	Modular Design and Life Cycle Design Approaches. *What is modular approach in design engineering? How it helps?* *How the life cycle design approach influences design decisions?*	1
4.3	Application of Bio-mimicry, Aesthetics and Ergonomics in Design. *How do aesthetics and ergonomics change engineering designs?* *How do the intelligence in nature inspire engineering designs? What are the common examples of bio-mimicry in engineering?*	1
4.4	Value Engineering, Concurrent Engineering, and Reverse Engineering in Design. *How do concepts like value engineering , concurrent engineering and reverse engineering influence engineering designs?*	1
4.5	Case Studies: Bio-mimicry based Designs. *Conduct exercises to develop new designs for simple*	1

	products using bio-mimicry and train students to bring out new nature inspired designs.	
5	**Module 5: Expediency, Economics and Environment in Design Engineering**	
5.1	Design for Production, Use, and Sustainability. *How designs are finalized based on the aspects of production methods, life span, reliability and environment?*	1
5.2	Engineering Economics in Design. *How to estimate the cost of a particular design and how will economics influence the engineering designs?*	1
5.3	Design Rights. *What are design rights and how can an engineer put it into practice?*	1
5.4	Ethics in Design. *How do ethics play a decisive role in engineering design?*	1
5.5	Case Studies: Design for Production, Use, and Sustainability. *Conduct exercises using simple products to show how designs change with constraints of production methods, life span requirement, reliability issues and environmental factors.*	1
Second Series Examination		

Code.	Course Name	L	T	P	Hrs	Credit
HUT 200	**Professional Ethics**	2	0	0	2	2

Preamble: To enable students to create awareness on ethics and human values.

Prerequisite: Nil

Course Outcomes: After the completion of the course the student will be able to

CO 1	Understand the core values that shape the ethical behaviour of a professional.
CO 2	Adopt a good character and follow an ethical life.
CO 3	Explain the role and responsibility in technological development by keeping personal ethics and legal ethics.
CO 4	Solve moral and ethical problems through exploration and assessment by established experiments.
CO 5	Apply the knowledge of human values and social values to contemporary ethical values and global issues.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO 1								2			2	
CO 2								2			2	
CO 3								3			2	
CO 4								3			2	
CO 5								3			2	

Assessment Pattern

Bloom's category	Continuous Assessment Tests		End Semester Exam
	1	2	
Remember	15	15	30
Understood	20	20	40
Apply	15	15	30

Mark distribution

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern:

Attendance	: 10 marks
Continuous Assessment Tests (2 Nos)	: 25 marks
Assignments/Quiz	: 15 marks

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contains 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 14 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Define integrity and point out ethical values.
2. Describe the qualities required to live a peaceful life.
3. Explain the role of engineers in modern society.

Course Outcome 2 (CO2)

1. Derive the codes of ethics.
2. Differentiate consensus and controversy.
3. Discuss in detail about character and confidence.

Course Outcome 3(CO3):

1. Explain the role of professional's ethics in technological development.
2. Distinguish between self interest and conflicts of interest.
3. Review on industrial standards and legal ethics.

Course Outcome 4 (CO4):

1. Illustrate the role of engineers as experimenters.
2. Interpret the terms safety and risk.
3. Show how the occupational crimes are resolved by keeping the rights of employees.

Course Outcome 5 (CO5):

1. Exemplify the engineers as managers.
2. Investigate the causes and effects of acid rain with a case study.
3. Explorate the need of environmental ethics in technological development.

INFORMATION TECHNOLOGY

Model Question paper

QP CODE: **Reg No:_____**

PAGES:3 **Name :_____**

THIRD/FOURTH SEMESTER B.TECH DEGREE EXAMINATION, MONTH & YEAR

Course Code: HUT 200
Course Name: PROFESSIONAL ETHICS

Max. Marks: 100 **Duration: 3 Hours**

(2020-Scheme)

PART A

(Answer all questions, each question carries 3 marks)

1. Define empathy and honesty.

2. Briefly explain about morals, values and ethics.

3. Interpret the two forms of self-respect.

4. List out the models of professional roles.

5. Indicate the advantages of using standards.

6. Point out the conditions required to define a valid consent?

7. Identify the conflicts of interests with an example?

8. Recall confidentiality.

9. Conclude the features of biometric ethics.

10. Name any three professional societies and their role relevant to engineers.

(10x3 = 30 marks)

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. a) Classify the relationship between ethical values and law?

b) Compare between caring and sharing. (10+4 = 14 marks)

Or

12. a) Exemplify a comprehensive review about integrity and respect for others.

b) Discuss about co-operation and commitment. (8+6 = 14 marks)

MODULE II

13.a) Explain the three main levels of moral developments, deviced by Kohlberg.

b) Differentiate moral codes and optimal codes. (10+4 = 14 marks)

Or

14. a) Extrapolate the duty ethics and right ethics.

b) Discuss in detail the three types of inquiries in engineering ethics (8+6 = 14 marks)

MODULE III

15.a) Summarize the following features of morally responsible engineers.

(i) Moral autonomy **(ii)** Accountability

b) Explain the rights of employees (8+6 = 14 marks)

Or

16. a) Explain the reasons for Chernobyl mishap ?

b) Describe the methods to improve collegiality and loyalty. (8+6 = 14 marks)

MODULE IV

17.a) Execute collegiality with respect to commitment, respect and connectedness.

b) Identify conflicts of interests with an example. (8+6 = 14 marks)

Or

18. a) Explain in detail about professional rights and employee rights.

b) Exemplify engineers as managers.

MODULE V

19.a) Evaluate the technology transfer and appropriate technology.

b) Explain about computer and internet ethics.

(8+6 = 14 marks)

Or

20. a) Investigate the causes and effects of acid rain with a case study.

b) Conclude the features of ecocentric and biocentric ethics. (8+6 = 14 marks)

Syllabus

Module 1 – Human Values.

Morals, values and Ethics – Integrity- Academic integrity-Work Ethics - Service Learning- Civic Virtue- Respect for others- Living peacefully- Caring and Sharing- Honestly- courage-Cooperation commitment- Empathy-Self Confidence -Social Expectations.

Module 2 - Engineering Ethics & Professionalism.

Senses of Engineering Ethics - Variety of moral issues- Types of inquiry- Moral dilemmas –Moral Autonomy – Kohlberg's theory- Gilligan's theory- Consensus and Controversy-Profession and Professionalism- Models of professional roles-Theories about right action –Self interest-Customs and Religion- Uses of Ethical Theories.

Module 3- Engineering as social Experimentation.

Engineering as Experimentation – Engineers as responsible Experimenters- Codes of Ethics- Plagiarism- A balanced outlook on law - Challenges case study- Bhopal gas tragedy.

Module 4- Responsibilities and Rights.

Collegiality and loyalty – Managing conflict- Respect for authority- Collective bargaining- Confidentiality-Role of confidentiality in moral integrity-Conflicts of interest- Occupational crime- Professional rights-Employee right- IPR Discrimination.

Module 5- Global Ethical Issues.

Multinational Corporations- Environmental Ethics- Business Ethics- Computer Ethics -Role in Technological Development-Engineers as Managers- Consulting Engineers- Engineers as Expert witnesses and advisors-Moral leadership.

Text Book

1. M Govindarajan, S Natarajan and V S Senthil Kumar, Engineering Ethics, PHI Learning Private Ltd, New Delhi,2012.
2. R S Naagarazan, A text book on professional ethics and human values, New age international (P) limited ,New Delhi,2006.

Reference Books

1. Mike W Martin and Roland Schinzinger, Ethics in Engineering,4th edition, Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi,2014.
2. Charles D Fleddermann, Engineering Ethics, Pearson Education/ Prentice Hall of India, New Jersey,2004.
3. Charles E Harris, Michael S Protchard and Michael J Rabins, Engineering Ethics-Concepts and cases, Wadsworth Thompson Learning, United states,2005.
4. http://www.slideword.org/slidestag.aspx/human-values-and-Professional-ethics

Course Contents and Lecture Schedule

SL.No	Topic	No. of Lectures 25
1	**Module 1 – Human Values.**	
1.1	Morals, values and Ethics, Integrity, Academic Integrity,Work Ethics	1
1.2	Service Learning, Civic Virtue, Respect for others, Living peacefully	1
1.3	Caring and Sharing, Honesty, Courage, Co-operation commitment	2
1.4	Empathy, Self Confidence, Social Expectations	1
2	**Module 2- Engineering Ethics & Professionalism.**	
2.1	Senses of Engineering Ethics, Variety of moral issues, Types of inquiry	1
2.2	Moral dilemmas, Moral Autonomy, Kohlberg's theory	1
2.3	Gilligan's theory, Consensus and Controversy, Profession& Professionalism, Models of professional roles, Theories about right action	2
2.4	Self interest-Customs and Religion, Uses of Ethical Theories	1
3	**Module 3- Engineering as social Experimentation.**	
3.1	Engineering as Experimentation, Engineers as responsible Experimenters	1
3.2	Codes of Ethics, Plagiarism, A balanced outlook on law	2
3.3	Challenger case study, Bhopal gas tragedy	2
4	**Module 4- Responsibilities and Rights.**	
4.1	Collegiality and loyalty, Managing conflict, Respect for authority	1
4.2	Collective bargaining, Confidentiality, Role of confidentiality in moral integrity, Conflicts of interest	2
4.3	Occupational crime, Professional rights, Employee right, IPR Discrimination	2
5	**Module 5- Global Ethical Issues.**	
5.1	Multinational Corporations, Environmental Ethics, Business Ethics, Computer Ethics	2
5.2	Role in Technological Development, Moral leadership	1
5.3	Engineers as Managers, Consulting Engineers, Engineers as Expert witnesses and advisors	2

CODE	SUSTAINABLE ENGINEERING	CATEGORY	L	T	P	CREDIT
MCN201			2	0	0	NIL

Preamble: Objective of this course is to inculcate in students an awareness of environmental issues and the global initiatives towards attaining sustainability. The student should realize the potential of technology in bringing in sustainable practices.

Prerequisite: NIL

Course Outcomes: After the completion of the course the student will be able to

CO 1	Understand the relevance and the concept of sustainability and the global initiatives in this direction
CO 2	Explain the different types of environmental pollution problems and their sustainable solutions
CO 3	Discuss the environmental regulations and standards
CO 4	Outline the concepts related to conventional and non-conventional energy
CO 5	Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1						2	3					2
CO 2						2	3					2
CO 3						2	3					2
CO 4						2	3					2
CO 5						2	3					2

AssessmentPattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember	20	20	40
Understand	20	20	40
Apply	10	10	20
Analyse			
Evaluate			
Create			

Continuous Internal Evaluation Pattern:

Attendance : 10 marks
Continuous Assessment Test (2 numbers) : 25 marks
Assignment/Quiz/Course project : 15 marks

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contain 10 questions with 2questions from each module, having 3 marks for each question. Students should

answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 14 marks.

Mark Distribution

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Course Level Assessment Questions

Course Outcome 1 (CO1): Understand the relevance and the concept of sustainability and the global initiatives in this direction

1. Explain with an example a technology that has contributed positively to sustainable development.
2. Write a note on Millennium Development Goals.

Course Outcome 2 (CO2): Explain the different types of environmental pollution problems and their sustainable solutions

1. Explain the 3R concept in solid waste management?
2. Write a note on any one environmental pollution problem and suggest a sustainable solution.
3. In the absence of green house effect the surface temperature of earth would not have been suitable for survival of life on earth. Comment on this statement.

Course Outcome 3(CO3): Discuss the environmental regulations and standards

1. Illustrate Life Cycle Analysis with an example of your choice.
2. "Nature is the most successful designer and the most brilliant engineer that has ever evolved". Discuss.

Course Outcome 4 (CO4): Outline the concepts related to conventional and non-conventional energy

1. Suggest a sustainable system to generate hot water in a residential building in tropical climate.
2. Enumerate the impacts of biomass energy on the environment.

Course Outcome 5 (CO5): Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles

1. Suggest suitable measures to make the conveyance facilities used by your institution sustainable.

Model Question paper

Part A

(Answer all questions. Each question carries 3 marks each)

1. Define sustainable development.
2. Write a short note on Millennium Development Goals.
3. Describe carbon credit.
4. Give an account of climate change and its effect on environment.
5. Describe biomimicry? Give two examples.

6. Explain the basic concept of Life Cycle Assessment.
7. Name three renewable energy sources.
8. Mention some of the disadvantages of wind energy.
9. Enlist some of the features of sustainable habitat.
10. Explain green engineering.

Part B

(Answer one question from each module. Each question carries 14 marks)

11. Discuss the evolution of the concept of sustainability. Comment on its relevance in the modern world.

OR

12. Explain Clean Development Mechanism.
13. Explain the common sources of water pollution and its harmful effects.

OR

14. Give an account of solid waste management in cities.
15. Explain the different steps involved in the conduct of Environmental Impact Assessment.

OR

16. Suggest some methods to create public awareness on environmental issues.
17. Comment on the statement, “Almost all energy that man uses comes from the Sun”.

OR

18. Write notes on:
    a. Land degradation due to water logging.
    b. Over exploitation of water.
19. Discuss the elements related to sustainable urbanisation.

OR

20. Discuss any three methods by which you can increase energy efficiency in buildings.

Syllabus

Sustainability- need and concept, technology and sustainable development-Natural resources and their pollution, Carbon credits, Zero waste concept. Life Cycle Analysis, Environmental Impact Assessment studies, Sustainable habitat, Green buildings, green materials, Energy, Conventional and renewable sources, Sustainable urbanization, Industrial Ecology.

Module 1

Sustainability: Introduction, concept, evolution of the concept; Social, environmental and economic sustainability concepts; Sustainable development, Nexus between Technology and Sustainable development; Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs),

Clean Development Mechanism (CDM).

Module 2

Environmental Pollution: Air Pollution and its effects, Water pollution and its sources, Zero waste concept and 3 R concepts in solid waste management; Greenhouse effect, Global warming, Climate change, Ozone layer depletion, Carbon credits, carbon trading and carbon foot print, legal provisions for environmental protection.

Module 3

Environmental management standards: ISO 14001:2015 frame work and benefits, Scope and goal of Life Cycle Analysis (LCA), Circular economy, Bio-mimicking, Environment Impact Assessment (EIA), Industrial ecology and industrial symbiosis.

Module 4

Resources and its utilisation: Basic concepts of Conventional and non-conventional energy, General idea about solar energy, Fuel cells, Wind energy, Small hydro plants, bio-fuels, Energy derived from oceans and Geothermal energy.

Module 5

Sustainability practices: Basic concept of sustainable habitat, Methods for increasing energy efficiency in buildings, Green Engineering, Sustainable Urbanisation, Sustainable cities, Sustainable transport.

Reference Books

1. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
2. Bradley. A.S; Adebayo,A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning
3. Environment Impact Assessment Guidelines, Notification of Government of India, 2006
4. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998
5. ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency Publications-Rating System, TERI Publications - GRIHA Rating System
6. Ni bin Chang, Systems Analysis for Sustainable Engineering: Theory and Applications, McGraw-HillProfessional.
7. Twidell, J. W. and Weir, A. D., Renewable Energy Resources, English Language Book Society (ELBS).
8. Purohit, S. S., Green Technology - An approach for sustainable environment, Agrobios Publication

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	Sustainability	
1.1	Introduction, concept, evolution of the concept	1
1.2	Social, environmental and economic sustainability concepts	1
1.3	Sustainable development, Nexus between Technology and Sustainable development	1

1.4	Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs)	1
1.5	Clean Development Mechanism (CDM)	1
2	Environmental Pollution	
2.1	Air Pollution and its effects	1
2.2	Water pollution and its sources	1
2.3	Zero waste concept and 3 R concepts in solid waste management	1
2.4	Greenhouse effect, Global warming, Climate change, Ozone layer depletion	1
2.5	Carbon credits, carbon trading and carbon foot print.	1
2.6	Legal provisions for environmental protection.	1
3	Environmental management standards	
3.1	Environmental management standards	1
3.2	ISO 14001:2015 frame work and benefits	1
3.3	Scope and Goal of Life Cycle Analysis (LCA)	1
3.4	Circular economy, Bio-mimicking	1
3.5	Environment Impact Assessment (EIA)	1
3.6	Industrial Ecology, Industrial Symbiosis	1
4	Resources and its utilisation	
4.1	Basic concepts of Conventional and non-conventional energy	1
4.2	General idea about solar energy, Fuel cells	1
4.3	Wind energy, Small hydro plants, bio-fuels	1
4.4	Energy derived from oceans and Geothermal energy	1
5	Sustainability Practices	
5.1	Basic concept of sustainable habitat	1
5.2	Methods for increasing energy efficiency of buildings	1
5.3	Green Engineering	1
5.4	Sustainable Urbanisation, Sustainable cities, Sustainable transport	1

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
ITL201	DATA STRUCTURES LAB	PCC	0	0	3	2

Preamble:

This lab is intended to make the students capable of

- understanding the importance of data structures, abstract data type, and their basic usability in different application,
- Implementing linear and non-linear data structures using linked lists and arrays.
- Applying various data structure such as stacks, queues, trees, graphs, etc. to solve various computing problems
- Identifying suitable data structure and algorithm to solve a real world problem.

Prerequisite: programming in C

Course Outcomes: After the completion of the course the student will be able to

CO_No	Course Outcome(CO)	Bloom's Category
CO 1	**Compare** various kinds of searching and sorting techniques	level 5: Evaluate
CO 2	**Construct** Linear and nonlinear data structures using arrays and linked list	level 6:Create
CO 3	**Develop** Programs employing dynamic memory management	level 6:Create
CO 4	**Choose** appropriate data structure to solve various computing problems.	level 5: Evaluate
CO 5	**Originate** hash tables and collision resolution Techniques	level 6:Create
CO 6	**Identify** suitable data structure and algorithm to solve a real world problem.	level 3:Apply

Mapping of course outcomes with program outcomes

COs	PROGRAMME OUTCOMES (PO)											
	PO 1	4 PO 2	5 PO 3	5 PO 4	6 PO 5	3 PO 6	2 PO 7	3 PO 8	3 PO 9	3 PO 10	3 PO 11	3 PO 12
CO 1	3	3	3	2	2	1	-	-	-	-	2	1
CO 2	3	3	3	3	3	1	-	-	-	-	2	1
CO 3	3	3	3	3	3	1	-	-	-	-	2	1
CO 4	3	3	3	3	3	1	-	-	-	-	2	1
CO 5	3	3	3	3	3	1	-	-	-	-	2	1
CO 6	3	3	3	3	3	1	-	-	-	-	2	1

3/2/1: high/medium/low

Assessment Pattern

Mark distribution

Total Marks	CIE	ESE	ESE Duration
150	75	75	2.5 hours

Continuous Internal Evaluation Pattern:

Attendance : 15marks
Continuous Assessment : 30 marks
Internal Test (Immediately before the second series test): 30marks

End Semester Examination Pattern: The following guidelines should be followed regarding award of marks
(a) Preliminary work : 15Marks
(b) Implementing the work/Conducting the experiment : 10Marks
(c) Performance, result and inference (usage of equipments and trouble shooting) : 25Marks
(d) Viva voce : 20 marks
(e) Record : 5Marks

General instructions: Practical examination to be conducted immediately after the second series test covering entire syllabus given below. Evaluation is a serious process that is to be conducted under the equal responsibility of both the internal and external examiners. The number of candidates evaluated per day should not exceed 20. Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Develop a C program to implement insertion sort, selection sort and bubble sort.
2. Design a program to Implement i) Quick sort ii) Merge sort.
3. Create programs for i) Linear Search ii) Binary Search.

Course Outcome 2 (CO2)

1. Design a Menu driven program to implement singly linked list operations with options for insertion, deletion, search and traversal.
2. Develop Menu driven program to implement doubly linked list operations with options for insertion at front, insertion at end, deletion at front, deletion at end and traversal.

Course Outcome 3(CO3):

1. Design a Menu driven program to implement singly linked list operations with options for insertion, deletion, search and traversal.
2. Simulate first fit, best fit and worst fit memory allocation strategies using linked list.

Course Outcome 4 (CO4):

1. Device Dijkstra's Algorithm for finding Shortest path
2. Apply Queue and stack in Breadth First Search and Depth First Search respectively

Course Outcome 5 (CO5):

1. Implement hash table using various mapping functions
2. Resolve the collisions if any using collision resolution techniques like linear Probing, Random Probing, Double hashing and Quadratic Probing

Course Outcome 6 (CO6):

1. Design and implement an application program which is to be used in Ticket counter, where First person gets ticket first and go out first, using suitable data structure. The program should do the following functions

   a) When new person come to the counter the details of the person (Name and age) should be added to the data structure.

   b) After issuing tickets, the details of the corresponding person should be deleted from the data structure

   (Hint: Each node of linked list should contain fields Name, Age and Rink)
2. Design and implement an application program to store the details of pass percentage of the college in chronological order of years (oldest to newest) and retrieve the information in reverse chronological order of years, using suitable data structure.

   Hint: A Node of linked list may contain the fields Year, Pass Percentage and Rlinlk.

   Menu may contain

   a) Store details

   b) Retrieve details

LIST OF EXPERIMENTS

1. Develop a C program to implement insertion sort, Selection sort and bubble sort*.
2. Design a program to Implement i) Quick sort ii) Merge sort*.
3. Create Programs for i) Linear Search ii) Binary Search*.
4. Create a menu driven program to implement singly linked list operations with options for insertion, deletion, search and traversal*.
5. Device a menu driven program to implement doubly linked list operations with options for insertion at front, insertion at end, deletion at front, deletion at end and traversal.
6. Apply linked list concept to perform polynomial addition*
7. Simulate first fit, best fit and worst fit memory allocation strategies using linked list*.
8. Develop a program to perform stack operations using i) array ii) linked list*.
9. Perform queue operations using i) array ii) linked list*.

10. Apply stack to perform i) Infix to postfix conversion ii) Postfix evaluation*
11. Develop a program to perform preorder, in-order, post order traversals on binary trees*
12. Construct binary search trees to perform insertion, deletion, search
13. Apply Queue and stack in Breadth First Search and Depth First Search respectively *
14. Device Dijkstra's Algorithm for finding Shortest path
15. Resolve the collisions if any using collision resolution techniques like linear Probing, Random Probing, Double hashing and Quadratic Probing*

(* indicates mandatory experiments.)

Text Books

1. Samanta D., Classic Data Structures, Prentice Hall India, 2/e,2009.
2. Ellis horowitz, SartajSahni, Fundamentals of Data structures, GalgotiaBooksource

Reference Books

1. Horwitz E., S. Sahni and S. Anderson, F
2. undamentals of Data Structures in C, University Press (India),2008.
3. Aho A. V., J. E. Hopcroft and J. D. Ullman, Data Structures and Algorithms, Pearson Publication,1983.
4. Tremblay J. P. and P. G. Sorenson, Introduction to Data Structures with Applications, Tata McGraw Hill, 1995.
5. Peter Brass, Advanced Data Structures, Cambridge University Press,2008
6. Lipschuts S., Theory and Problems of Data Structures, Schaum's Series,1986.
7. Wirth N., Algorithms + Data Structures = Programs, Prentice Hall,2004.
8. Hugges J. K. and J. I. Michtm, A Structured Approach to Programming, PHI,1987.
9. Martin Barrett, Clifford Wagner, And Unix: Tools For Software Design, John Wiley, 2008 reprint.

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
ITL203	PROGRAMMING AND SYSTEM UTILITIES LAB	PCC	0	0	3	2

Preamble: This laboratory course is meant for understanding the fundamental system utilities. The course is also aimed for understanding and practicing the programming language Python.

Prerequisite: PYTHON programming knowledge and Computer Fundamentals.

Course Outcomes: After the completion of the course the student will be able to

CO No.	Course Outcomes	Bloom's Category
CO 1	Develop readable* Python programs by making use of basic constructs- Decision controls, Looping controls, Lists, Tuple and Strings	Create
CO 2	Design modular Python programs using normal and recursive functions	Create
CO3	Design programs using Dictionaries and Files	Create
CO 4	Experiment with the basic Windows/ Linux administration & network configuration utilities	Apply
CO 5	Experiment with version control tools using git	Apply
readable* - readability of a program means the following: 1. Logic used is easy to follow 2. Standards to be followed for indentation and formatting 3. Meaningful names are given to variables 4. Concise comments are provided wherever needed		

Mapping of course outcomes with program outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	2	3	1	3	-	-	-	-	-	-	-
CO 2	2	3	3	3	3	-	-	-	-	-	-	-
CO 3	2	3	3	3	3	-	-	-	-	-	-	-
CO 4	2	2	1	2	1	-	-	-	-	-	-	-
CO 5	-	-	2	-	3	-	-	-	3	2	-	-

3/2/1: High/Medium/Low

Assessment Pattern

Mark distribution

Total Marks	CIE	ESE	ESE Duration
150	75	75	2.5 hours

Continuous Internal Evaluation Pattern:

Attendance	:	15marks
Continuous Assessment	:	30 marks
Internal Test (Immediately before the second series test)	:	30marks

End Semester Examination Pattern: The following guidelines should be followed regarding award of marks

(a) Preliminary work : 15Marks
(b) Implementing the work/Conducting the experiment : 10Marks
(c) Performance, result and inference
(Usage of equipments and troubleshooting) : 25Marks
(d) Viva voce : 20marks
(e) Record : 5Marks

General instructions: Practical examination to be conducted immediately after the second series test covering entire syllabus given below. Evaluation is a serious process that is to be conducted under the equal responsibility of both the internal and external examiners. The number of candidates evaluated per day should not exceed 20. Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.

Course Level Assessment Questions

Course Outcome 1 (CO1):

Develop a python program to

1. Print all prime numbers with in an interval
2. Search an element in a list
3. Input a list of n numbers. Calculate and display the average of numbers. Also display the square of each value in the list
4. Add two matrices.
5. Find the number of occurrences of a given substring in a string.
6. Count the number of vowels, consonants, words and question marks in a given string.

Course Outcome 2 (CO2):

Develop a python program to

1. Find the value of **`nCr`** using function.
2. Implements calculator with functions like add, subtract, multiply, divide, exponent etc.
3. Find factorial of a given number using recursion.
4. Find n^{th} Fibonacci number using recursion.

Course Outcome 3 (CO3):

1. Develop a python program to create dictionary of phone numbers and names of n persons. Display the contents of the dictionary in alphabetical order of their names

2. Develop a Python program to implement the following scenario. A book shop details contains the Title of book and Number of copies of each title. As books are added to shop the number of copies in each should increase and as books are sold the number of copies in each should decrease.
3. Develop a python code to read a text file, copy the contents to another file after removing the blank lines.
4. Develop a python program to implement the following scenario. Given a file "**`data.txt`**" with three columns of data separated by spaces. Read it into 3 separate simple sequences.
5. Create a class student with attributes name, rollno and a method showData() for showing the details. Create two instances of the class and call the method for each instance. Develop a python program to implement the scenario.

Course Outcome 4 (CO4):

Perform the following operations:

1. Apply the use of ATTRIB windows command to change the attributes of a file.
2. Create a file **`xyz.txt`** and change the ownership of this file to some other user on your machine.
3. Create a file **`hello.txt`** and make it executable.
4. Create a new user account and home directory called "Duck" and Set the user account "Duck's" expiry date as 07 - 07 -2020
5. Check the network connectivity of your computer using suitable Linux commands

Course Outcome 5 (CO5):

Perform the following:

1. Create a directory in your machine and make it as a repository and perform the following
   a. Create a text file and add some content into it.
   b. Add the file to the staging area of the Git repository.
   c. Commit the file to your repository.
   d. See the commit details using git log command.
2. Go to your Git repository and perform the following
   a. Do some modifications in your text file. Commit the changes.
   b. Try to revert to your old revision, again do some modifications in your text file and try to discard the changes.

List of Experiments

Part A : Programming in Python

1. **Basic programming experiments** to familiarization of data types and input-output statements
2. **Decision making, branching and looping statements**
3. **Function & Function calls**
   1. Function definitions and access
   2. Parameters and arguments
   3. Recursion
4. **Strings**
   a) String traversal, join, slicing
   b) String searching, Comparison

c) Other important String methods

5. **Lists, Tuples and Dictionaries**
   a) Creation of List & List Operations
   b) Tuple and Tuple operations
   c) Creation of Dictionary and Operations
   d) Comparison of List and Tuple
6. **Matrix representation**
   a) Creating matrix
   b) Matrix operations - addition, subtraction and multiplication
7. **Files and Operations**
   a) Files - defining, opening/closing, read/write operations
   b) Exceptions in Python
   c) Pickling
8. **Object Oriented Programming using Python**
   c) Creation of Classes & Instances, method calling
   d) Constructor & Destructor concepts
   e) Implementation of Inheritance

Part B : System Utilities

Basic Windows/Linux Administration Utilities

1. **Experiments on Windows Operating System**

   a. Perform the following commands

   DIR, TYPE, DEL, ERASE, MD, CD, COPYCON, RMDIR, REN, VER, DATE, TIME, TREE, PATH, CLS, RMDIR, BREAK, SET, EXIT, APPEND, CHKDISK, ATTRIB, SYS, EDIT, XCOPY, DISKCOPY

   b. Explore and describe some system utility like **regedit**, memory partioning, control panel and window tools

2. **Experiments on Linux Operating System**

   a) Perform general purpose utilities in Linux:

   echo, uname, whoami, passwd, date, date +%T, date +%h, date +%m, date +%y, date +"%h%y", cal, cal 12 2030,echo$HOME,pwd,ls,ls-all,ls-l,cat,cat > file1, cat >> file2, ls -l >fileinfo

   b) Familiarize working with files and managing file attributes

3. **Network Configuration Utilities**

   a)ifconfig utility, enable/disable network interface,**traceroute**,

   telnet, **nslookup, netstat, w, scp**,etc

   b)Connecting to the internet

4. **GIT for version control**
    a. Installation and configuration of Git on Ubuntu and Windows operating systems
    b. Perform Basic Git Commands (**`gitinit, add, status, commit`**,and **`log`**) and Git**`checkout`** command

Text Books

1. Allen Downey, Jeffrey Elkner, Chris Meyers, " How to think like a Computer Scientist-Learning with Python", Green Tea Press, First edition,2002.
2. Mark Lutz,"Learning Python: Powerful Object-Oriented Programming" , O'Reilly Media Inc.,5th,2013

Reference

1. S.A.Kulkarni, "Problem Solving and PYTHON Programming", 2nd edition, Yes Dee Publishing Pvt Ltd,2018
2. Kenneth A. Lambert, B. L. Juneja, "Fundamentals of Python", Cengage Learning India Pvt. Ltd.,2015.
3. Mark Summerfield," Programming in Python 3: A Complete Introduction to the Python Language", Pearson Education,2nd,2018
5. YashavantKanetkar ,Aditya Kanetkar ,"Let Us Python ",BPB Publications, 1st Edition, 2019
6. Allen Downey, "Learning with Python", Dreamtec Press, 1st Edition,2015
7. https://docs.python.org/3/reference/
8. Version Control with Git: Powerful tools and techniques for collaborative software development 2nd Edition, Kindle Edition by Jon Loeliger, MatthewMcCullough
9. https://spoken-tutorial.org/

SEMESTER-III

MINOR

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
ITT281	JAVA PROGRAMMING	VAC	3	1	0	4

Preamble: The syllabus is prepared with the intended to deliver students the elementary concepts of Java Programming and equip them to code java application built over those concepts. It also introduces to them advanced level areas like event driven programming with Java.

Prerequisite: Basics of Programming

Course Outcome (CO): After completion of the course, the student will be able to

CO No.	Course Outcome	Bloom's Category
CO1	Summarize Object Oriented Programming concepts and basic characteristics of Java	Understand
CO2	Summarize basic java packages, inheritance and interfaces	Understand
CO3	Summarize exceptions and I/O streams concepts	Understand
CO4	Demonstrate the usage of threads and generics classes	Understand
CO5	Build simple Graphical User Interface programs with Java	Apply

Mapping of Course Outcomes with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	-	1	-	-	-	-	-	-	-
CO2	1	1	2	1	-	-	-	-	-	-	-	-
CO3	3	1	1	-	-	-	-	-	-	-	-	-
CO4	3	1	1	1	-	-	-	-	-	-	-	-
CO5	3	1	1	2	2	-	-	-	-	-	-	-

3/2/1: High/Medium/Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Semester Examination (Marks)
	1	2	
Remember	15	15	30
Understand	25	25	50
Apply	10	10	20
Analyse			
Evaluate			
Create			

Mark Distribution

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 10marks

Continuous Assessment Test(2numbers) : 25 marks

Assignment/Quiz/Courseproject : 15marks

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contain 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 14 marks.

Sample Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Explain core principles of Object Oriented Design.
2. Describe the characteristics of Java.
3. Illustrate the concept of Polymorphism with an example.
4. Describe Java Source File Structure.
5. Explain constructors in detail

Course Outcome 2 (CO2):

1. Explain the concept of Super classes and sub classes.
2. Differentiate classes and interfaces.
3. Illustrate the concept of Interfaces with an example.
4. Describe Final methods and classes in java.
5. Explain extending interfaces in Java.

Course Outcome 3 (CO3):

1. Explain throwing and catching exceptions in Java.
2. Describe the different built-in exceptions in Java.
3. Illustrate the concept of Exception handling with an example.
4. Describe Byte and character streams in java.
5. Explain stack trace elements.

Course Outcome 4 (CO4):

1. Explain the concept of multithreading in Java.
2. Describe the different bounded types in Java.
3. Illustrate thread synchronization with example.
4. Describe inter-thread communication in java.
5. Explain the concept of generic programming in Java.

Course Outcome 5 (CO5):

1. Experiment with AWT in Java.
2. Build AWT programs for simulating Calculator.
3. Experiment with different Form components in Swing.

Model Question Paper

PART A

Answer all questions, each carries 3 marks

1. Why are java programs said to be platform independent?
2. Explain how access modifiers are used to control the visibility of identifiers?
3. What is the use of interface in java? Give example.
4. What is a package? How a class within a package is compiled and executed?
5. List out different exception classes in Java.
6. Write a note on byte stream and character stream classes in java
7. List out different bounded types in java
8. Draw the life cycle of a thread showing different stages and methods invoked.
9. List any 3 event sources and their corresponding generated event type and listeners used
10. What are the advantages of using swing?

PART B

11.
   a. What is the use of constructor in java? Give examples for different types of constructors.(7)
   b. Define a java class having overloaded methods to calculate the area of a rectangle and circle. (7)

OR

12.
   a. Write a Java program that counts the number of odd and even numbers in an array of 10 integers.(8)
   b. Briefly explain the architecture of JVM.(6)

13.
   a. List any five methods of String class, give examples.(5)
   b. With the help of examples, explain how inheritance is implemented in java. (9)

OR

14.
   a. Write a java program to count the number of occurrences of a particular word in a sentence using string handling methods.(8)
   b. Differentiate between abstract class and interface. (6)

15.
   a. Explain exception handling in java. Briefly explain various exception handling keywords in java with examples(9)
   b. Write a Java program that counts the number of words in a text file.(6)

OR

16.
   a. Write a Java program that accepts N integers through console and sort them in ascending order.(8)
   b. Explain the scenario under which the following three exceptions occur, NumberFormatException, ArrayIndexOutOfBoundsException and ArithmeticException(6)

17.
   a. Explain the different ways of creating threads in java(9)
   b. Explain the concept of generic programming in Java.(5)

OR

18.
   a. Write a java program to create two threads, one for writing even numbers and the other for writing odd numbers upto 100 in two different files.(12)
   b. What are the uses of synchronizedkeyword?(2)

19.
   a. Demonstrate the usage of any four Form components in Swing with an example. (4)
   b. Implement a Java AWT program for simulating Calculator(10)

OR

20. Write a java AWT based java program to display Fibonacci numbers in a list control upto a limit entered using TextField. The event handling as well as code for clearing the

components must be provided (14)

Syllabus

MODULE 1: INTRODUCTION TO OOP AND JAVA FUNDAMENTALS (10 Hours)
Object Oriented Programming – Abstraction – objects and classes – Encapsulation- Inheritance – Polymorphism- OOP in Java – Characteristics of Java – The Java Environment – Java Virtual Machine- Java Source File Structure – Compilation. data types, operators, control statements, Introduction to Java programming.– Classes fundamentals, objects, methods, constructors, parameter passing, overloading, access control keywords– static members -Comments, Arrays-Java Documentation usage
MODULE 2: INHERITANCE AND INTERFACES (10 Hours)
Inheritance – Super classes- sub classes –Protected members – constructors in sub classes- the Object class – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces – Defining and importing packages. Strings-Java Built-in Classes and it's usage
MODULE 3: EXCEPTION HANDLING AND I/O (7 Hours)
Exceptions – exception hierarchy – throwing and catching exceptions – built-in exceptions, creating own exceptions, Stack Trace Elements. Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files
MODULE 4: MULTITHREADING AND GENERIC PROGRAMMING (8 Hours)
Differences between multithreading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter-thread communication. Generic Programming – Generic classes – generic methods – Bounded Types – Restrictions and Limitations
MODULE 5: EVENT DRIVEN PROGRAMMING (10 Hours)
Graphics programming – Frame – Components – working with 2D shapes – Using color, fonts, and images – Basics of event handling – event handlers – adapter classes – actions – mouse events – AWT event hierarchy – Introduction to Swing – layout management – Swing Components – Text Fields , Text Areas – Buttons- Check Boxes – Radio Buttons –Lists- choices- Scrollbars – Windows –Menus – Dialog Boxes.

Text Books

1. HerbertSchildt,―JavaThecompletereference‖,8thEdition,McGrawHillEducation, 2011.
2. CayS.Horstmann,Garycornell,―CoreJavaVolume–IFundamentals‖,9thEdition, Prentice Hall,2013.

Reference Books

1. PaulDeitel,HarveyDeitel,―JavaSE8forprogrammers‖,3rdEdition,Pearson,2015.
2. Steven Holzner, ―Java 2 Black book‖, Dreamtech press,2011.
3. TimothyBudd,―UnderstandingObject-orientedprogrammingwithJava‖,Updated Edition, Pearson Education,2000.

Course Contents and Lecture Schedule

No.	Topic	No. of Lectures
1	**Introduction**	**10**
1.1	**Fundamentals of Object Oriented Programming:** Abstraction, objects and classes, Encapsulation, Inheritance, Polymorphism	3
1.2	**OOP in Java**: Characteristics of Java,The Java Environment – Java Virtual Machine-, Java Source File Structure , Compilation, data types, operators, control statements	3
1.3	**Introduction to Java programming:** Classes fundamentals, objects, methods, constructors, parameter passing, overloading, access control keywords, static members ,Comments, Arrays, -Java Documentation Usage	4
2	**Inheritance And Interfaces**	**10**
2.1	**Inheritance:** Super classes, sub classes, Protected members, – constructors in sub classes, the Object class, abstract classesand methods, final methods and classes	5
2.2	**Interfaces**: defining an interface, implementing interface, differences between classes and interfaces and extending interfaces, Defining and importing packages. Strings, Java Built-in Classes and it's usage	5
3	**Exception Handling And I/O**	**7**
3.1	**Exceptions:** exception hierarchy, throwing and catching exceptions, built-in exceptions, creating own exceptions, Stack Trace Elements.	4
3.2	**Input / Output Basics:** Streams, Byte streams and Character streams, Reading and Writing Console, Reading and Writing Files	3
4	**Multithreading And Generic Programming**	**8**
4.1	**Multithreading:** Differences between multi threading and multitasking, thread life cycle, creating threads, synchronizing threads,Inter-thread communication.	4

4.2	**Generic Programming:** Generic classes, generic methods,Bounded Types, Restrictions and Limitations	4
5	**Event Driven Programming**	**10**
5.1	**Graphics programming:** Frame, Components, working with 2D shapes, Using color, fonts, andimages	3
5.2	**Basics of event handling:** Event handlers, adapter classes, actions, mouse events, AWT eventhierarchy	3
5.3	**Introduction to Swing:** layout management, Swing Components, Text Fields , Text Areas, Buttons, Check Boxes, Radio Buttons, Lists, choices, Scrollbars, Windows, Menus, DialogBoxes.	4

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
ITT283	DATA COMMUNICATION	VAC	3	1	0	4

Preamble: The syllabus is prepared in view of devising students capable of understanding the essential concepts and terminology used for data communication.

Prerequisite: NIL

Course objectives

- To introduce basic terminology and concepts used in data transmission
- To understand encoding techniques used in data communication
- Familiarize students the fundamental knowledge about computer networks

Course Outcomes: After the completion of the course the student will be able to

CO No.	Course Outcome(CO)	Bloom's Category
CO 1	**Describe** the fundamental concepts of data communication, network models, and standards and wired networks.	Understand
CO 2	**Identify** different transmission media, data and signals.	Apply
CO 3	**Demonstrate** different encoding techniques used for analog to digital conversion and vice versa.	Understand
CO 4	**Describe** the different types of bandwidth utilization techniques and basic principles of switching.	Understand
CO 5	**Describe** the different access methods, channelization and wireless networks.	Understand

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	2	-	-	-	-	-	-	-	-	-	1
CO 2	1	2	-	2	2	-	-	-	-	-	-	1
CO 3	2	1	1	-	-	-	-	-	-	-	-	1
CO 4	3	2	2	1	1	-	-	-	-	-	-	1
CO 5	1	-	1	-	2	-	-	-	-	-	1	2

3/2/1: high/medium/low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember	10	10	30
Understand	20	20	50
Apply	20	20	20
Analyse			
Evaluate			
Create			

Mark distribution

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 10marks
Continuous Assessment Test (2 numbers) : 25marks
Assignment/Quiz/Course project : 15marks

End Semester Examination Pattern: There will be two parts; **Part A** and **Part B**. Part A contain 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer *all* questions. Part B contains 2 questions from each module of which student should answer *any one*. Each question can have maximum 2 sub-divisions and carry 14 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Explain the fundamentals of data communication.

2. Explain the different types of networks.

3. Explain the different types of network models and standards.

4. Explain the different types of wired networks.

Course Outcome 2 (CO2)

1. Identify the different types of transmission media.

2. Identify the different types of data and signals.

3. Identify data rate limits for noisy and noiseless channel.

Course Outcome 3 (CO3):

1. Explain the fundamentals of data transmission.

2. Describe about different transmission modes.

3. Demonstrate the analog data conversion to analog signals and analog data into digital signals.

4. State and explain different keying techniques.

Course Outcome 4 (CO4):

1. Describe the functionality of different multiplexing techniques.

2. Illustrate about different spread spectrum techniques.

3. Describe basic principles of switching.

Course Outcome 5 (CO5):

1. Illustrate the random access methods used for collision avoidance.

2. Explain different controlled access methods.

3. Describe about different channelization protocols.

4. Demonstrate different services provided by wireless networks

Model Question Paper

PARTA **(10*3=30)**

(Each Question carries 3Marks)

1. List out the key components of data communication.
2. Summarize the essential criteria's required for an ideal network?
3. Mention Shannon's Theorem. Find out the channel capacity of a noisy channel which is having signal to noise ratio almost zero.
4. Analyze different characteristics used to measure the network performance.
5. Define the role of scrambling in digital transmission.
6. Calculate the baud rate for the given bit rate and type of modulation
    a. 4000 bps,QPSK

b. 36000 bps, 64-QAM

7. Identify the different phases used for communication in circuit switched network.
8. Define frequency division multiplexing and mention its applications.
9. Compare and contrast Pure ALOHA and Slotted ALOHA.
10. Examine the significance of transmission convergence sublayer inWiMax.

PARTB **(5*14=70)**

11. Illustrate different types of connections and topologies used in network for connecting devices with the help of diagram.

OR

12. Substantiate the need of OSI model in network communication? Briefly explain the functionalities of each layer in OSI model.
13. Analyse different types of transmission impairments occurring in transmission media in detail.

OR

14. Explain in detail about guided and unguided media used for data transmission.
15. Discuss in detail about different line coding schemes.

OR

16. Identify the different techniques used for changing an analog signal to digital data.
17. Illustrate in detail about Time division multiplexing. With the help of neat sketch explain different schemes of Time division multiplexing.

OR

18. Examine the need of spread spectrum? Which are different spread spectrum techniques?
19. Discuss in detail about different channelization protocols.

OR

20. Demonstrate in detail about Bluetooth .List out it applications.

Syllabus

Module 1 (7 Hours)
Introduction to Data Communication- Components, Data Representation, Data Flow. Networks - Network Criteria, Physical structures, Physical Topology, Network Types- LAN, WAN, Switching -Internet -Network Models-OSI Model.
Module 2 (9 Hours)
Transmission media – Guided media – Twisted pair cable, coaxial cable, fiber optic cable, Unguided media - Radio waves, Microwaves, Infrared. Data and signals - Periodic analog signals-digital signals-transmission impairment - Attenuation, Distortion - Noise- different types of noise – Data rate limits-Noiseless channel, Noisy Channel, Performance
Module 3 (10 Hours)
Digital data transmission – Digital to Digital Conversion –Line Coding, Line Coding Schemes, Block coding, Transmission modes- Serial, Parallel, Synchronous, Asynchronous and Isochronous transmission. Encoding analog data into analog signals - AM, FM, PM. Encoding analog data into digital signals - PCM, DM – Keying Techniques - ASK, FSK, PSK, QAM
Module 4 (7 Hours)
Multiplexing- Frequency Division Multiplexing (FDM) – Time Division Multiplexing (TDM), Synchronous Time Division Multiplexing –Statistical time Division multiplexing Spread spectrum-The concept of spread spectrum – frequency hopping spread spectrum – direct sequence spread spectrum. Basic Principles of Switching-Circuit Switch Networks, Packet Switching, Structure of Switch
Module 5 (12 Hours)
Media Access Control – Random Access - Controlled Access-Channelization. Introduction to Wireless LAN-IEEE 802.11 –Bluetooth- WiMax, Cellular Telephony - 1G, 2G, 3G, 4G, 5G.

Text Books

1. Behrouz A Forouzan, “Data Communication and Networking”, McGraw Hill Education(india)Private limited,Fifth edition,2013.

Reference Books

1. Stallings W., Data and Computer Communications, 8/e, Prentice Hall,2007.

2. Tanenbaum A. S and D. Wetherall, Computer Networks, Pearson Education,2013

3. Taub& Schilling, Principles of Communication Systems: TataMcGraw-Hill

4. Simon Haykin,Communication Systems: John Wiley & Sons. Pvt.Ltd

5. Das, Mullick& Chatterjee, Principles of Digital Communication: Wiley EasternLtd.

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Overview (7 Hours)**	
1.1	Introduction to Data Communication and networks	3
1.2	Network Models-OSI Model	4
2	**Transmission media (9 Hours)**	
2.1	Guided media and UnGuided media	2
2.2	Data and signals	3
2.3	Transmission impairments	2
2.4	Data rate limits and performance	2
3	**Digital data transmission (10 Hours)**	
3.1	Digital to digital Conversion	5
3.2	Transmission modes	1
3.3	Encoding analog data into analog signals	1
3.4	Encoding analog data into digital signals	2
3.5	KeyingTechniques	1
4	**Bandwidth utilization: Multiplexing and Spectrum spreading, Switching (7 Hours)**	
4.1	Multiplexing	3
4.2	Spread spectrum	2
4.3	Basic Principles of switching	2
5	**Media Access Control and Wireless LANs (12 Hours)**	
5.1	Random Access	2
5.2	Channelization	1
5.3	Wireless LANs	5
5.4	Other Wireless networks	4

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
ITT285	SOFTWARE ENGINEERING	VAC	3	1	0	4

Preamble: The syllabus is prepared with the view of preparing the Engineering Graduates capable of understanding essential concept of software engineering and software development process.

Prerequisite: Basics of programming

Course Outcomes: After the completion of the course the student will be able to

CO No.	Course Outcome (CO)	Bloom's Category
CO1	**Summarize** different software development models	Level 2: Understand
CO2	**Identify** methods for requirement analysis, specification, design & testing	Level 3: Apply
CO3	**Explain** the software quality maintenance measures	Level 2: Understand
CO4	**Explain** the role of people in Software Engineering	Level 2: Understand
CO5	**Analyze** the risk factors and project management in Software Development	Level 3: Apply
CO6	**Illustrate** the legal and business aspects of Software Engineering	Level 2: Understand

Mapping of course outcomes with program outcomes

COs	PROGRAMME OUTCOMES (PO)											
	K3 PO1	4 PO2	5 PO3	5 PO4	6 PO5	3 PO6	2 PO7	3 PO8	3 PO9	3 PO10	3 PO11	3 PO12
CO1	1	2	3	-	3	2	-	2	3	1	2	1
CO2	2	3	3	1	3	-	-	1	2	2	3	1
CO3	1	1	-	-	3	1	-	1	-	1	-	1
CO4	-	1	-	1	-	1	-	1	3	3	2	1
CO5	3	3	-	1	2	-	-	-	-	-	2	1
CO6	-	-	-	-	-	3	-	3	-	-	2	1

3/2/1: high/medium/low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember	10	10	10
Understand	20	20	20
Apply	20	20	70
Analyse			
Evaluate			
Create			

Mark distribution

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 10marks
Continuous Assessment Test(2numbers) : 25 marks
Assignment/Quiz/Course project : 15 marks

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contain 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 14 marks.

Sample Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Explain importance of different phases of software development
2. List out the advantages and disadvantages of Spiral model
3. Illustrate the advantages of Agile model over other models.
4. Describe waterfall model in detail.
5. Explain Agile model in detail

Course Outcome 2 (CO2):

1. List out the requirement specification methods
2. Describe different architecture styles
3. Identify different UML diagrams to do software design
4. Explain unit, integration and system testing in detail.
5. Differentiate different system models.
6. Develop an SRS for a MobileApp that does caller identification.

Course Outcome 3 (CO3):

1. Write short note on reliability metrics.

2. Illustrate the steps in software configuration management.
3. Explain the functioning of DevOps.

Course Outcome 4 (CO4):

1. Analyze the role of users and staff in problem solving.
2. Identify the people factors in human driven software engineering.
3. Discuss the responsibilities of each personnel in a project.

Course Outcome 5 (CO5):

1. Analyze the risk factors in a MobileApp project
2. Describe the phases of software project management
3. Examine different types of documents generated during the software development.
4. Explain the software maintenance methods.
5. Discuss the responsibilities of a project manager.

Course Outcome 6 (CO6):

1. Describe intellectual property in the context of software.
2. Summarize the data privacy policies in software engineering
3. Illustrate different business models with examples.

Model Question Paper

PARTA **(10*3=30)**
(Each Question carries 3 Marks)

1. List out the advantages and disadvantages of Spiral model
2. Examine the importance of different phases of software development
3. Classify the software requirements.
4. Compare and contrast decision tree and decision table.
5. Summarize the objectives of testing.
6. Differentiate cohesion and coupling in software design.
7. Write short note on reliability metrics.
8. Analyze the role of users in problem definition.
9. Analyze the risk factors in a MobileApp project
10. Summarize the data privacy policies in software engineering

PARTB **(5*14=70)**

11. Describe each phase is software development life cycle in detail.

OR

12. Explain Agile model in detail
13. Discuss the formal methods of requirement specification

OR

14. Demonstrate the format of an SRS with a suitable example.
15. Illustrate different architecture styles with neat diagrams

OR

16. Identify different UML diagrams to do software design
17. Illustrate the steps in software configuration management

OR

18. Discuss the responsibilities of each personnel in a project
19. Describe the phases of software project management

OR

20. Illustrate different business models with examples.

Syllabus

Module 1: Introduction to Software Engineering
Software Engineering -Introduction and Overview- Software Process Models.
Module 2: Feasibility Study, Requirements Analysis & specification
Feasibility Study. Requirements Analysis & specification, Modeling Techniques.SRS
Module 3: Software Design, Software Testing
Software design, System Models, Design Methods. System Architecture, Object Oriented Design. Software Testing -Testing Documentation and Help Facilities.
Module 4: Software Reliability, SCM, People and Software Engineering
Software Reliability, Testing and bug fixing Tools, Software Configuration Management, Software Project Management, People and Software Engineering.
Module 5: Software documentation, delivery & maintenance, SPM, legal & business aspects
Software documentation, delivery & maintenance, Software Project Management, Legal Aspects of Software Engineering, Business Aspects of Software Engineering.

Text Books

T1. Roger S. Pressman, Software Engineering: A practitioner's approach, 8th Edition (Indian Edition), McGraw Hill. 2019
T2. Rajib Mall, Fundamentals of Software Engineering, 5th Edition, Prentice Hall India. 2018

Reference Books

R1.Pankaj Jalote, An integrated approach to Software Engineering, 3rd Edition, Springer/Narosa.
R2.Ian Sommerville, Software Engineering, 10th Edition, Addison-Wesley
R3.Sunitha EV, Sarath KS, Software Development Life Cycle: Theory vs Practice, Jyothis Publishers, 2019.
R4.Pfleeger, Atlee, Software Engineering Theory and Practice, 4 edition, 2009, Pearson.
R5.Grady Booch, Object-Oriented Analysis and Design with Applications, 3rd Edition, Pearson.

Course Contents and Lecture Schedule

Sl.No	**Module 1: Introduction to Software Engineering**	**7hrs**
1.1	**Introduction to Software Engineering**- overview of the software development process, importance of each step in software development, Cases of software project failures of major companies.	1
1.2	**Software Process Models**- Waterfall model - phases, pros and cons of the model, application (detailed description of each phase is required)	2
1.3	**Prototyping model** - phases, pros and cons of the model, application	1
1.4	**Spiral model** - phases, pros and cons of the model, application	1
1.5	**Rapid Software Development**, Agile model - phases, pros and cons of the model, application	2
	Module 2: Feasibility Study, Requirements Analysis & specification	**9 hrs**
2.1	**Feasibility Study -** methods, feasibility report	1
2.2	**Requirements Analysis & specification** - importance of requirements, types of requirements, Requirement Analysis, modeling and specification steps.	1
2.3	**Scenarios and Use Cases** - case study	1
2.4	**Informal Methods of Specification** - advantages and disadvantages **Formal Methods of Specification -** Axiomatic and Algebraic specifications	2
2.5	**Modeling Techniques** for Requirements Analysis and Definition - DFD – ER Diagrams – Decision tables – Decision Trees	3
2.6	**Software Requirement Specification** - format, importance, fit and gap analysis	1
	Module 3: Software Design, Software Testing	**12 hrs**
3.1	**Software design –** Cohesion and Coupling, Usability, UI/UX design, System Models: Data-flow models, Semantic data models, Object models. Design Methods- object oriented and function oriented.	3
3.2	**System Architecture** - Architectural Styles, Software Considerations of System Architectures.	1

3.3	**Object Oriented Design –** overview of UML diagrams, Tools and Techniques, design reuse.	2
3.4	Web App and Mobile App design – responsive design.	1
3.5	**Software Testing** - Objectives of testing, Testing Principles. Functional and Structural testing	3
3.6	Generation of test data - Test Plan - Unit testing – Integration testing – System testing. Testing GUIs, Test reporting, Testing Documentation and Help Facilities.	1
3.7	Testing Object-Oriented Applications, Web Apps and Mobile Apps	1
	Module 4: Software Reliability, SCM, People and Software Engineering	**9 hrs**
4.1	**Software Reliability** - Reliability metrics, The development process Reviews, Different aspects of reliability Programming techniques, Testing and bug fixing Tools, Performance testing.	3
4.2	**Software Configuration Management** – steps, features and tools, case study with DevOps.	2
4.3	**People and Software Engineering** - Software Development Staff and roles, The importance of people in problem solving process: The Role of Users in Problem definition;	2
4.4	**Human driven software engineering**; The people factor – Multidisciplinary aspects; The team factor; The customer factor.	2
	Module 5: Software documentation, delivery & maintenance, SPM, legal & business aspects	**8 hrs**
5.1	**Software documentation, delivery & maintenance**, Categories of Documentation, categories of software products, software maintenance methods.	2
5.2	**Software Project Management** - phases of Project Management, Project plan, Risk analysis.	2
5.3	**Legal Aspects of Software Engineering**- Contracts and licenses, Software Copyright, Software Patents, Trade Secrets and Non-Disclosure Agreements, Privacy.	2
5.4	**Business Aspects of Software Engineering** - Business Models. Emerging Trends in Software Engineering	2

SEMESTER -IV

SEMESTER-IV

SLOT	Course No.	COURSES	L-T-P	Hours	Credit
A	MAT208	PROBABILITY,STATISTICS AND ADVANCED GRAPH THEORY	3-1-0	4	4
B	ITT202	PRINCIPLES OF OBJECT ORIENTED TECHNIQUES	3-1-0	4	4
C	ITT204	COMPUTER ORGANIZATION	3-1-0	4	4
D	ITT206	DATABASE MANAGEMENT SYSTEMS	3-1-0	4	4
E 1\2	EST200	DESIGN & ENGINEERING	2-0-0	2	2
	HUT200	PROFESSIONAL ETHICS	2-0-0	2	2
F	MCN202	CONSTITUTION OF INDIA	2-0-0	2	-
S	ITL202	OBJECT ORIENTED TECHNIQUES LAB	0-0-3	3	2
T	ITL204	DATABASE MANAGEMENT SYSTEMS LAB	0-0-3	3	2
R/M/H	VAC	REMEDIAL/MINOR/HONOURS COURSE	3-1-0	4*	4
	TOTAL			**30**	**22/26**

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
MAT 208	PROBABILITY,STATISTICS AND ADVANCED GRAPH THEORY	BASIC SCIENCE COURSE	3	1	0	4

Preamble: This course introduces students to the modern theory of probability and statistics, covering important models of random variables and techniques of parameter estimation and hypothesis testing. This course introduce fundamental concepts in Graph Theory, including properties and characterisation of Graph/Trees and Graph theoretic algorithms, which are widely used in Mathematical modelling and has got applications across **Information Technology**

Prerequisite: A basic course in one-variable and multi-variable calculus, knowledge of elementary set theory, matrices

Course Outcomes: After the completion of the course the student will be able to

CO 1	Understand the concept, properties and important models of discrete random variables and, using them, analyse suitable random phenomena.
CO 2	Understand the concept, properties and important models of continuous random variables and, using them, analyse suitable random phenomena.
CO 3	Perform statistical inferences concerning characteristics of a population based on attributes of samples drawn from the population
CO 4	Understand the basic concept in Graph theory, Understand planar graphs and it's properties. Demonstrate the knowledge of fundamental concepts of matrix representation of graphs, Apply fundamental theorems on Eularian graphs and Hamiltonian graphs.
CO 5	Understand the basic concept in Trees, coloring of graphs. Apply coloring of graphs, Apply algorithm to find the minimum spanning tree

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	2	2	2					2		1
CO 2	3	2	2	2	2					2		1
CO 3	3	2	2	2	2					2		1
CO 4	3	2	2	2	2					2		1
CO 5	3	2	2	2	2					2		1

Assessment Pattern

Bloom's Category	Continuous Assessment Tests(%)		End Semester Examination(%)
	1	2	
Remember	10	10	10
Understand	30	30	30
Apply	30	30	30
Analyse	20	20	20
Evaluate	10	10	10
Create			

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contain 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 14 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Let X denote the number that shows up when an unfair die is tossed. Faces 1 to 5 of the die are equally likely, while face 6 is twice as likely as any other. Find the probability distribution, mean and variance of X.
2. An equipment consists of 5 components each of which may fail independently with probability 0.15. If the equipment is able to function properly when at least 3 of the components are operational, what is the probability that it functions properly?
3. X is a binomial random variable $B(n,p)$ with $n = 100$ and $p = 0.1$. How would you approximate it by a Poisson random variable?
4. Three balls are drawn at random without replacement from a box containing 2 white, 3 red and 4 black balls. If X denotes the number of white balls drawn and Y denotes the number of red balls drawn, find the joint probability distribution of (X,Y)

Course Outcome 2 (CO2)

1. What can you say about $P(X = a)$ ↑for any real number a when X is a (i) discrete random variable? (ii) Continuous random variable?
2. A string, 1 meter long, is cut into two pieces at a random point between its ends. What is the probability that the length of one piece is at least twice the length of the other?

3. A random variable has a normal distribution with standard deviation 10. If the probability that it will take on a value less than 82.5 is 0.82, what is the probability that it will take on a value more than 58.3?

4. X and Y are independent random variables with X following an exponential distribution with parameter μ and Y following and exponential distribution with parameter λ. Find $P(X+Y \leq 1)$

Course Outcome 3(CO3):

1. In a random sample of 500 people selected from the population of a city 60 were found to be left-handed. Find a 95% confidence interval for the proportion of left-handed people in the city population.

2. What are the types of errors involved in statistical hypothesis testing? Explain the level of risks associated with each type of error.

3. A soft drink maker claims that a majority of adults prefer its leading beverage over that of its main competitor's. To test this claim 500 randomly selected people were given the two beverages in random order to taste. Among them, 270 preferred the soft drink maker's brand, 211 preferred the competitor's brand, and 19 could not make up their minds. Determine whether there is sufficient evidence, at the 5% level of significance, to support the soft drink maker's claim against the default that the population is evenly split in its preference.

4. A nutritionist is interested in whether two proposed diets, *diet A* and *diet B* work equally well in providing weight-loss for customers. In order to assess a difference between the two diets, she puts 50 customers on diet A and 60 other customers on diet B for two weeks. Those on the former had weight losses with an average of 11 pounds and a standard deviation of 3 pounds, while those on the latter lost an average of 8 pounds with a standard deviation of 2 pounds. Do the diets differ in terms of their weight loss?

Course Outcome 4(CO4):

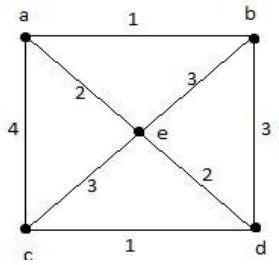
1. How many edges are there in a graph with ten vertices each of degree six?
2. Prove that a simple graph with n vertices must be connected, if it has more than $\frac{(n-1)(n-2)}{2}$ edges
3. Prove that a connected graph G is an Euler graph if all vertices of G are of even degree.
4. Use Kuratowski'stheorem to determine whether $K_{4,4}$ is planar.

Course Outcome 5 (CO5):

1. Prove that a tree with n vertices has $n - 1$ edges.
2. Find the chromatic number of $K_{m,n}$

3) Using graph model, how can the final exam at a university be scheduled so that no student has two exams at the same time

4) Explain Prim's algorithm and use it to find the minimum spanning tree for the graph given below



Syllabus

Module 1 (Discrete probability distributions) 9 hours

(Text-1: *Relevant topics* from sections-3.1-3.4, 3.6, 5.1)

Discrete random variables and their probability distributions, Expectation, mean and variance, Binomial distribution, Poisson distribution, Poisson approximation to the binomial distribution, Discrete bivariate distributions, marginal distributions, Independent random variables, Expectation -multiple random variables.

Module 2 (Continuous probability distributions) 9 hours

(Text-1: *Relevant topics* from sections-4.1-4.4, 3.6, 5.1)

Continuous random variables and their probability distributions, Expectation, mean and variance, Uniform, exponential and normal distributions, Continuous bivariate distributions, marginal distributions, Independent random variables, Expectation-multiple random variables, i.i.d random variables and Central limit theorem (**without proof**).

Module 3 (Statistical inference) 9 hours

(Text-1:*Relevant topics from sections*-5.4, 3.6, 5.1, 7.2, 8.1, 8.3, 9.1-9.2,9.4)

Population and samples, Sampling distribution of the mean and proportion (for large samples only), Confidence interval for single mean and single proportions (for large samples only). Test of hypotheses: Large sample test for single mean and single proportion, equality of means and equality of proportions of two populations, small sample t-tests for single mean of normal population, equality of means (**only pooled t-test, for independent samples from two normal populations with equal variance**)

Module 4 (Advanced Graph theory -I) 9 hours

(Text-2: *Relevant topics of sections* -10.1, 10.2, 10.3, 10.4, 10.5, 10.7)

Introduction- Basic definitions, Directed graphs, pseudo graph, multigraph, Graph models, Graph terminology-vertex degree, simple graph, Complete graphs, cycles, bipartite graph,

new graphs from old-union, complement, Representing graph-Adjacency matrix, Incidence Matrix , Isomorphism, Connectivity, path , cut vertices , cut edges ,connectedness in directed and undirected graphs, Counting paths between vertices-Euler paths and circuits , Fleury's algorithm**(proof of algorithm omitted)** , Hamiltonian paths and circuits. Ore's theorem, Planar graph, -Euler's formula on planar graphs, Kuratowski's theorem **(Proof of theorem omitted)**

Module 5 (Advanced Graph theory -II) (9 hours)

(Text-2: *Relevant topics* of *sections* –(10.8,11.1, 11.4, 11.5)

Graph colouring, dual graph, chromatic number, chromatic number of completegraphK_n, chromatic number of complete bipartite graph K_{Nn}, chromatic number of cycle C_n , Four color theorem, applications of graph colouring-scheduling and assignments

Trees-rooted trees, Properties of trees-level, height, balanced rooted tree, Spanning tree- basic theorems on spanning tree (**DFS, BFS algorithms and it's applicationsomitted**), Minimum spanning tree, Prim's algorithm and Kruskal's algorithm(**proofs of algorithms omitted)**

(9 hours)

Text Books

1. (Text-1) Jay L. Devore, *Probability and Statistics for Engineering and the Sciences*, 8th edition, Cengage, 2012
2. (Text-2) Kenneth H Rosen, *Discrete Mathematics and it's applications*, Tata Mc Graw Hill, 8 th Edition,

Reference Books

1. Hossein Pishro-Nik, *Introduction to Probability, Statistics and Random Processes*, Kappa Research, 2014 (Also available online at www.probabilitycourse.com)
2. Sheldon M. Ross, *Introduction to probability and statistics for engineers and scientists*, 4th edition, Elsevier, 2009.
3. T.Veera Rajan, *Probability, Statistics and Random processes*, Tata McGraw-Hill, 2008
4. Ralph P Grimaldi, *Discrete and Combinatorial Mathematics, An applied Introduction*, 4th edition, Pearson
5. C L Liu, *Elements of Discrete Mathematics*, Tata McGraw Hill, 4th edition,2017
6. NarasinghDeo, *Graph theory*, PHI, 1979
7. John Clark , Derek Allan Holton, *A first look at Graph Theory*.

Assignments

Assignments should include specific problems highlighting the applications of the methods introduced in this course in physical sciences and engineering.

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Discrete Probability distributions**	**9 hours**
1.1	Discrete random variables and probability distributions, expected value, mean and variance (discrete)	3
1.2	Binomial distribution-mean, variance, Poisson distribution-mean, variance, Poisson approximation to binomial	3
1.3	Discrete bivariate distributions, marginal distributions, Independence of random variables (discrete), Expected values	3
2	**Continuous Probability distributions**	**9 hours**
2.1	Continuous random variables and probability distributions, expected value, mean and variance (continuous)	2
2.2	Uniform, exponential and normal distributions, mean and variance of these distributions	4
2.3	Continuous bivariate distributions, marginal distributions, Independent random variables, Expected values, Central limit theorem.	3
3	**Statistical inference**	**9 hours**
3.1	Population and samples, Sampling distribution of single mean and single proportion(large samples)	1
3.2	Confidence interval for single mean and single proportions (large samples)	2
3.3	Hypothesis testing basics, large sample test for single mean, single proportion	2
3.4	Large sample test for equality of means and equality of proportions of two populations	2
3.5	t-distribution and small sample t-test for single mean and pooled t-test for equality of means	2
4	**Advanced Graph Theory -I**	**9 hours**
4.1	**Introduction-** Basic definition – Application of graphs Incidence	1

	and Degree – Isolated vertex, pendent vertex and Null graph	
4.2	Theorems connecting vertex degree and edges, bipartite graphs.	1
4.3	Adjacency matrix, incidence matrix, Isomorphism	1
4.4	Path, cut set, cut edges, Connectedness of directed and undirected graphs ,path isomorphism	2
4.5	Euler paths and circuits , Fleury's algorithm**(proof of algorithm omitted)** , Hamiltonian paths and circuits. Ore's theorem(proof omitted)	3
4.6	Planar graph, - Euler's theorem on planar graph , applications of Kuratowski's theorem	1
5	**Advanced Graph Theory -II**	**9 hours**
5.1	Graph colouring, dual graph	1
5.2	Chromatic number, chromatic number of K_n, K_{Nn} , C_n ,	2
5.3	Four colour theorem, applications of graph colouring-scheduling and assignments,	2
5.4	Trees-spanning trees-definition and example, minimum spanning tree,	2
5.5	Prim's algorithm and Kruskal's algorithm(**proofs of algorithms omitted)**	2

MODEL QUESTION PAPER (2020 Scheme)

Reg. No: ..... Total Pages: 4

Name : .....

FOURTH SEMESTER B.TECH DEGREE EXAMINATION (Month & year)

Course Code: MAT208

Course Name: PROBABILITY, STATISTICS AND ADVANCED GRAPH THEORY

Max Marks:100 **Duration : 3 Hours**

PART A (Answer all questions. Each question carries 3 marks)

1. Suppose X is a Poisson random variable find $P(X = 1) = P(X = 2)$ .Find the mean and variance. (3)
2. The diameter of a circular metallic discs produced by a machine is a random variable with mean 6cm and variance 2cm. Find the mean area of the discs. (3)
3. If the cumulative distribution of a continuous random variable is given by

$$F(x) = \begin{cases} 0 & x \leq 1 \\ 0.5 & 1 < x < 3, \\ 1 & x \geq 3 \end{cases}$$

Find $P(x \leq 2)$ (3)

4. The random variable X is exponentially distributed with mean 3. Find $P(X > t + 3|X > t)$ where t is any positive real number. (3)
5. The 95% confidence interval for the mean mass (in grams) of tablets produced by a machine is [0.56 0.57], as calculated from a random sample of 50 tablets. What do you understand from this statement? (3)
6. The mean volume of liquid in bottles of lemonade should be at least 2 litres. A sample of bottles is taken in order to test whether the mean volume has fallen below 2 litres. Give a null and alternate hypothesis for this test and specify whether the test would be one-tailed or two-tailed. (3)
7. Draw the graph represented by the following adjacency matrix

$$\begin{bmatrix} 1 & 2 & 1 \\ 2 & 0 & 0 \\ 0 & 2 & 2 \end{bmatrix}$$ (3)

8. Give an example of a graph which has a circuit that is (i) Eularian but not Hamiltonian(ii)Hamiltonian but not Eularian (iii) neither Eularian nor Hamiltonian (3)
9. Find the value of $X_2(K_3)$ (3)

10. How many non isomorphic spanning tree does K_3 have ?. Justify your answer (3)

PART B (Answer one question from each module)

MODULE 1

11. (a) Verify that $p(x) = \binom{8}{7}\left(\frac{1}{2}\right)^x, x = 1,2,3$ is a probability distribution. Find (i) $P(X \leq 2)$ (ii) $E[X]$ and (iii) $var(X)$. (7)

(b) Find the mean and variance of a binomial random variable (7)

OR

12. (a) Accidents occur at an intersection at a Poisson rate of 2 per day. What is the probability that there would be no accidents on a given day? What is the probability that in January there are at least 3 days (not necessarily consecutive) without any accidents? (7)

(b) Two fair dice are rolled. Let X denote the number on the first die and Y = 0 or 1, according as the first die shows an even number or odd number. Find (i) the joint probability distribution of X and Y, (ii) the marginal distributions. (iii) Are X and Y independent? (7)

MODULE 2

13. (a) The IQ of an individual randomly selected from a population is a normal distribution with mean 100 and standard deviation 15. Find the probability that an individual has IQ (i) above 140 (ii) between 120 and 130. (7)

(b) A continuous random variable X is uniformly distributed with mean 1 and variance 4/3. Find $P(X < 0)$ (7)

OR

14. (a) Determine the value of c so that $f(x,y) = cxy$ for $0 < x < 3, 0 < y < 3$ and $f(x,y) = 0$ otherwise satisfies the properties of a joint density function of random variables X and Y. Also find $P(X+Y \leq 1)$. Are X and Y independent? Justify your answer (7)

(b) The lifetime of a certain type of electric bulb may be considered as an exponential random variable with mean 50 hours. Using central limit theorem, find the approximate probability that 100 of these electric bulbs will provide a total of more than 6000 hours of burning time. (7)

MODULE 3

15. (a) The mean blood pressure of 100 randomly selected persons from a target population is 127.3units. Find a 95% confidence interval for the mean blood pressure of the population. (7)

(b) The CEO of a large electric utility claims that 80 percent of his 1,000,000 customers are very satisfied with the service they receive. To test this claim, the local newspaper surveyed 100 customers, using simple random sampling. Among the sampled customers, 73 percent say they are very satisfied. Based on these findings, do you think that the CEO is making a false claim of high satisfaction levels among his customers? Use a 0.05 level of significance. (7)

OR

16. (a) A magazine reported the results of a telephone poll of 800 adult citizens of a country. The question posed was: "Should the tax on cigarettes be raised to pay for health care reform?" The results of the survey were: Out of the 800 persons surveyed, 605 were non-smokers out of which 351 answered "yes" and the rest "no". Out of the remaining 195, who were smokers, 41 answered "yes" and the remaining "no". Is there sufficient evidence, at the 0.05 significance level, to conclude that the two populations smokers and non-smokers differ significantly with respect to their opinions?
(7)

(b) Two types of cars are compared for acceleration rate. 40 test runs are recorded for each car and the results for the mean elapsed time recorded below:

	Sample mean	Sample Standard Deviation
Car A	7.4	1.5
Car B	7.1	1.8

Determine if there is a difference in the mean elapsed times of the two car models at 95% confidence level. (7)

MODULE 4

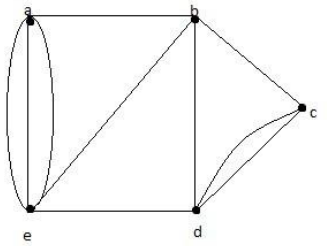
17. (a) Prove that an undirected graph has an even number of odd degree vertices (7)

(b)Show that a bipartite graph with an odd number of vertices does not have a Hamilton circuit (7)

OR

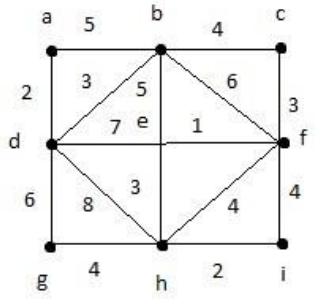
18. (a) Show that an edge in a simple graph is a cut edge if and only if this edge is not part of any simple circuit in the graph. (7)

(b) Use Fleury's algorithm to find an Euler circuit in the following graph (7)



MODULE 5

19. (a) Prove that a simple graph is a tree if and only if it is connected, but the deletion of any of it's edges produces a graph that is not connected (7)(b) Find the minimal spanning tree for the following graph by Prim's algorithm (7)



OR

20. (a)Show that a connected bipartite graph has a chromatic number of 2. (7)

(b)Prove that a full m-ary tree with l leaves has n = ml-1/m-1 vertices and i=l-1/m-1 internal vertices (7)

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
ITT202	PRINCIPLES OF OBJECT ORIENTED TECHNIQUES	PCC	3	1	0	4

Preamble:

This course is intended to make the students capable of

1. Compare the capabilities of Object oriented and Procedure oriented programming languages.
2. Model the problem scenarios using object oriented concepts and UML.
3. Develop robust programs by optimally utilising the capabilities JAVA programming language.

Prerequisite: Programming Concepts

Course Outcomes: After the completion of the course the student will be able to

CO No	Course Outcomes	Bloom's Category
CO 1	Describe the specific capabilities of Object-Oriented paradigm compared to procedure oriented paradigm	Understand
CO 2	Explain the use of object oriented concepts to analyse the given problem.	Understand
CO 3	Describe the different inheritance features available in Java	Understand
CO 4	Construct robust programs using Exception Handling	Apply
CO 5	Construct applets utilising multithreading, event handling and Graphical User Interface, also model the problem scenarios using UML diagrams.	Apply

Mapping of course outcomes with program outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	3	3	-	2	-	-	-	-	-	-	1
CO 2	2	3	3	-	2	-	-	-	-	-	-	-
CO 3	2	3	3	-	2	-	-	-	-	-	-	-
CO 4	2	3	3	-	2	-	-	-	-	-	-	-
CO 5	2	3	3	-	2	-	-	-	-	-	-	-

3/2/1: high/medium/low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember			
Understand	25	25	50
Apply	25	25	50
Analyse			
Evaluate			
Create			

Mark distribution

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 10marks
Continuous Assessment Test(2numbers) : 25 marks
Assignment/Quiz/Course project : 15marks

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contain 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 14 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Compare and contrast the implementation of data abstraction in procedure oriented and object oriented language.

2. Explain how encapsulation helps in data security. Justify your answer by comparing the scenario in procedure oriented languages.

3. Describe TWO features of object oriented programming languages that promote code reuse.

Course Outcome 2 (CO2):

1. Describe about the statement “String is a primitive data type or not in C++.

2. Describe the use of static" functions in C and Java.

Course Outcome 3(CO3):

1. Explain the difference between the object oriented design concepts of generalisation and specialisation, and describe how these relate to the inheritance feature in object oriented programming languages.
2. Describe how is-a and has-a inter-class relationships may be implemented in object oriented programming, giving code examples to support your answer.
3. What is multiple inheritance? Discuss how multiple inheritance is implemented in Java.

Course Outcome 4(CO4):

1. Experiment with runtime and compile time errors. Would you rather have an error discovered at run time or compile time?
2. Experiment with out of bound exception with example code.
3. Build java programs using following constructs.

   a) try{}

   b) catch{}

   c) throw()

Course Outcome5(CO5):

1. Experiment with multithreaded applets.

2. Experiment with inter-process communication mechanism in java.

3. Design a class diagram of the following System: Vending Machine. A vending machine sells small, packaged, ready to eat items (chocolate bars, cookies, candies, etc.). Each item has a price and a name. A customer can buy an item, using a smart card (issued by the vending machine company) to pay for it. No other payment forms (i.e. cash, credit card) are allowed. The smart card records on it the amount of money available. The functions supported by the system are: Sell an item(choose from a list of items, pay item, distribute item)Recharge the machine Set up the machine (define items sold and price of items)Monitor the machine (number of items sold, number of items sold per type, totalrevenue)The

system can be used by a customer, a maintenance employee (who recharges items in the machines), an administrator (who sets up the machine).

Model Question paper

Course Code:ITT202

Course Name: PRINCIPLES OF OBJECT ORIENTED TECHNIQUES

Max.Marks:100 **Duration: 3Hours**

PART A

Answer all Questions. Each question carries 3 Marks

1. Explain the use of „static" functions in C and Java.
2. Comment on the statement "String is a primitive data type or not in C++.
3. Explain the use of 'this' keyword in Java.
4. Write a short note on implementation of "write once, run anywhere" concept in Java
5. Explain encapsulation using class in java.
6. Write short note on inner class in Java.
7. Explain the use of dynamic method dispatch.
8. Differentiate between 'throw', 'throws', and 'Throwable'.
9. Explain event handling model with diagram.
10. Write short note on sand box security model for applets.

PartB

Answer any one Question from each module. Each question carries14 Marks

11.a) Compare and contrast the implementation of data abstraction in procedure oriented and object oriented language. 7 Marks

b) Discuss how encapsulation helps in data security. Justify your answer by comparing the scenario in procedure oriented languages. 7 Marks

OR

12. a) Write a short note on garbage collection in java. 6Marks

b) Describe with example, TWO features of object oriented programming languages that promote code reuse. 8 Marks

13. a) Compare and contrast overriding and overloading with examples.

6 Marks

b) With an example, discuss the use of passing objects as parameters.

8 Marks

OR

14.a) Discuss the uses of‘static" keyword with example scenarios. 7 marks

b) Examine the use of ‘final’ keyword in the context of access control.

7Marks

15.a) Explain the difference between the object oriented design concepts of generalisation and specialisation, and describe how these relate to the inheritance feature in object oriented programming languages. 6marks

b) Describe how is-a and has-a inter-class relationships may be implemented in object oriented programming, giving code examples to support your answer.

8 Marks

OR

16.a) What is multiple inheritance? Discuss how multiple inheritance is implemented in Java. 7 marks

b) Compare and contrast the usage of abstract class and interface in Java. Give examples of each. 7 Marks

17.a) Discuss the difference between runtime and compile time errors. Would you rather have an error discovered at run time or compile time? 8 Marks

b) Explain out of bound exception with example code. 6marks

OR

18. a) Explain the use of following constructs in Java with example.

i)try{}

ii)catch{}

iii)throw() 6Marks

b) Elaborate on the interprocess communication mechanism in java.

8 Marks

19. a) Discuss how to implement a multithreaded applet with an example.

6 Marks

b) Explain with an example the event model in Java. 8 Marks

OR

20. a) Differentiate between static and dynamic models in UML. 4 Marks

b) Draw a class diagram of the following System: Vending Machine. A vending machine sells small, packaged, ready to eat items (chocolate bars, cookies, candies, etc.). Each item has a price and a name. A customer can buy an item, using a smart card (issued by the vending machine company) to pay for it. No other payment forms (i.e. cash, credit card) are allowed. The smart card records on it the amount of money available .The functions supported by the system are: Sell an item(choose from a list of items, pay item, distribute item) Recharge the machine Set up the machine (define items sold and price of items)Monitor the machine (number of items sold, number of items sold per type, total revenue)The system can be used by a customer, a maintenance employee (who recharges items in the machines),an administrator(who sets up the machine).

10 Marks

Module 1 **Syllabus**	No. of Lectures
Object-Oriented Programming vs Procedure-Oriented Programming, Procedural Languages - The Object-Oriented Approach - Characteristics of Object-Oriented Languages Objects –Classes – Inheritance – Reusability - Creating New Data Types - Polymorphism and Overloading ,Object oriented concepts in Java -Java Overview: Java virtual machine, data types, operators, control statements, Classes fundamentals, objects, methods, constructors, this keyword, Garbage collection	10 hours
Module 2	
Overloading Methods, Overloading Constructors, Using Objects as Parameters, Call by value and Call by reference, Acess control, use of static and final keywords, Nested and Inner classes	8 hours
Module 3	
Derived Class and Base Class, Usage of super keyword, Creating a Multilevel Hierarchy, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance, Definition and application of Packges and Interfaces	8 hours
Module 4	
Fundamentals of exception handling, Exception Types, Using try and catch, throw, throws, finally, Java‟s Built-in Exceptions, Creating Exception subclasses, the Java Thread Model, Creating a Thread, Creating Multiple Threads, Thread Priorities, Synchronization, Inter thread	9 hours

Communication	
Module 5	
Event Handling-delegation event model, event classes, sources, listeners. String class - basics. Applet basics and methods, AWT- working with frames, graphics, color, font. AWT Control fundamentals. Swing overview, Introduction to Object Oriented Modelling ,Unified Modeling Language**,** UML class diagram, Use-case diagram, Familiarisation of UML tools, Case study	10 hours

Text Books

1. Herbert Schildt, Java: The Complete Reference, 8/e, Tata McGraw Hill,2011.

2. Bahrami A., Object Oriented Systems Development using the Unified Modeling

Language, McGraw Hill,1999.

Reference Books

1. Flanagan D., Java in A Nutshell, 5/e, O'Reilly,2005.

2. Sierra K., Head First Java, 2/e, O'Reilly,2005.

3. Balagurusamy E., Programming JAVA a Primer, 5/e, McGraw Hill,2014.

4. Barclay K., J. Savage, Object Oriented Design with UML and Java, Elsevier,2004.

5. James Rumbaugh.,Unified Modeling Language Reference Manual,Addison-Wesley Professional,2005

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Object Oriented concepts**	**10Hours**
1.1	Object-Oriented Programming vs Procedure-orientated Programming, Procedural Languages - The Object-Oriented Approach - Characteristics of Object-Oriented Languages	3 hours
1.2	Objects –Classes – Inheritance – Reusability - Creating New Data Types - Polymorphism and Overloading	3 hours
1.3	Object oriented concepts in Java -Java Overview: Java virtual machine, data types, operators, control statements, Classes fundamentals, objects, methods, constructors, this keyword, Garbage collection	4 hours
2	**Method overloading**	**8 Hours**

2.1	Overloading Methods, Overloading Constructors, Using Objects as Parameters	4 hours
2.2	Access control, use of static and final keywords, Nested and Inner classes	4 hours
3	**Inheritance**	**8 Hours**
3.1	Derived Class and Base Class, Usage of super keyword, Creating a Multilevel Hierarchy, Method Overriding	4 hours
3.2	Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance, Definition and application of Packages and Interfaces	4 hours
4	**Exception handling and Multithreaded Programming**	**9 Hours**
4.1	Fundamentals of exception handling, Exception Types, Using try and catch, throw, throws, finally, Java‟s Built-in Exceptions, Creating Exception subclasses.	4 hours
4.2	The Java Thread Model, Creating a Thread, Creating Multiple Threads, Thread Priorities, Synchronization, Inter thread Communication	5 hours
5	**Event Handling, AWT and UML**	**10 Hours**
5.1	Event Handling-delegation event model, event classes, sources, listeners. String class – basics. Applet basics and methods	3 hours
5.2	AWT- working with frames, graphics, color, font. AWT Control fundamentals. Swing overview	3 hours
5.3	Introduction to Object Oriented Modelling-Unified Modelling Language, UML class diagram, Use-case diagram, Familiarisation of UML tools, Case study	4 hours

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
ITT204	COMPUTER ORGANIZATION	PCC	3	1	0	4

Preamble

This syllabus has been prepared to meet the following objectives.

1. To impart an understanding of the internal organization and operations of a computer.
2. To introduce the concepts of processor logic design.
3. To introduce the concept of pipe-lining and its hazards.
4. To understand and analyze various issues related to memory hierarchy.
5. To introduce the various modes of data transfer between CPU and I/O devices.

Prerequisite: ITT201 Digital System Design

Course Outcomes: After the completion of the course the student will be able to

CO No	Course Outcome(CO)	Bloom's Category
CO 1	Describe the basic organization of computer and different instruction formats and addressing modes.	Understand
CO 2	Analyze the basic operations and sequencing of control signals	Analyze
CO 3	Represent the design of registers and arithmetic logic unit	Understand
CO 4	Examine the concept of pipe-lining and various hazards associated with it	Analyze
CO 5	Compare the performance of memory systems like cache and DRAM and Select appropriate interfacing standards for I/O devices.	Analyze

Mapping of course outcomes with program outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	-	-	-	-	-	-	-	1	1
CO2	3	3	3	2	-	-	-	-	-	-	1	1
CO3	3	2	3	-	-	-	-	-	-	-	1	1
CO4	3	3	3	3	2	-	-	-	-	-	1	2
CO5	3	3	3	3	1	-	-	-	-	-	1	2

3/2/1: high/medium/low

Assessment Pattern

Bloom's Category	Continuous Assessment Test		End-Semester Examination
	1	**2**	
Remember	**12**	**8**	**16**
Understand	**10**	**12**	**24**
Apply	**20**	**20**	**40**
Analyse	**8**	**10**	**20**
Evaluate			
Create			

Mark distribution

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 10marks
Continuous Assessment Test(2numbers) : 25 marks
Assignment/Quiz/Course project : 15marks

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contain 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 14 marks.

Sample Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Explain the importance of different addressing modes in computer architecture with suitable example
2. How is the operation X = (A + B) * (C + D) / (E+F) is performed using:

a) Three address instruction
b) Two address instruction
c) One address instruction

Course Outcome 2 (CO2):

1. Enumerate the sequence of actions involved in executing an unconditional branch instruction.
2.Write down the sequence of actions needed to fetch and execute the instruction:
Store R6, X(R8).

Course Outcome 3 (CO3):

1.Draw the block diagram for the hardware that implements the following statement x + yz: AR ← AR + BR where AR and BR are two n-bit registers and x, y, and z are control variables. Include the logic gates for the control function. (The symbol + designates an OR operation in a control or Boolean function and an arithmetic plus in a micro operation.)

2. Illustrate the difference in performance of an Arithmetic Right Shifter & a Logical Right Shifter

Course Outcome 4 (CO4):

1.A5-stage pipelined processor has Instruction Fetch(IF), Instruction Decode (ID), Operand Fetch (OF),PerformOperation(PO)andWriteOperand(WO)stages.TheIF,ID,OFandWOstagestake 1 clock cycle each for any instruction. The PO stage takes 1 clock cycle for ADD and SUB instructions, 3 clock cycles for MUL instruction, and 6 clock cycles for DIV instruction respectively. Operand forwarding is used in the pipeline. What is the number of clock cycles needed to execute the following sequence of instructions?

Instruction	Meaning of instruction
I1 :MUL R2,R0,R1	R2 = R0*R1
I1 :DIV R5,R3,R4	R5 = R3/R4
I2 :ADD R2,R5,R2	R2 = R5+R2
I3 :SUB R5,R2,R6	R5 =R2-R6

2. The instruction pipeline of a RISC processor has the following stages: Instruction Fetch (IF), Instruction Decode (ID), Operand Fetch (OF), Perform Operation (PO) and Write back (WB), The IF, ID, OF and WB stages take 1 clock cycle each for every instruction. Consider a sequence of 100 instructions. In the PO stage, 40 instructions take 3 clock cycles each, 35 instructions take 2 clock cycles each, and the remaining 25 instructions take 1 clock cycle each. Assume that there are no data hazards and no control hazards. How many clock cycles are required for completion of execution of the sequence of instruction?

Course Outcome 5(CO5):

1. A computer has a 256 KByte, 4-way set associative, write-back data cache with block size of 32 Bytes. The processor sends 32 bit addresses to the cache controller. Each cache tag directory entry contains, in addition to address tag, 2 valid bits, 1 modified bit and 1 replacement bit. How many bits are there in the tag,set and word field of an address?
2. Discuss DRAM scheduling policies.

Course Outcome 6 (CO6):

1. What is the basic advantage of using interrupt initiated data transfer over transfer under program control without an interrupt? What is asynchronous data transfer? Explain in detail.
2. Explain the working of Universal Serial Bus(USB).

Model Question Paper

PARTA (10*3=30)

(Each question carries 3 Marks)

1. What are fundamental phases of the instruction cycle?
2. The register R1 = 12, and R2= 13. The instruction ADD R1, R2 is in memory location 2000H. After the execution of the instruction, what will be the value of PC, MAR, IR andR1?.
3. What do you meant by logic micro operations?
4. Design a 4bit combination logic shifter.
5. "Increasing the number of pipeline stages will decrease the execution time of the program". True or False? Justify your answer.
6. What is operand forwarding? What is its significance?
7. For a 16KB, 4-way associative cache with block size 16 bytes, what is the number of tag bits per block if the physical address capacity is16MB?
8. List the advantages of memory interleaving
9. Compare Polling and Vectored Interrupts.
10. What is DMA? What do you meant by Burst mode?

PARTB (5*14=70)

(Each full question carries 14 marks)

11.a) Discuss the sequencing of control signals for the following instructions.

i)Load R1,10(R2) ii) AddR1, R2 (8marks)

b) Compare and contrast memory mapped IO over programmed IO. (6marks)

OR

12.a) Illustrate with example, explain the different types of addressing modes in a RISC processor. (9marks)

b) Discuss how stack used for subroutine call. (5marks)

13.a) Design a 4 bit arithmetic unit with two selection variables s0 and s1 and two n-bit data inputs A&B and input carry Cin

s1	s2	Cin=0	Cin=1	
0	0	F=A	F=A+1	
0	1	F=A+B	F=A+B+1	
1	0	F=A+B'	F=A+B'+1	
1	1	F=A-1	F=A	

(9marks)

b) Explain the design of an accumulator. (5marks)

OR

14. a) Design an adder/subtractor circuit with one selection variable s and two inputs A and B. When s=0, the circuit performs A+B and when s=1 it performs A-B, by taking 2's complement of B. (9marks)

b) Explain the design of status register. (5 marks)

15.a) Consider an instruction pipeline with four stages with the stage delays 5 nsec, 6 nsec, 11 nsec, and 8 nsec respectively. The delay of an inter-stage register stage of the pipeline is 1 nsec. What is the approximate speedup of the pipeline in the steady state under ideal conditions as compared to the corresponding non-pipelined implementation? (5marks)

b) Discuss structural hazards and control hazards with examples (9marks)

OR

16. a) A 5-stage pipelined processor has the stages: Instruction Fetch (IF), Instruction Decode (ID), Operand Fetch (OF), Execute (EX) and Write Operand (WO). The IF, ID, OF, and WO stages take 1 clock cycle each for any instruction. The EX stage takes 1 clock cycle for ADD and SUB instructions, 3 clock cycles for MUL instruction, and 6 clock cycles for DIV instruction. Operand forwarding is used in the pipeline (for data dependency, OF stage of the dependent instruction can be executed only after the previous instruction completes EX). What is the number of clock cycles needed to execute the following sequence of instructions?

MUL R2,R10,R1
DIV R5,R3,R4
ADD R2,R5,R2
SUBR5,R2,R6 (7marks)

b) Discuss various types data hazards in a RISC Instruction pipeline with appropriate examples. (7marks)

17. a) Consider an application running on a multiprocessor system that takes 600 cycles, (during which processors are stalled), to handle a local cache miss leading to referencing a remote memory. The CPI for all references that hit in cache is 1 cycle. If 0.2% of cache access result in a local miss, how much faster will the system run if it has a perfect cache that never miss. (5marks)

b) Discuss organization of DRAM in detail. (9marks)

OR

18.a) Discuss open page and closed page row buffer management policy in DRAM Controller (9 marks)

b) Given a cell array of 8K(8192), with Clock cycle=4 and Clock Rate=133MHZ. In DRAM, the period for refreshing all rows is 16ms whereas 64ms in SDRAM. Find out the Refresh Overhead of SDRAM when compared to DRAM (5marks)

19.a) Discus different types of interrupt handling methods (7marks)

b) Explain the working of SCSI. (7marks)

OR

20.a)Discuss various bus arbitration methods. (7 marks)

b) Explain the working of PCI. (7 marks)

Syllabus

Module 1 (10 hours)
Basic Structure and Operation of Computers – functional units –operational concepts – memory operations – addressing modes – instruction sequencing – basic I/O – subroutine calls – execution of a complete instruction – sequencing of control signals.
Module 2 (8 hours)
Processor Logic Design and Organization – register transfer logic – micro operations – conditional control statements. Design of arithmetic unit, logic unit, ALU and shifter – Accumulator.
Module 3 (9 hours)
RISC – RISC instruction set – pipelining – hazards and mitigation.
Module 4 (11 hours)
Memory – cache memory, mapping and performance improvement. DRAM organization. Memory controllers-scheduling
Module 5 (7 hours)
Peripheral Subsystem – I/O organization – interrupts – DMA – bus arbitration – standard I/O interfaces.

Text Books:

1. Patterson D.A. and J. L. Hennessey, Computer Organization and Design, 5/e, Morgan Kauffmann Publishers,2013.
2. Hamacher C., Z. Vranesic and S. Zaky, Computer Organization,5/e, McGrawHill,2011.
3. M. Morris Mano, Computer System Architecture, 3/e, Pearson Education,2007.
4. Bruce Jacob, David T. Wang, and Spencer Ng, Memory Systems: Cache, DRAM, Disk, 1/e Morgan Kauffmann Publishers,2007.

References:

1. William Stallings, Computer Organization and Architecture: Designing forPerformance, Pearson, 9/e,2013.
2. Computer Architecture: Pipelined and Parallel Processor Design M.J. Flynn Published byNarosa Publishing House,2012
3. Rajaraman V. and T. Radhakrishnan, Computer Organization and Architecture,Prentice Hall, 2011.
4. Messmer H. P., The Indispensable PC Hardware Book, 4/e, Addison-Wesley,2001

Course Content & Lecture Schedule

Module 1: Fundamentals of Computer Organization		**10 hours**
1.1	Basic Structure of computers–functional units –basic operational concepts –bus structures –software.	**2 hours**
1.2	Memory locations and addresses –memory operations – instructions and instruction sequencing – addressing modes – ARM Example (programs not required).	**4 hours**
1.3	Basic I/O operations –stacks, subroutine calls. Basic processing unit – fundamental concepts –instruction cycle - execution of a complete instruction – multiple-bus organization –sequencing of control signals.	**4 hours**
Module 2:Processor Logic Design		**8 hours**
2.1	Register transfer logic –inter register transfer – arithmetic, logic and shift micro operations –conditional control statements.	**4 hours**
2.2	Design of arithmetic unit, logic unit, arithmetic logic unit and shifter – status register –processor unit –design of accumulator.	**4 hours**
Module 3: RISC Instruction Pipelining		**9 hours**
3.1	Introduction to RISC instruction set, load store architecture	**3hours**
3.2	Overview of pipelining, pipelined datapath and control	**2 hours**
3.3	Pipeline hazards, hazard mitigation techniques.	**4 hours**
Module 4: Memory system : Cache & DRAM		**11hours**
4.1	Introduction to cache memory, cache mapping, block replacement techniques, measuring and improving cache performance .	**4 hours**
4.2	Introduction to DRAM system, DRAM organization-Memory interleaving.	**2 hours**
4.3	Memory controllers, Address mapping, DRAM Scheduling policies, Row Buffer management policies- DRAM Refreshing	**5 hours**

Module 5: Peripheral Subsystem		**7 hours**
5.1	I/O organization: accessing of I/O devices –interrupts	**2 hours**
5.2	Direct memory access –buses –bus arbitration	**2 hours**
5.3	Interface circuits –standard I/O interfaces (PCI, SCSI, USB)	**3 hours**

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
ITT206	Database Management Systems	PCC	3	1	0	4

Preamble: Database Management Systems course is intended to deliver students the elementary concepts of a database management system and equips them to design and implement a database application built over those concepts. It also introduces to them advanced level areas like transaction processing, concurrency control and recovery management. The current trend, unstructured data – No SQL is unveiled too.

Prerequisite: NIL

Course Outcome (CO): After completion of the course, the student will be able to

CONo.	CO	Bloom's Category
CO1	Describe the fundamental concepts of databases.	Understand
CO2	Construct an Entity-Relationship (ER) model and transform to relational schema.	Apply
CO3	Develop queries for relational database in the context of practical applications.	Apply
CO4	Model and design relational databases following the design principles.	Apply
CO5	Describe the concepts of control and recovery techniques in transaction processing and NoSQL database.	Understand

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	3	-	-	-	-	-	-	-	-	-
CO2	2	2	3	-	-	-	-	-	-	-	-	-
CO3	1	1	2	2	3	-	-	-	-	-	-	2
CO4	2	2	3	2	-	-	-	-	-	-	-	-
CO5	2	2	3	-	-	-	-	-	-	-	-	-

3/2/1: High/Medium/Low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests(Marks)		End Semester Examination (Marks)
	1	2	
Remember	5		30
Understand	30	20	30
Apply	15	30	40

Mark Distribution

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 10marks
Continuous Assessment Test(2numbers) : 25 marks
Assignment/Quiz/Course project : 15marks

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contain 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 14 marks.

Sample Course Level Assessment Questions

CO1: Explain 3-Schema architecture of database system with the help of a neat diagram.

CO2: Construct an ER diagram for a college database given the following statements:

- A college contains many departments
- Each department can offer any number of courses
- Many instructors can work in a department
- An instructor can work only in one department
- For each department there is a Head
- An instructor can be head of only one department

- Each instructor can take any number of courses
- A course can be taken by only one instructor
- A student can enroll for any number of courses
- Each course can have any number of students

CO3: Build SQL queries for each of the following relation schema given below:

employee (employee-name, street, city)
works (employee-name, company-name, salary)
company (company-name, city)
manages (employee-name, manager-name)

a. Find the names, street addresses, and cities of residence of all employees who work for First Bank Corporation and earn more than$10,000.
b. Find all employees in the database who do not work for First Bank Corporation.
c. Find all employees in the database who earn more than each employee of Small Bank Corporation.
d. Find the company that has the most employees.
e. Find those companies whose employees earn a higher salary, on average, than the average salary at First Bank Corporation.

CO4: Experiment with the table shown below:

branchNo	*branchAddress*	*telNos*
B001	8 Jefferson Way, Portland, OR 97201	503-555-3618, 503-555-2727, 503-555-6534
B002	City Center Plaza, Seattle, WA 98122	206-555-6756, 206-555-8836
B003	14 – 8th Avenue, New York, NY 10012	212-371-3000
B004	16 – 14th Avenue, Seattle, WA 98128	206-555-3131, 206-555-4112

a. Why is this table not in1NF?
b. Describe and illustrate the process of normalizing the data shown in this table to third normal form(3NF).
c. Identify the primary, alternate and foreign keys in your 3NFrelations.

CO5: Consider the following four schedules due to three transactions (indicated by the subscript) using read and write on a data item x, denoted by r(x) and w(x) respectively. Check which one of them is conflict serializable.

a. r1(x); r2(x); w1(x); r3(x);w2(x)

b. r2(x); r1(x); w2(x); r3(x);w1(x)

c. r3(x); r2(x); r1(x); w2(x);w1(x)

d. r2(x); w2(x); r3(x); r1(x);w1(x)

Model Question paper

Course Code: ITT 206

Course Name: Database Management Systems

Max.Marks:100 **Duration: 3Hours**

Part-A
(Answer all questions. Each question carries 3 marks)

1. List three significant differences between a file-processing system and a DBMS.
2. List three reasons why database systems support data manipulation using a declarative query language such as SQL, instead of just providing a library of C or C++ functions to carry out data manipulation.
3. Why are duplicate tuples not allowed in a relation?
4. What is union compatibility? Why do UNION, INTERSECTION, and DIFFERENCE operations require that the relations on which they are applied be union compatible?
5. What is done when INSERT operation violates one or more constraints?
6. What are assertions? How do they differ from triggers?
7. LetR(A,B,C,D,E,P,G)bearelationalschemainwhichthefollowingFDshold:{AB->CD, DE->P, C->E, P->C, B->G}. What is the highest normal form the relation schema R isin?
8. Why are Armstrong"s axioms considered sound and complete?
9. What are the ACID properties for data integrity in DBMS? Explain each of them.
10. Discuss about the lock compatibility matrix.

Part -B

(Answer one question from each module. Each question carries 14 marks)

Module -I

11.

a. Construct an E-R diagram for a hospital with a set of patients and a set of medical doctors. Associate with each patient a log of the various tests and examinations conducted. Make suitable assumptions that are valid. (8 marks)

b. Explain the 3-schema architecture for database systems with a diagram. (6marks)

12.

a. Construct an E-R diagram for a car insurance company whose customers own one or more cars each. Each car has associated with it zero to any number of recorded accidents. Each insurance policy covers one or more cars and has one or more premium payments associated with it. Each payment is for a particular period of time, and has an associated due date, and the date when the payment was received. You can make suitable and valid assumptions. (8marks)

b. What are the different types of database end users? Discuss the main activities of each. (6 marks)

Module -II

13.

a. Given below is the schema of a database that keeps track of student enrollment in courses and the books adopted for each course:

STUDENT(ssn, name, major, bdate)

COURSE(course#, cname, dept)

ENROLL(ssn, course#, quarter, grade)

BOOK_ADOPTION(course#, quarter, book_isbn)

TEXT(book_isbn, book_title, publisher, author)

Using relational algebra specify the following queries:

- List the number of courses taken by all students named John Smith in Winter 2009(i.e., Quarter=W09).
- Produce a list of textbooks (include Course#, Book_isbn, Book_title) for courses offered by the „IT" department that have used more than two books.
- Listanydepartmentthathasallitsadoptedbookspublishedby„PearsonPublishing".

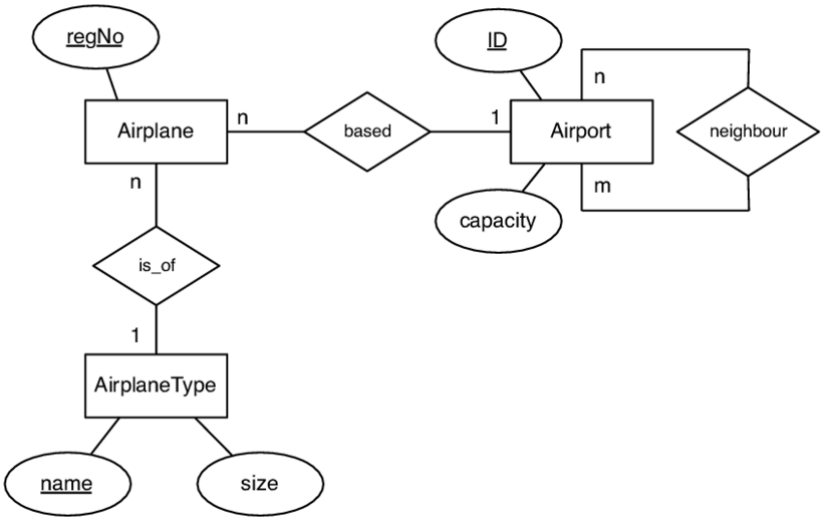
(9 marks)

b. What are the possible approaches for mapping binary 1:1 relations in an ER diagram?

(5 marks)

14.

a. Convert the ER model below into its equivalent relational schema: (5 marks)



b. Consider the following relational schema for a library:

MEMBER (memb_no, name, dob) BOOKS

(isbn, title, authors, publisher) BORROWED

(memb_no, isbn,date)

Write the following queries in relational algebra:

- Find the names of members who have borrowed any book published by "McGraw-Hill".
- Find the name and membership number of members who have borrowed more than five different books published by "Morgan Kaufmann".
- For each publisher, find the name and membership number of members who have borrowed more than five books of that publisher.

(9marks)

Module-III

15.

a. For the EMPLOYEE schema given below: EMPLOYEE

(employee_name, street, city)

WORKS (employee_name, company_name, salary)

MANAGES (employee_name, manager_name)

write SQL queries for the following:

- Find the names and cities of residence of all employees who work for "GraminBank Corporation".

- Find all employees in the database who earn more than each employee of "Co-operative Bank Corporation".
- Assume that the companies may be located in several cities. Find all companies located in every city in which "Kerala Bank Corporation" is located.
- Find the company that has the most employees. (9marks)

b. Why does SQL not automatically eliminate duplicate tuples in the results of its queries? (5marks)

16.

a. For the database schema given below:

STUDENT (name, stud_no, class, major)

COURSE (course_name, course_no, credit_hours, department)

SECTION (section_identifier, course_no, semester, year, instructor)

GRADE_REPORT (stud_No, section_identifier, grade)

PREREQUISITE (course_no, prerequsitie_no)

write SQL queries for the following:

- Insert a new student, <'Nikhila', 25, 1,'Math'>, in the database.
- Change the class of student 'Anirudh' to2.
- Insert a new course,<'KnowledgeEngineering','IT4390',3,'IT'>.
- Delete the record for the student whose name is 'Kripa'and whose student number is 17. (9marks)

b. What is a correlated nested query in SQL? Give an example. (5marks)

Module -IV

17.

a. Determine if the FD sets

F = {A → C, AC → D, E → AD, E → H} and

G = {A → CD, E → AH} are functionally equivalent. (7 marks)

b. Illustrate the following problems with suitable examples:

- Generation of spurious tuples
- Type-2 insertion anomaly

(7 marks)

18.

a. UsingUllman"salgorithm,checkwhethertherelationschemaR(A,B,C,D,E)decomposed into R1(A,D), R2(A,B), R3(B,E), R4(C,D,E) and R5(A,E) and the FD set

{A -> C

B -> C

C -> D

DE->C

CE -> A}

Is lossy or lossless. (7 marks)

b. Given an FD set F= {A->BC, B->C, A->B, AB->C}. Find its minimal cover. (7 marks)

Module -V

19.

a. With a diagram, discuss the various states of a transaction. (4marks)

b. What is log based recovery? Explain deferred database modification. (10marks)

20.

a. Explain the two-phase locking protocol. How does it implement lock conversions to assure serializability? (10marks)

b. What are checkpoints? How are they implemented? (4 marks)

Syllabus

MODULE 1: INTRODUCTION (9 HOURS)
Fundamentals of Database Management Systems (DBMS),Database System Concepts and Architecture, Entity-Relationship Model, ER Diagrams
MODULE 2: RELATIONAL MODEL (8 HOURS)
Relational Model Concepts, Transformation of ER diagram to Relational Schema, Relational Algebra Operations
MODULE 3: STRUCTURED QUERY LANGUAGE (SQL) (11HOURS)
SQL Overview, Data Manipulation Language (DML), Advanced DML
Module 4: DATABASE DESIGN (7HOURS)
Database Design Guidelines, Normalization using Functional Dependencies
Module 5: TRANSACTION PROCESSING AND INTRODUCTION TO NoSQL (10 HOURS)
Transaction Processing Concepts, Characterizing Schedules, Concurrency Control Techniques, Recovery Techniques, Introduction to NoSQL Databases

Text Books

1. Elmasri R. and S. Navathe, *Database Systems: Models, Languages, Design and Application Programming*, Pearson Education,2013.

2. Silberschatz A., H. F. Korth and S. Sudarshan, *Database System Concepts*, 6/e, McGraw Hill, 2011.

Reference Books

1. C.J.Date, A.Kannan, S.Swamynathan, ―An Introduction to Database Systems, Eighth Edition, Pearson Education,2006.
2. Raghu Ramakrishnan, ―Database Management Systems, Fourth Edition, McGraw-Hill College Publications,2015.
3. G.K.Gupta,"Database Management Systems", Tata McGraw Hill,2011.
4. Xun (Brian) Wu, SudarshanKadambi, DevramKandhare, Aaron Ploetz, Seven NoSQL Databases in a Week:1st Edition, Kindle Edition.

Course Contents and Lecture Schedule

No.	Topic	No. of Lectures
1	**Introduction**	**9**
1.1	**Fundamentals of Database Management Systems**: Characteristics of DBMS, Database Users, Advantages of using DBMS.	2
1.2	**Database System Concepts and Architecture:** Data Models, Schemas, Instances and Database State. Three-Schema Architecture, Data Independence, Database Languages and Interfaces.	3
1.3	**Entity-Relationship Model**: Basic concepts - Entity, Attributes and Keys, Relationship Sets, Degree of Relationship Types, Roles and Structural Constraints.	2
1.4	**ER Diagrams**: Naming Conventions and Design Issues.	2
2	**Relational Model**	**8**
2.1	**Relational Model Concepts**: Domains, Attributes, Tuples and Relations, Relational Model Constraints and Relational Database Schemas.	3
2.2	**Transformation of ER diagram to Relational Schema.**	2
2.3	**Relational Algebra Operations:** SELECT, PROJECT, RENAME, Set Theoretic Operations, JOIN and DIVISION.	3
3	**Structured Query Language**	**11**

3.1	**SQL Overview**: Basic Structure, Data Definition Language Commands – CREATE, DROP and ALTER, Arithmetic Operations.	3
3.2	**Data Manipulation Language**: DML Commands - INSERT, SELECT, DELETE and UPDATE, Nested Queries, Set Operations, Aggregate Functions and Grouping, JOIN Operations	4
3.3	**Advanced DML:** Complex Queries, Views, Stored Procedures, Handling Exceptions and Triggers.	4
4	**Database Design**	**7**
4.1	**Database Design Guidelines**: Anomalies in Database Design – Insertion, Deletion and Modification, Functional Dependency (FD) – Closures, Armstrong‟sAxioms, Equivalence, Minimal Cover (proofs not required).	3
4.2	**Normalization using Functional Dependencies**: Normal Forms(NF) - INF, 2NF, 3NF and Boyce - Codd Normal Form, Lossless Join and Dependency Preserving Decompositions.	4
5	**Transaction Processing and Introduction to No SQL**	**10**
5.1	**Transaction Processing Concepts**: Transaction Concepts, ACID Properties, Transaction States.	2
5.2	**Characterizing Schedules:** Based on Recoverability and Serializability.	2
5.3	**Concurrency Control Techniques**: Types of Locks, Lock Based Protocols-Two Phase Locking protocol, Timestamp Based Protocols, Deadlock and Starvation.	3
5.4	**Recovery Techniques**: Recovery Based on Deferred Update and Immediate Update, Shadow Paging.	2
5.5	**Introduction to NoSQL Databases**	1

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
EST 200	DESIGN AND ENGINEERING		2	0	0	2

Preamble:

The purpose of this course is to

i) introduce the undergraduate engineering students the fundamental principles of design engineering,

ii) make them understand the steps involved in the design process and

iii) familiarize them with the basic tools used and approaches in design.

Students are expected to apply design thinking in learning as well as while practicing engineering, which is very important and relevant for today. Case studies from various practical situations will help the students realize that design is not only concerned about the function but also many other factors like customer requirements, economics, reliability, etc. along with a variety of life cycle issues.

The course will help students to consider aesthetics, ergonomics and sustainability factors in designs and also to practice professional ethics while designing.

Prerequisite:

Nil. The course will be generic to all engineering disciplines and will not require specialized preparation or prerequisites in any of the individual engineering disciplines.

Course Outcomes:

After the completion of the course the student will be able to

CO 1	Explain the different concepts and principles involved in design engineering.
CO 2	Apply design thinking while learning and practicing engineering.
CO 3	Develop innovative, reliable, sustainable and economically viable designs In corporating knowledge in engineering.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	1					1			1		
CO 2		2				1		1				2
CO 3			2			1	1		2	2		1

Assessment Pattern INFORMATION TECHNOLOGY

Continuous Internal Evaluation (CIE) Pattern:

Attendance	:	10 marks
Continuous Assessment Test (2 numbers)	:	25 marks
Assignment/Quiz/Course project	:	15 marks

End Semester Examination (ESE) Pattern: There will be two parts; Part A and Part B.
Part A : 30 marks
part B : 70 marks
Part A contains 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions.
Part B contains 2 case study questions from each module of which student should answer any one. Each question carry 14 marks and can have maximum 2 sub questions.

Mark distribution

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember	5	5	10
Understand	10	10	20
Apply	35	35	70
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

Course Level Assessment Questions

Course Outcome 1 (CO1): Appreciate the different concepts and principles involved in design engineering.

7. State how engineering design is different from other kinds of design

8. List the different stages in a design process.

9. Describe design thinking.

10. State the function of prototyping and proofing in engineering design.

11. Write notes on the following concepts in connection with design engineering 1) Modular Design, 2) Life Cycle Design , 3) Value Engineering, 4) Concurrent Engineering, and 5) Reverse Engineering

12. State design rights.

Course Outcome 2 (CO2) Apply design thinking while learning and practicing engineering.

2. Construct the iterative process for design thinking in developing simple products like a pen, umbrella, bag, etc.

2. Show with an example how divergent-convergent thinking helps in generating alternative designs and then how to narrow down to the best design.

3. Describe how a problem-based learning helps in creating better design engineering solutions.

4. Discuss as an engineer, how ethics play a decisive role in your designs

Course Outcome 3(CO3): Develop innovative, reliable, sustainable and economically viable designs incorporating different segments of knowledge in engineering.

2. Illustrate the development of any simple product by passing through the different stages of design process

2. Show the graphical design communication with the help of detailed 2D or 3D drawings for any simple product.

3. Describe how to develop new designs for simple products through bio-mimicry.

Model Question paper

Reg No.:_____ Name:_____

THIRD/FOURTH SEMESTER B.TECH DEGREE EXAMINATION

Course Code: EST 200

Course Name: DESIGN AND ENGINEERING

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each question carries 3 marks
Use only hand sketches

(1)Write about the basic design process.

(2)Describe how to finalize the design objectives.

(3)State the role of divergent-convergent questioning in design thinking.

(4)Discuss how to perform design thinking in a team managing the conflicts.

(5)Show how engineering sketches and drawings convey designs.

(6)Explain the role of mathematics and physics in design engineering process.

(7)Distinguish between project-based learning and problem-based learning in design engineering.

(8)Describe how concepts like value engineering, concurrent engineering and reverse engineering influence engineering designs?

(9)Show how designs are varied based on the aspects of production methods, life span, reliability and environment?

(10)Explain how economics influence the engineering designs?

(10x3 marks =30 marks)

Part B

Answer any ONE question from each module. Each question carry 14 marks

Module 1

(11)Show the designing of a wrist watch going through the various stages of the design process. Use hand sketches to illustrate the processes.

or

(12)Find the customer requirements for designing a new car showroom. Show how the design objectives were finalized considering the design constraints?

Module 2

(13)Illustrate the design thinking approach for designing a bag for college students within a limited budget. Describe each stage of the process and the iterative procedure involved. Use hand sketches to support your arguments.

or

(14)Construct a number of possible designs and then refine them to narrow down to the best design for a drug trolley used in hospitals. Show how the divergent-convergent thinking helps in the process. Provide your rationale for each step by using hand sketches only.

Module 3

(15) Graphically communicate the design of a thermo flask used to keep hot coffee. Draw the detailed 2D drawings of the same with design detailing, material selection, scale drawings, dimensions, tolerances, etc. Use only hand sketches.

or

(16)Describe the role of mathematical modelling in design engineering. Show how mathematics and physics play a role in designing a lifting mechanism to raise 100 kg of weight to a floor at a height of 10 meters in a construction site.

Module 4

(17) Show the development of a nature inspired design for a solar powered bus waiting shed beside a highway. Relate between natural and man-made designs. Use hand sketches to support your arguments.

or

(18)Show the design of a simple sofa and then depict how the design changes when considering 1) aesthetics and 2) ergonomics into consideration. Give hand sketches and explanations to justify the changes in designs.

Module 5

(19)Examine the changes in the design of a foot wear with constraints of 1) production methods, 2) life span requirement, 3) reliability issues and 4) environmental factors. Use hand sketches and give proper rationalization for the changes in design.

or

(20)Describe the how to estimate the cost of a particular design using ANY of the following: ii) a website, ii) the layout of a plant, iii) the elevation of a building, iv) an electrical or electronic system or device and v) a car.

Show how economics will influence the engineering designs. Use hand sketches to support your arguments.

(5x14 marks =70 marks)

Syllabus

Module 1

Design Process:- Introduction to Design and Engineering Design, Defining a Design Process-:Detailing Customer Requirements, Setting Design Objectives, Identifying Constraints, Establishing Functions, Generating Design Alternatives and Choosing a Design.

Module 2

Design Thinking Approach:-Introduction to Design Thinking, Iterative Design Thinking Process Stages: Empathize, Define, Ideate, Prototype and Test. Design Thinking as Divergent-Convergent Questioning. Design Thinking in a Team Environment.

Module 3

Design Communication (Languages of Engineering Design):-Communicating Designs Graphically, Communicating Designs Orally and in Writing. Mathematical Modeling In Design, Prototyping and Proofing the Design.

Module 4

Design Engineering Concepts:-Project-based Learning and Problem-based Learning in Design.Modular Design and Life Cycle Design Approaches. Application of Bio-mimicry,Aesthetics and Ergonomics in Design. Value Engineering, Concurrent Engineering, and Reverse Engineering in Design.

Module 5

Expediency, Economics and Environment in Design Engineering:-Design for Production, Use, and Sustainability. Engineering Economics in Design. Design Rights. Ethics in Design

Text Books

1)YousefHaik, SangarappillaiSivaloganathan, Tamer M. Shahin, Engineering Design Process, Cengage Learning 2003, Third Edition, ISBN-10: 9781305253285,

2)Voland, G., Engineering by Design, Pearson India 2014, Second Edition, ISBN 9332535051

Reference Books

1.Philip Kosky, Robert Balmer, William Keat, George Wise, Exploring Engineering, Fourth Edition: An Introduction to Engineering and Design, Academic Press 2015, 4th Edition, ISBN: 9780128012420.

2.Clive L. Dym, Engineering Design: A Project-Based Introduction, John Wiley & Sons, New York 2009, Fourth Edition, ISBN: 978-1-118-32458-5

3.Nigel Cross, Design Thinking: Understanding How Designers Think and Work, Berg Publishers 2011, First Edition, ISBN: 978-1847886361

4.Pahl, G., Beitz, W., Feldhusen, J., Grote, K.-H., Engineering Design: A Systematic Approach, Springer 2007, Third Edition, ISBN 978-1-84628-319-2

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Module 1: Design Process**	
1.1	Introduction to Design and Engineering Design. *What does it mean to design something? How Is engineering design different from other kinds of design? Where and when do engineers design? What are the basic Vocabulary in engineering design? How to learn and do engineering design.*	1
1.2	*Defining a Design Process*-: Detailing Customer Requirements. *How to do engineering design? Illustrate the process with an example. How to identify the customer requirements of design?*	1
1.3	*Defining a Design Process*-: Setting Design Objectives, Identifying Constraints, Establishing Functions. *How to finalize the design objectives? How to identify the design constraints? How to express the functions a design in engineering terms?*	1
1.4	*Defining a Design Process*-: Generating Design Alternatives and Choosing a Design. *How to generate or create feasible design alternatives? How to identify the "best possible design"?*	1
1.5	Case Studies:- Stages of Design Process. *Conduct exercises for designing simple products going through the different stages of design process.*	1
2	**Module 2: Design Thinking Approach**	
2.1	Introduction to Design Thinking *How does the design thinking approach help engineers in creating innovative and efficient designs?*	1
2.2	Iterative Design Thinking Process Stages: Empathize, Define, Ideate, Prototype and Test. *How can the engineers arrive at better designs utilizing the iterative design thinking process (in which knowledge acquired in the later stages can be applied back to the earlier stages)?*	1
2.3	Design Thinking as Divergent-Convergent Questioning. *Describe how to create a number of possible designs and then how to refine and narrow down to the 'best design'.*	1
2.4	Design Thinking in a Team Environment. *How to perform design thinking as a team managing the conflicts ?*	1
2.5	Case Studies: Design Thinking Approach. *Conduct exercises using the design thinking approach for*	1

designing any simple products within a limited time and budget

3 Module 3: Design Communication (Languages of Engineering Design)

3.1	Communicating Designs Graphically. *How do engineering sketches and drawings convey designs?*	1
3.2	Communicating Designs Orally and in Writing. *How can a design be communicated through oral presentation or technical reports efficiently?*	1
	First Series Examination	
3.3	Mathematical Modelling in Design. *How do mathematics and physics become a part of the design process?*	1
3.4	Prototyping and Proofing the Design. *How to predict whether the design will function well or not?*	1
3.5	Case Studies: Communicating Designs Graphically. *Conduct exercises for design communication through detailed 2D or 3D drawings of simple products with design detailing, material selection, scale drawings, dimensions, tolerances, etc.*	1
4	**Module 4: Design Engineering Concepts**	
4.1	Project-based Learning and Problem-based Learning in Design. *How engineering students can learn design engineering through projects?* *How students can take up problems to learn design engineering?*	1
4.2	Modular Design and Life Cycle Design Approaches. *What is modular approach in design engineering? How it helps?* *How the life cycle design approach influences design decisions?*	1
4.3	Application of Bio-mimicry, Aesthetics and Ergonomics in Design. *How do aesthetics and ergonomics change engineering designs?* *How do the intelligence in nature inspire engineering designs? What are the common examples of bio-mimicry in engineering?*	1
4.4	Value Engineering, Concurrent Engineering, and Reverse Engineering in Design. *How do concepts like value engineering , concurrent engineering and reverse engineering influence engineering designs?*	1
4.5	Case Studies: Bio-mimicry based Designs. *Conduct exercises to develop new designs for simple*	1

	products using bio-mimicry and train students to bring out new nature inspired designs.	
5	**Module 5: Expediency, Economics and Environment in Design Engineering**	
5.1	Design for Production, Use, and Sustainability. *How designs are finalized based on the aspects of production methods, life span, reliability and environment?*	1
5.2	Engineering Economics in Design. *How to estimate the cost of a particular design and how will economics influence the engineering designs?*	1
5.3	Design Rights. *What are design rights and how can an engineer put it into practice?*	1
5.4	Ethics in Design. *How do ethics play a decisive role in engineering design?*	1
5.5	Case Studies: Design for Production, Use, and Sustainability. *Conduct exercises using simple products to show how designs change with constraints of production methods, life span requirement, reliability issues and environmental factors.*	1
Second Series Examination		

Code.	Course Name	L	T	P	Hrs	Credit
HUT 200	**Professional Ethics**	2	0	0	2	2

Preamble: To enable students to create awareness on ethics and human values.

Prerequisite: Nil

Course Outcomes: After the completion of the course the student will be able to

CO 1	Understand the core values that shape the ethical behaviour of a professional.
CO 2	Adopt a good character and follow an ethical life.
CO 3	Explain the role and responsibility in technological development by keeping personal ethics and legal ethics.
CO 4	Solve moral and ethical problems through exploration and assessment by established experiments.
CO 5	Apply the knowledge of human values and social values to contemporary ethical values and global issues.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO 1								2			2	
CO 2								2			2	
CO 3								3			2	
CO 4								3			2	
CO 5								3			2	

Assessment Pattern

Bloom's category	Continuous Assessment Tests		End Semester Exam
	1	2	
Remember	15	15	30
Understood	20	20	40
Apply	15	15	30

Mark distribution

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern:

Attendance	: 10 marks
Continuous Assessment Tests (2 Nos)	: 25 marks
Assignments/Quiz	: 15 marks

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contains 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 14 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

4. Define integrity and point out ethical values.
5. Describe the qualities required to live a peaceful life.
6. Explain the role of engineers in modern society.

Course Outcome 2 (CO2)

4. Derive the codes of ethics.
5. Differentiate consensus and controversy.
6. Discuss in detail about character and confidence.

Course Outcome 3(CO3):

4. Explain the role of professional's ethics in technological development.
5. Distinguish between self interest and conflicts of interest.
6. Review on industrial standards and legal ethics.

Course Outcome 4 (CO4):

4. Illustrate the role of engineers as experimenters.
5. Interpret the terms safety and risk.
6. Show how the occupational crimes are resolved by keeping the rights of employees.

Course Outcome 5 (CO5):

4. Exemplify the engineers as managers.
5. Investigate the causes and effects of acid rain with a case study.
6. Explorate the need of environmental ethics in technological development.

INFORMATION TECHNOLOGY

Model Question paper

QP CODE: **Reg No:_____**

PAGES:3 **Name :_____**

THIRD/FOURTH SEMESTER B.TECH DEGREE EXAMINATION, MONTH & YEAR

Course Code: HUT 200
Course Name: PROFESSIONAL ETHICS

Max. Marks: 100 **Duration: 3 Hours**

(2020-Scheme)

PART A

(Answer all questions, each question carries 3 marks)

1. Define empathy and honesty.

2. Briefly explain about morals, values and ethics.

3. Interpret the two forms of self-respect.

4. List out the models of professional roles.

5. Indicate the advantages of using standards.

6. Point out the conditions required to define a valid consent?

7. Identify the conflicts of interests with an example?

8. Recall confidentiality.

9. Conclude the features of biometric ethics.

10. Name any three professional societies and their role relevant to engineers.

(10x3 = 30 marks)

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. a) Classify the relationship between ethical values and law?

b) Compare between caring and sharing. (10+4 = 14 marks)

Or

12. a) Exemplify a comprehensive review about integrity and respect for others.

b) Discuss about co-operation and commitment. (8+6 = 14 marks)

MODULE II

13.a) Explain the three main levels of moral developments, deviced by Kohlberg.

b) Differentiate moral codes and optimal codes. (10+4 = 14 marks)

Or

14. a) Extrapolate the duty ethics and right ethics.

b) Discuss in detail the three types of inquiries in engineering ethics (8+6 = 14 marks)

MODULE III

15.a) Summarize the following features of morally responsible engineers.

(i) Moral autonomy **(ii)** Accountability

b) Explain the rights of employees (8+6 = 14 marks)

Or

16. a) Explain the reasons for Chernobyl mishap ?

b) Describe the methods to improve collegiality and loyalty. (8+6 = 14 marks)

MODULE IV

17.a) Execute collegiality with respect to commitment, respect and connectedness.

b) Identify conflicts of interests with an example. (8+6 = 14 marks)

Or

18. a) Explain in detail about professional rights and employee rights.

b) Exemplify engineers as managers.

MODULE V

19.a) Evaluate the technology transfer and appropriate technology.

b) Explain about computer and internet ethics.

(8+6 = 14 marks)

Or

20. a) Investigate the causes and effects of acid rain with a case study.

b) Conclude the features of ecocentric and biocentric ethics. (8+6 = 14 marks)

Syllabus

Module 1 – Human Values.

Morals, values and Ethics – Integrity- Academic integrity-Work Ethics - Service Learning- Civic Virtue- Respect for others- Living peacefully- Caring and Sharing- Honestly- courage-Cooperation commitment- Empathy-Self Confidence -Social Expectations.

Module 2 - Engineering Ethics & Professionalism.

Senses of Engineering Ethics - Variety of moral issues- Types of inquiry- Moral dilemmas –Moral Autonomy – Kohlberg's theory- Gilligan's theory- Consensus and Controversy-Profession and Professionalism- Models of professional roles-Theories about right action –Self interest-Customs and Religion- Uses of Ethical Theories.

Module 3- Engineering as social Experimentation.

Engineering as Experimentation – Engineers as responsible Experimenters- Codes of Ethics- Plagiarism-A balanced outlook on law - Challenges case study- Bhopal gas tragedy.

Module 4- Responsibilities and Rights.

Collegiality and loyalty – Managing conflict- Respect for authority- Collective bargaining- Confidentiality- Role of confidentiality in moral integrity-Conflicts of interest- Occupational crime- Professional rights- Employee right- IPR Discrimination.

Module 5- Global Ethical Issues.

Multinational Corporations- Environmental Ethics- Business Ethics- Computer Ethics -Role in Technological Development-Engineers as Managers- Consulting Engineers- Engineers as Expert witnesses and advisors- Moral leadership.

Text Book

1. M Govindarajan, S Natarajan and V S Senthil Kumar, Engineering Ethics, PHI Learning Private Ltd, New Delhi,2012.
2. R S Naagarazan, A text book on professional ethics and human values, New age international (P) limited ,New Delhi,2006.

Reference Books

1. Mike W Martin and Roland Schinzinger, Ethics in Engineering, 4th edition, Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi,2014.
2. Charles D Fleddermann, Engineering Ethics, Pearson Education/ Prentice Hall of India, New Jersey,2004.
3. Charles E Harris, Michael S Protchard and Michael J Rabins, Engineering Ethics- Concepts and cases, Wadsworth Thompson Learning, United states,2005.
4. http://www.slideword.org/slidestag.aspx/human-values-and-Professional-ethics

Course Contents and Lecture Schedule

SL.No	Topic	No. of Lectures 25
1	**Module 1 – Human Values.**	
1.1	Morals, values and Ethics, Integrity, Academic Integrity,Work Ethics	1
1.2	Service Learning, Civic Virtue, Respect for others, Living peacefully	1
1.3	Caring and Sharing, Honesty, Courage, Co-operation commitment	2
1.4	Empathy, Self Confidence, Social Expectations	1
2	**Module 2- Engineering Ethics & Professionalism.**	
2.1	Senses of Engineering Ethics, Variety of moral issues, Types of inquiry	1
2.2	Moral dilemmas, Moral Autonomy, Kohlberg's theory	1
2.3	Gilligan's theory, Consensus and Controversy, Profession& Professionalism, Models of professional roles, Theories about right action	2
2.4	Self interest-Customs and Religion, Uses of Ethical Theories	1
3	**Module 3- Engineering as social Experimentation.**	
3.1	Engineering as Experimentation, Engineers as responsible Experimenters	1
3.2	Codes of Ethics, Plagiarism, A balanced outlook on law	2
3.3	Challenger case study, Bhopal gas tragedy	2
4	**Module 4- Responsibilities and Rights.**	
4.1	Collegiality and loyalty, Managing conflict, Respect for authority	1
4.2	Collective bargaining, Confidentiality, Role of confidentiality in moral integrity, Conflicts of interest	2
4.3	Occupational crime, Professional rights, Employee right, IPR Discrimination	2
5	**Module 5- Global Ethical Issues.**	
5.1	Multinational Corporations, Environmental Ethics, Business Ethics, Computer Ethics	2
5.2	Role in Technological Development, Moral leadership	1
5.3	Engineers as Managers, Consulting Engineers, Engineers as Expert witnesses and advisors	2

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
MCN202	CONSTITUTION OF INDIA		2	0	0	NIL

Preamble:

The study of their own country constitution and studying the importance environment as well as understanding their own human rights help the students to concentrate on their day to day discipline. It also gives the knowledge and strength to face the society and people.

Prerequisite: Nil

Course Outcomes: After the completion of the course the student will be able to

CO 1 Explain the background of the present constitution of India and features.

CO 2 Utilize the fundamental rights and duties.

CO 3 Understand the working of the union executive, parliament and judiciary.

CO 4 Understand the working of the state executive, legislature and judiciary.

CO 5 Utilize the special provisions and statutory institutions.

CO 6 Show national and patriotic spirit as responsible citizens of the country

Mapping of course outcomes with program outcomes

								PO				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	8	PO 9	PO 10	PO 11	PO 12
CO 1						2	2	2		2		
CO 2						3	3	3		3		
CO 3						3	2	3		3		
CO 4						3	2	3		3		
CO 5						3	2	3		3		
CO 6						3	3	3		2		

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember	20	20	40
Understand	20	20	40
Apply	10	10	20
Analyse			
Evaluate			
Create			

Mark distribution

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 10 marks
Continuous Assessment Test (2 numbers) :25 marks
Assignment/Quiz/Course project :15 marks

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contain 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 14 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1 Discuss the historical background of the Indian constitution.

2 Explain the salient features of the Indian constitution.

3 Discuss the importance of preamble in the implementation of constitution.

Course Outcome 2 (CO2)

1 What are fundamental rights ? Examine each of them.

2 Examine the scope of freedom of speech and expression underlying the constitution.

3 The thumb impression of an accused is taken by the police against his will. He contends that this is a violation of his rights under Art 20(3) of the constitution. Decide.

Course Outcome 3(CO3):

1 Explain the powers of the President to suspend the fundamental rights during emergency

2 Explain the salient features of appeal by special leave.

3. List the constitutional powers of President.

Course Outcome 4 (CO4):

1 Discuss the constitutional powers of Governor.

2 Examine the writ jurisdiction of High court.

3 Discuss the qualification and disqualification of membership of state legislature.

Course Outcome 5 (CO5):

1 Discuss the duties and powers of comptroller of auditor general.

2 Discuss the proclamation of emergency.

3 A state levies tax on motor vehicles used in the state, for the purpose of maintaining roads in the state. X challenges the levy of the tax on the ground that it violates the freedom of interstate commerce guaranteed under Art 301. Decide.

Course Outcome 6 (CO6):

1 Explain the advantages of citizenship.

2 List the important principles contained in the directive principles of state policy.

3 Discuss the various aspects contained in the preamble of the constitution

Model Question paper

PART A

(Answer all questions. Each question carries 3 marks)

1 Define and explain the term constitution.

2 Explain the need and importance of Preamble.

3 What is directive principle of state policy?

4 Define the State.

5 List the functions of Attorney general of India.

6 Explain the review power of Supreme court.

7 List the qualifications of Governor.

8 Explain the term and removal of Judges in High court.

9 Explain the powers of public service commission.

10 List three types of emergency under Indian constitution.

(10X3=30marks)

PART B

(Answer on question from each module. Each question carries 14 marks)

Module 1

11 Discuss the various methods of acquiring Indian citizenship.

12 Examine the salient features of the Indian constitution.

Module 2

13 A high court passes a judgement against X. X desires to file a writ petition in the supreme court under Art32, on the ground that the judgement violates his fundamental rights. Advise him whether he can do so.

14 What is meant by directive principles of State policy? List the directives.

Module3

15 Describe the procedure of election and removal of the President of India.

16 Supreme court may in its discretion grant special leave to appeal. Examine the situation.

Module 4

17 Discuss the powers of Governor.

18 X filed a writ petition under Art 226 which was dismissed. Subsequently, he filed a writ petition under Art 32 of the constitution, seeking the same remedy. The Government argued that the writ petition should be dismissed, on the ground of res judicata. Decide.

Module 5

19 Examine the scope of the financial relations between the union and the states.

20 Discuss the effects of proclamation of emergency.

(14X5=70marks)

Syllabus

Module 1 Definition, historical back ground, features, preamble, territory, citizenship.

Module 2 State, fundamental rights, directive principles, duties.

Module 3 The machinery of the union government.

Module 4 Government machinery in the states

Module 5 The federal system, Statutory Institutions, miscellaneous provisions.

Text Books

1 D DBasu, Introduction to the constitution of India, Lexis Nexis, New Delhi, 24e, 2019

2 PM Bhakshi, The constitution of India, Universal Law, 14e, 2017

Reference Books

1 Ministry of law and justice, The constitution of India, Govt of India, New Delhi, 2019.

2 JN Pandey, The constitutional law of India, Central Law agency, Allahabad, 51e, 2019

3 MV Pylee, India's Constitution, S Chand and company, New Delhi, 16e, 2016

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Module 1**	
1.1	Definition of constitution, historical back ground, salient features of the constitution.	1
1.2	Preamble of the constitution, union and its territory.	1
1.3	Meaning of citizenship, types, termination of citizenship.	2
2	**Module 2**	
2.1	Definition of state, fundamental rights, general nature, classification, right to equality ,right to freedom , right against exploitation	2

2.2	Right to freedom of religion, cultural and educational rights, right to constitutional remedies. Protection in respect of conviction for offences.	2
2.3	Directive principles of state policy, classification of directives, fundamental duties.	2
3	**Module 3**	
3.1	The Union executive, the President, the vice President, the council of ministers, the Prime minister, Attorney-General, functions.	2
3.2	The parliament, composition, Rajya sabha, Lok sabha, qualification and disqualification of membership, functions of parliament.	2
3.3	Union judiciary, the supreme court, jurisdiction, appeal by special leave.	1
4	**Module 4**	
4.1	The State executive, the Governor, the council of ministers, the Chief minister, advocate general, union Territories.	2
4.2	The State Legislature, composition, qualification and disqualification of membership, functions.	2
4.3	The state judiciary, the high court, jurisdiction, writs jurisdiction.	1
5	**Module 5**	
5.1	Relations between the Union and the States, legislative relation, administrative relation, financial Relations, Inter State council, finance commission.	1
5.2	Emergency provision, freedom of trade commerce and inter course, comptroller and auditor general of India, public Services, public service commission, administrative Tribunals.	2
5.3	Official language, elections, special provisions relating to certain classes, amendment of the Constitution.	2

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
ITL202	OBJECT ORIENTED TECHNIQUES LAB	PCC	0	0	3	2

Preamble:

This lab is intended to make the students capable of

Understanding the importance of Object Oriented Programming in designing the Software applications,

Implementing programs using Object oriented concepts of inheritance and polymorphism,

Analysing the given problem to design multithreaded programs,

Developing robust programs using exception handling features in Java.

Prerequisite: ITT202 PRINCIPLES OF OBJECT ORIENTED TECHNIQUES

Course Outcomes: After the completion of the course the student will be

CO No	Course Outcome(CO)	Bloom's Category
CO 1	**Solve** the given problem by applying Object oriented features and Java concepts.	Apply
CO 2	**Implement** the concept of method and constructor overloading	Apply
CO 3	**Implement** the concept of inheritance Apply	Apply
CO 4	**Use** the concept of multithreading and modify an existing program with proper exception handling	Apply
CO 5	**Build** Robust programs in JAVA using AWT and SWING	Apply

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	2	1	2	-	-	-	-	-	-	1
CO 2	2	2	2	-	2	-	-	-	-	-	-	1
CO 3	2	2	2	-	2	-	-	-	-	-	-	1
CO 4	2	3	3	1	2	-	-	-	-	-	-	2
CO 5	2	3	3	1	3	-	-	-	-	-	-	2

3/2/1: High/Medium/Low

Assessment Pattern

Mark distribution

Total Marks	**CIE**	**ESE**	**ESE Duration**
150	75	75	2.5 hours

Continuous Internal Evaluation Pattern:

Attendance : 15marks
Continuous Assessment : 30 marks
Internal Test (Immediately before the second series test) : 30marks

End Semester Examination Pattern: The following guidelines should be followed regarding award of marks
(a) Preliminary work : 15Marks
(b) Implementing the work/Conducting the experiment : 10Marks
(c) Performance, result and inference (usage of equipments and trouble shooting):25Marks
(d) Viva voce : 20 marks
(e) Record : 5Marks

General instructions: Practical examination to be conducted immediately after the second series test covering entire syllabus given below. Evaluation is a serious process that is to be conducted under the equal responsibility of both the internal and external examiners. The number of candidates evaluated per day should not exceed 20. Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Develop a program in Java to display the details of bank account using Class.
2. Develop a program in Java to implement Stack operations using Class.
3. Construct a Java class to store some employee details and provide methods to set and get values.

Course Outcome 2 (CO2)

1. Develop a Java program to implement functions to display an input integer, string and float values using the concept of method overloading

2. The Fibonacci sequence is defined by the following rule. The first 2 values in the sequence are 1, 1. Every subsequent value is the sum of the 2 values preceding it. Develop a Java program that uses both recursive and no recursive functions to print the nth value of the Fibonacci sequence

Course Outcome 3(CO3):

1. Develop a Java program to read and print students data using inheritance Class person: name, age, gender
   Class student inherits from person: mark1, mark2, mark3, total marks, grade.

2. Develop a java program to create an abstract class named Shape that contains two integers and an empty method named printArea(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contain only the method printArea( ) that prints the area of the given shape.

3. Suppose your institution wishes to maintain a database of its employees. The database is divided into a number of classes whose (Assistant Professor, Associate Professor, Professor etc). Construct a Super Class Person to store personal information. Derive all the above classes from the Class. Develop a Java program to specify all the classes and define functions to create the database and retrieve individual information as and when required. Support at least 5 employees on each category.

Course Outcome 4 (CO4):

1. Develop a Java application that executes two threads. One thread displays ―"Hello" in every 1000 milliseconds and other displays ― "World" in every 3000 milliseconds. Create the threads by extending the Thread class

2. Construct a Stack Class with proper exception handling mechanisms. While doing a Pop operation, if the stack is empty then display an error message. While doing a Push operation, if the stack is full then display corresponding error message.

3. Develop a java program that implements a multi-thread application that has three threads. First thread generates random integer for every 1 second and if the value is even, second thread computes the square of the number and prints and if the value is odd, the third thread will print the value of cube of the number.

Course Outcome 5 (CO5):

1. Develop a java program that simulates a traffic light using AWT. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "stop" or "ready" or "go" should appear above the buttons in a selected colour. Initially there is no message shown.

2. Develop a program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a NumberFormatException. If Num2 were Zero, the program would throw an Arithmetic Exception Display the exception in a message dialog box

3. Develop a Java program that works as a simple calculator using SWING. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divide by zero.

LIST OF EXPERIMENTS

Cycle	Name of Experiment
I	Program to implement Simple Classes for understanding objects, member functions and Constructors. write Classes having: (i) Methods without arguments (ii) Methods with argument (iii) Constructors (iv) Methods with default arguments
II	Programs to implement (i) Method overloading (ii) Constructor overloading (iii) Static functions (iv) Inner class (v) Nested classes
III	Programs to implement Inheritance
IV	Programs to implement (i) Multithreading (ii) Exception handling (iii) Thread synchronization
V	Program to implement Graphical user Interface using: (i) AWT (i) SWING

Reference Books

1. Herbert Schildt, Java: The Complete Reference, 8/e, Tata McGraw Hill,2011.
2. Flanagan D., Java in A Nutshell, 5/e, O'Reilly,2005.
3. Sierra K., Head First Java, 2/e, O'Reilly,2005.
4. Balagurusamy E., Programming JAVA a Primer, 5/e, McGra Hill,2014.

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
ITL204	DATABASE MANAGEMENT SYSTEMS LAB	PCC	0	0	3	2

Preamble:

Database Management Systems Lab course is intended to provide students a hands on experience in database management concepts. It also provides a strong formal foundation in database concepts, technology and practice to the students. It gives an exposure to design and develop applications.

Prerequisite:

CODE	COURSE NAME	DESCRIPTION	SEM
ITT206	Database Management Systems	Gives concepts of database management systems and exposure to database programming, modelling and design.	4

Course Outcomes: After completion of the course, the student will be able to

CO No.	DESCRIPTION	Blooms' Taxonomy
CO1	Construct database using DDL, DCL and basic DML commands in SQL.	Apply
CO2	Build nested and join queries.	Apply
CO3	Apply procedural SQL concepts like view, exception handling, stored procedure, function, trigger, cursor in various database applications.	Apply
CO4	Design and develop database applications.	Create

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	2	1	2	-	1	-	-	-	-	-	-	1
CO2	2	2	1	1	1	-	-	-	-	-	-	-

CO3	3	2	2	1	-	-	-	-	-	-	-	-
CO4	2	3	3	2	-	-	-	-	-	-	-	-

3/2/1: High/Medium/Low

Assessment Pattern

Mark distribution

Total Marks	**CIE**	**ESE**	**ESE Duration**
150	75	75	2.5 hours

Continuous Internal Evaluation Pattern:

Attendance :15marks
Continuous Assessment :30marks
Internal Test (Immediately before the second series test) :30 marks

End Semester Examination Pattern: The following guidelines should be followed regarding award of marks

1.
   a. Database Design : 10 Marks
   b. Implementation of Project : 15 Marks
2. Performance, result and inference (usage of application tool and troubleshooting) : 25Marks
3. Viva voce : 20Marks
4. Record : 5Marks

General instructions: Practical examination to be conducted immediately after the second series test covering entire syllabus given below. Evaluation is a serious process that is to be conducted under the equal responsibility of both the internal and external examiners. The number of candidates evaluated per day should not exceed 20. Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.

LIST OF EXPERIMENTS (Experiments No.10 & 11 are not mandatory)

1. Familiarization of Data Definition Language (DDL)and Data Control Language (DCL) commands.
2. Familiarization of Data Manipulation Language (DML) commands (INSERT, SELECT, DELETE and UPDATE).
3. Implementation of various Aggregate functions and Grouping in SQL.
4. Implementation of Nested Queries.
5. Implementation of Join Queries.
6. Creation of Views.
7. Creation of Stored Procedures and Functions.
8. Exception Handling in SQL.
9. Creation of Triggers and Cursors.
10. Familiarization of Transaction Control Language(TCL)Commands.
11. Familiarization of NoSQL database using MongoDB.
12. Develop an application to demonstrate database connectivity.

CLASS PROJECT (One project per group of at most four members)

Applications like Library Management System, Hospital Management System, Student Management Systems, Reservation Systems etc. can be considered as project topics.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Create a table project and for each project retrieve the project number, project name and the number of employees who work on that project.
2. Retrieve the social security number of all employees who work on project number 1,2 or 3

Course Outcome 2 (CO2)

3. Create a table employee with employee number, name, SSN, salary and department number and display the minimum salary of employee whose salary is greater than salary of all employees in department5.

Course Outcome 3(CO3):

4. Create a SQL procedure application for exception using continue and exit handler

5. Create a table and perform cursor operations and trigger

Course Outcome 4 (CO4):

6. Develop a data driven GUI application in any domain (bank, library, hospital etc.)
    a. Implementation of student management system
    b. Implementation of any reservation system

Text Books

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Database System Concepts, McGraw-Hill Education (Asia), Fifth Edition,2006.
2. AtulKahate, Introduction to Database Management Systems,Pearson
3. C. J. Date, A. Kannan and S. Swamynathan, An Introduction to Database Systems, Pearson Education, Eighth Edition,2009.
4. Patrick O'Neil and Elizabeth O'Neil, Database Principles, Programming and Performance, Harcourt Asia Pte. Ltd., First Edition,2001.
5. Peter Rob and Carlos Coronel, Database Systems Design, Implementation and Management, Thomson Learning-Course Technology, Seventh Edition,2007.
6. RamezElmasri, Shamkant B. Navathe, Fundamentals of Database Systems (7th Edition), Pearson EducationLtd.
7. Shio Kumar Singh, Database Systems Concepts, Designs and Application, Pearson Education, Second Edition,2011.

SEMESTER –IV

MINOR

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
ITT282	DATABASE MANAGEMENT	VAC	3	1	0	4

Preamble: This course aims at facilitating the student to understand the various functionalities of DBMS software and perform many operations related to creating, manipulating and maintaining databases for Real-world applications and student to understand the various designing concepts, storage methods, querying and managing databases.

Prerequisite: Nil

Course Outcomes: After the completion of the course the student will be able to

CO_NO	Course Outcome(CO)	Bloom's Category
CO 1	Impart the basic understanding of the theory and applications of database management systems.	Level 2 : Understand
CO 2	Give basic level understanding of internals of database systems.	Level 2 : Understand
CO 3	Construct simple and moderately advanced database queries using Structured Query Language (SQL)	Level 3: Apply
CO 4	Understand and successfully apply logical database design principles and database normalization.	Level 3: Apply
CO 5	Give understanding of organization of Physical Data in DBMS and expose to some of the recent trends in databases	Level 2 : Understand

Mapping of course outcomes with program outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	2	1	-	-	-	-	-	-	-	-	-
CO 2	2	1	2	1	-	-	-	-	-	-	-	-
CO 3	3	2	3	2	1	-	-	-	-	-	-	1
CO 4	3	2	3	2	1	-	-	-	-	-	-	1
CO 5	1	1	3	3	1	-	-	-	-	-	-	2

3/2/1: high/medium/low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember	10	10	20
Understand	20	20	40
Apply	20	20	40

Analyse			
Evaluate			
Create			

Mark distribution

Total Marks	**CIE**	**ESE**	**ESE Duration**
150	50	100	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 10marks
Continuous Assessment Test(2numbers) : 25 marks
Assignment/Quiz/Course project : 15marks

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contain 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 14 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Compare structured data and unstructured data?
2. Explain the advantages of DBMS?
3. Relate Entity, Entity Set, and Entity Type?

Course Outcome 2 (CO2)

1. Explain about Integrity Constraints
2. Describe views in DBMS?
3. Explain the purpose of DML commands in SQL

Course Outcome 3(CO3):

1. Develop SQL queries.
2. Experiment with the use of group by and having clause in sql

3. Build SQL query to find the name of the maximum salaried employee in each department

Course Outcome 4 (CO4):

1. Let R= (A, B, C, D, E, F) be a relation scheme with the following dependencies:

   C->F, E->A, EC->D, A->B. Identify the key for R?

2. Experiment with 3NF with example
3. Make use of lossless and dependency preserving decompositions?

Course Outcome 5 (CO5):

1. Explain the use of Query Optimization
2. Compare Non-clustered and clustered index
3. Explain the concept of ACID properties in DBMS
4. Explain Semantic Web, RDF,GIS

Model Question paper

Course Code: ITT282

Course Code: DATABASE MANAGEMENT

Max Marks:100 Duration: 3hr

PART A

Answer all questions, each carries 3 marks

1. List any three categories of database users, highlighting any one important characteristic of each category.

2. In a relationship of degree 2, how can we decide if an attribute of the relationship can be moved to one of the entity sets?

3. Distinguish between total and partial participation constraints with the help of real examples.

4. Illustrate DELETE and UPDATE clauses using typical examples.

5. Given a relation R(A,B,C,D,E,F) with functional dependencies A→B, B→D, D→EF, F→A, compute {D}+ and{EF}+.

6. What are fully functional dependencies and partial functional dependencies? Give an example to distinguish between these?

7. Define the following:

(a) Physical record

(b) Logical record

(c) Blocking factor

8. How is clustering index different from primary index?

9. What are the desirable properties of transactions? Explain.

10. What is the significance of check-pointing. (10*3=30)

PART B

Answer all questions, each carries 14 marks

11. a) Design an ER diagram to represent the following scenario: A company has many employees working on a project. An employee can be part of one or more projects. Each employee works on a project for certain amount of time. Assume suitable attributes for entities and relations. Mark the primary key(s) and the cardinality ratio of the relations.(9)

b) What are logical data independence and physical data independence? What is the difference between them? Which of these harder to realize? Why? (5)

OR

12. a) With the help of neat diagram, explain three schema architecture of DBMS. (9)

b) How is weak entity type different from a strong entity type? Give an example. (5)

13. a) With the help of an example, compare DML and DDL. (6)

b) Consider the following relational schema:

Suppliers(sid:integer, sname:string, city:string, street:string)

Parts(pid:integer, pname:string, color:string)

Catalog(sid:integer, pid:integer, cost:real)

Write SQL query to find the names of all suppliers who have not supplied only blue parts.(8)

OR

14. a) Explain the aggregate functions in SQL? (6)

b) Consider the following relational schema:

employee(empId, empName, empDept)

customer(custId, custName, salesRepId, rating)

salesRepId is a foreign key referring to empId of the employee relation. Assume that each employee makes a sale to at least one customer. Write SQL query to find the names of all the employees with all their customers having a'GOOD'rating. (8)

15. a) Explain three uses of attribute closure algorithm (5)

b) Given a relation R(A,B,C,D,E,F,G, H) with keys BD and C and functional dependencies D→G, E→F and H→C, decompose the R into the highest normal form possible. (9)

OR

16. a) What are Armstrong's axioms (5)

b) Given a relation R(A1,A2,A3,A4,A5) with functional dependencies A1→A2A4 and A4→A5, check if the decomposition R1(A1,A2,A3), R2(A1,A4), R3(A2,A4,A5) is lossless. (9)

17. a) Illustrate structure of B-Tree and B+-Tree and explain how they are different. (5)

b) Consider an EMPLOYEE file with 10000 records where each record is of size 80 bytes. The file is sorted on employee number (15 bytes long), which is the primary key. Assuming un-spanned organization, block size of 512 bytes and block pointer size of 5 bytes, compute the number of block accesses needed for retrieving an employee record based on employee number if (i) No index is used (ii)Multi-level primary index is used. (9)

OR

18. a) Distinguish between dense index and sparse index (5)

b) Explain heuristics-based query optimization. (9)

19. a) Check if the following schedules are conflict-serializable using precedence graph. If so, give the equivalent serial schedule(s). r3(X), r2(X), w3(X),r1(X),w1(X). (7)

b) Explain the concept behind the following:

(i) Log base recovery.

(ii) Deferred database modification. (7)

OR

20. a) Why Concurrency Control Is Needed? What are the different types of problems we may encounter when two transactions run concurrently? Illustrate each problem with suitable examples. (7)

b)Explain the characteristics of data in GIS. (7)

Syllabus

Module 1 (7 Hours)
Introduction: Data: structured, semi-structured and unstructured data, Concept & Overview of DBMS, Data Models, Database Languages, Database Administrator, Database Users, Three Schema architecture of DBMS. Database architectures and classification. Entity-Relationship Model: Basic concepts, Design Issues, Mapping Constraints, Keys, Entity-Relationship Diagram, Weak EntitySets.
Module 2 (8 Hours)
Relational Model: Structure of relational Databases, Integrity Constraints, synthesizing ER diagram to relational schema .**Database Languages:** Concept of DDL and DML relational algebra. **Structured Query Language (SQL**): Basic SQL Structure, Set operations, Aggregate Functions, nested sub-queries, Views, assertions and triggers.
Module 3 (10 Hours)
Relational Database Design: Different anomalies in designing a database, normalization, functional dependency (FD), Armstrong's Axioms, closures, Equivalence of FDs, minimal Cover. Normalization using functional dependencies, INF, 2NF, 3NF and BCNF, lossless and dependency preserving decompositions.
Module 4 (10 Hours)
Physical Data Organization: index structures, primary, secondary and clustering indices, Single level and Multi-level indexing, B+- Trees .Query Optimization: heuristics-based query optimization.
Module 5 (10 Hours)
Transaction Processing Concepts: overview of concurrency control and recovery acid properties, serial and concurrent schedules, conflict serializability, Two-phase locking, failure classification, storage structure, stable storage, log based recovery, deferred database modification, check-pointing, **Recent topics :** Semantic Web and RDF, GIS, biological databases .

Text Books

1. Elmasri R. and S. Navathe, Database Systems: Models,Languages, Design and Application Programming,6e,2013.
2. Sliberschatz A., H. F. Korth and S. Sudarshan, Database System Concepts, 6/e,McGraw Hill, 2011.
3. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke,McGrawHill Education, 3rd Edition,2003.

Reference Books

1. Powers S., *Practical RDF*, O'Reilly Media,2003.

2. Plunkett T., B. Macdonald, *et al.*, *Oracle Big Data Hand Book*, Oracle Press,2013.
3. Peter Rob and Carlos Coronel, Database System- Design, Implementation and Management (7/e), Cengage Learning, 2007.

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Introduction**	**7 Hours**
1.1	Data: structured, semi-structured and unstructured data, Concept & Overview of DBMS	2
1.2	Data Models, Database Languages, Database Administrator, Database Users, Three Schema architecture of DBMS, Database architectures and classification.	2
1.3	Entity-Relationship Model: Basic concepts, Design Issues, Mapping Constraints, Keys, Entity- Relationship Diagram, Weak Entity Sets.	3
2	**Relational Model**	**8 Hours**
2.1	Structure of relational Databases, Integrity Constraints, synthesizing ER diagram to relational schema	3
2.2	Database Languages**,** Concept of DDL and DML relational algebra.	2
2.3	Basic SQL Structure, Set operations, Aggregate Functions, nested sub-queries, Views, assertions and triggers.	3
3	**Relational Database Design**	**10 Hours**
3.1	Different anomalies in designing a database, normalization	3
3.2	Functional dependency (FD), Armstrong's Axioms, closures, Equivalence of FDs, minimal Cover.	3
3.3	Normalization using functional dependencies, INF, 2NF, 3NF and BCNF, lossless and dependency preserving decompositions.	4
4	**Physical Data Organization**	**10 Hours**
4.1	index structures, primary, secondary and clustering indices	3
4.2	Single level and Multi-level indexing, B+- Trees	3
4.3	Query Optimization: heuristics-based query optimization.	4
5	**Transaction Processing Concepts**	**10 Hours**
5.1	overview of concurrency control and recovery, acid properties, serial and concurrent schedules, conflict serializability	3
5.2	Two-phase locking, failure classification, storage structure, stable storage, log based recovery, deferred database modification, check-pointing	4
5.3	Semantic Web and RDF, GIS, biological databases.	3

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
ITT284	COMPUTER NETWORKS	VAC	3	1	0	4

Preamble: The syllabus is prepared with a view to equip the Engineering Graduates to learn basic concepts in computer networking, and to design, inspect and evaluate network models and protocols for real world applications.

Prerequisite: Nil

Course Objectives

- To introduce the basic terminology and concepts used in computer networking
- To understand data link layer services and protocols
- To learn and apply the process of routing and IP addressing in Internet

Course Outcomes: After completion of the course the student will be able to

CO No.	Course Outcome (CO)	Bloom's Category Level
CO 1	Examine different network design models and protocols	Level 1: Remember
CO 2	Inspect data link layer issues and protocols	Level 2: Understand
CO 3	Apply the process of routing and IP addressing in Internet	Level 3: Apply
CO 4	Understand transport layer services and congestion control mechanisms	Level 2: Understand
CO 5	Demonstrate the working of various application layer protocols such as HTTP, SMTP, POP3, FTP and DNS. Explain various Internet control protocols used to manage and monitor network traffic.	Level 2: Understand

Mapping of Course Outcomes with Program Outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	2	-	-	-	-	-	-	-	-	2
CO 2	3	2	-	2	-	-	-	-	-	-	-	-
CO 3	3	3	3	2	1	-	-	-	-	-	-	3
CO 4	2	-	2	2	-	-	-	-	-	-	-	-
CO 5	2	-	2	3	-	-	-	-	-	-	-	2

3/2/1: high/medium/low

Assessment Pattern

Bloom's Category Levels	Continuous Assessment Tests		End Semester Examination
	1	2	
BL 1: Remember	10	10	20
BL 2: Understand	30	30	60
BL 3: Apply	10	10	20
BL 4: Analyse			
BL 5: Evaluate			
BL 6: Create			

Mark distribution

Total Marks	Continuous Internal Evaluation (CIE)	End Semester Examination (ESE)	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 10marks
Continuous Assessment Test(2numbers) : 25 marks
Assignment/Quiz/Course project : 15marks

End Semester Examination Pattern: There will be *two* parts; **Part A** and **Part B**. Part A contain 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer *all* questions. Part B contains 2 questions from each module of which student should answer *any one*. Each question can have maximum 2 sub-divisions and carry 14 marks.

Sample Course Level Assessment Questions

Course Outcome 1 (CO 1):

1. List the various layers of the OSI reference model.
2. What are the different types of network topologies?
3. What are the various devices used in different layers of the TCP/IP reference model.
4. Define a Protocol Data Unit(PDU).

Course Outcome 2 (CO 2):

1. Compare and contrast the functionalities of hubs, bridges and switches.
2. Explain the main features of Fast Ethernet?
3. Explain the different fields in IEEE 802.3 frame format?

4. Explain the techniques for detecting burst errors in data transmission.

Course Outcome 3 (CO 3):

1. Experiment with the working of Distance Vector Routing algorithm.
2. A block is assigned an IP address 201.99.88.119/22. Identify the IP address of the first and last host of this block.
3. What is super-netting? What is its application in classless addressing?
4. What is the relevance of Token Bucket algorithm in computer networks?

Course Outcome 4 (CO 4):

1. Explain the appropriateness of using a pseudo-header in TCP for computing checksum.
2. Illustrate the steps involved in TCP connection establishment and release.
3. Explain with the help of an example, the working of Remote Procedure Calls.
4. Describe the various congestion control mechanisms in transport layer.

Course Outcome 5 (CO 5):

1. Explain how a Domain Name System (DNS) works.
2. Compare link state routing algorithms with distance vector routing protocols
3. Explain the suitability of various error correcting codes to deal with single-bit and burst errors in data transmission.
4. Describe the major design issues in network layer.
5. Describe the working of SMTP, IMAP and POP3 mail transfer protocols.

Model Question Paper

Part A

Answer all questions. Each question carries 3 marks. (10 * 3 = 30 Marks)

1. List the main characteristics of different types of Computer Networks.
2. Define Maximum Transmission Unit (MTU) of a protocol data unit.
3. Briefly explain the various types of CSMA protocols.
4. A message 11001001 has to be transmitted using the CRC polynomial x^3+1 to protect it from errors. Compute the message that should actually be transmitted.
5. How does link state routing build and distribute the link state packets?
6. One of the IP addresses of a block of address is 201.99.88.119/22. Find the range of the assignable IP address.

7. What is traffic shaping? Compare traffic shaping with traffic policing.
8. Why is Token Bucket algorithm relevant in networks?
9. How can ARP and RARP be used to resolve addresses in computer networks?
10. What happens when an FTP control connection breaks while data transfer is in progress?

Part B

Answer all questions. Each question carries 14 marks. (5 * 14 = 70 Marks)

11. List and explain the main features of all the seven layers of the TCP/IP reference model.

OR

12. Explain the major design issues for the network layer.
13. Why do Ethernet frames require a minimum frame size? Discuss how Gigabit Ethernet solves this problem.

OR

14. How do burst errors occur? Explain how Hamming codes can be effectively used to deal with burst errors.
15. Compute the IP address of the 5^{th} host in the 6^{th} subnet of a network whose network address is given by 192.168.0.1 and subnet mask is given by255.255.255.240.

OR

16. What is count-to-infinity problem? Discuss any two methods to practically solve this problem.
17. Illustrate with suitable examples, the operation of Go-Back-N and Selective-Repeat sliding window protocols.

OR

18. Describe the TCP segment header format. Clearly indicate the significance of each flag.
19. Differentiate between persistent and non-persistent HTTP connections. Discuss the message formats of HTTP request and response.

OR

20. Describe the working of SMTP, IMAP and POP3 protocols in a simple mail transfer scenario.

Syllabus

Module 1 (7 Hours)
Computer Networks - Types of Networks, Reference models - OSI and TCP/IP, Internet - The network edge, The network core, Network access, Delay and loss, Protocol layers and services - Design issues for the layers - Interface and Services
Module 2 (9 Hours)
Data Link layer design Issues - Flow Control and ARQ techniques, Services - Error detection and correction, Protocols - HDLC, MAC, Multiple access protocols, MAC Sub layer - IEEE 802 for LANs and MANs, IEEE 802.3, 802.4, 802.5, Devices - Hubs, Bridges and Switches, VLAN, High-speed LANs - Gigabit Ethernet.
Module 3 (10 Hours)
Network layer - services, IPv4 - IP Addressing - Classless and Classfull Addressing. Sub-netting and super-netting, Routing in Internet - Shortest path routing, Flooding, Distance Vector Routing, Link State Routing, RIP and OSPF, IPV6, Internet Multicasting, Multicast routing.
Module 4 (10 Hours)
Transport layer services and primitives, UDP - Segment Structure, Remote Procedure Call, TCP - Segment Header, Connection establishment and Release, Transmission Policy, Congestion Control - General principles, Quality-of-Service requirements - Traffic shaping.
Module 5 (9 Hours)
Internet Control and Management Protocols - ICMP, SNMP, ARP and RARP, Application Layer - HTTP - Overview, Persistent and non-persistent connections, Message formats, Cookies, FTP, Electronic Mail - SMTP, POP3 and IMAP, DNS - services and caching policies.

Text Books

1. F. Kurose and K. W. Ross, Computer Networking: A Top-Down Approach Featuring Internet, 6/e, Pearson Education,2012.
2. A. S. Tanenbaum and D. J. Wetherall, Computer Networks, 5/e, Pearson,2013.
3. L. L. Peterson and B. S. Davie, Computer Networks, A systems approach, 5/e, Morgan Kaufmann,2011.

Reference Books

1. William Stallings, Computer Networking with Internet Protocols, Prentice-Hall,2004.
2. Behrouz A. Forouzan, TCP/IP Protocol Suite, 4/e, McGrawHill

3. Behrouz A. Forouzan, Data Communications and Networking, 4/e, Tata McGraw Hill.
4. Fred Halsall, Computer Networking and the Internet,5/e.

Course Contents and Lecture Schedule

Sl. No.	Topic	No. of Lectures
1	**Computer Networks – Fundamentals**	**7 Hours**
1.1	Types of Networks, Reference models - OSI andTCP/IP.	2
1.2	Internet - The network edge, The network core, Network access, Delay and loss.	2
1.3	Protocol layers and services - Design issues for the layers - Interface and Services.	3
2	**Data Link layer**	**9 Hours**
2.1	Design Issues - Flow Control and ARQ techniques, Services - Error detection and correction.	3
2.2	Protocols - HDLC, MAC, Multiple access protocols, MAC Sub layer - IEEE 802 for LANs and MANs.	3
2.3	IEEE 802.3, 802.4, 802.5, Devices - Hubs, Bridges and Switches, VLAN, High-speed LANs - Gigabit Ethernet.	3
3	**Network layer**	**10 Hours**
3.1	Services, IPv4 - IP Addressing.	3
3.2	Classless and Classfull Addressing. Sub-netting and super-netting	3
3.3	Routing in Internet - Shortest path routing, Flooding, Distance Vector Routing, Link State Routing, RIP and OSPF, IPV6, Internet Multicasting, Multicast routing.	4
4	**Transport layer**	**10 Hours**
4.1	Services and primitives, UDP - Segment Structure, Remote Procedure Call.	3
4.2	TCP - Segment Header, Connection establishment and Release, Transmission Policy.	3
4.3	Congestion Control - General principles, Quality-of-Service requirements - Traffic shaping.	4
5	**Application layer**	**9 Hours**
5.1	Internet Control and Management Protocols- ICMP, SNMP, ARP and RARP.	3
5.2	Application Layer - HTTP - Overview, Persistent and non-persistent connections, Message formats, Cookies.	2
5.3	FTP, Electronic Mail - SMTP, POP3 and IMAP, DNS - services and caching policies.	4

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
ITT286	SOFTWARE PROJECT MANAGEMENT TECHNIQUES	VAC	3	1	0	4

Preamble: The syllabus is prepared with the view of preparing the Engineering Graduates capable of understanding essential concept of software project management and software development process.

Prerequisite: Basics of programming, software engineering.

Course Outcomes: After the completion of the course the student will be able to

CO No.	Course Outcome (CO)	Bloom's Category
CO1	**List** the activities in Software Project Management.	Level 1: Remember
CO2	**Summarize** different Software Process Models	Level 2: Understand
CO3	**Explain** methods for software cost estimation	Level 2: Understand
CO4	**Analyze** Project Scheduling and risk management methods.	Level 3: Apply
CO5	**Illustrate** the methods to manage and control projects and people in an organization.	Level 2: Understand

Mapping of course outcomes with program outcomes

COs	PROGRAMME OUTCOMES (PO)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	-	1	-	-	2	-	3	1	3	1
CO2	-	-	-	-	-	-	-	-	2	2	3	1
CO3	2	1	-	1	2	-	-	-	3	3	3	1
CO4	1	3	-	-	1	-	-	-	3	3	3	1
CO5	-	1	-	1	1	-	3	-	2	2	3	1

3/2/1: high/medium/low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember	10	10	10
Understand	20	20	20
Apply	20	20	70
Analyse			
Evaluate			
Create			

Mark distribution

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 10marks
Continuous Assessment Test(2numbers) : 25 marks
Assignment/Quiz/Course project : 15 marks

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contain 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 14 marks.

Sample Course Level Assessment Questions

Course Outcome 1 (CO1):

1. List the characteristics which make software projects different from other project.
2. List out the activities within stepwise planning
3. What are the various activities covered by software project management.
4. Define portfolio management of software projects. Discuss with examples

Course Outcome 2 (CO2):

1. Illustrate SRUM in details
2. Explain the phases of software development
3. Describe the rapid software development method
4. Explain Agile model in detail.

Course Outcome 3 (CO3):

1. Write short note on reliability metrics.
2. Write the steps in cost-benefit analysis comprises
3. Classify the project sizing metrics.
4. Describe COCOMO model with appropriate data

Course Outcome 4 (CO4):

1. Experiment with network planning models.
2. Experiment with the different steps in project scheduling.
3. Make use of resource allocation and cost scheduling methods in software projects.

Course Outcome 5 (CO5):

1. Explain the methods to visualize the progress of the project.
2. Summarize the setting of checkpoints.
3. Illustrate the salient features of fixed price and time and material contract models
4. Explain the procedure of change control
5. Compare intrinsic and extrinsic motivation.
6. Explain the Oldham-Hackman job characteristic model
7. Explain in detail about the team structures

Model Question Paper

PARTA **(10*3=30)**

(Each Question carries 3 Marks)

1. Identify the characteristics which make software projects different from other project.
2. List out the activities within stepwise planning
3. Examine the steps in cost-benefit analysis comprises
4. Classify the project sizing metrics.
5. Illustrate network planning models with example.
6. Define critical path.
7. Identify the methods to visualize the progress of the project.
8. Summarize the setting of checkpoints.
9. Differentiate intrinsic and extrinsic motivation.
10. List some obstacles for good group decision making

PARTB **(5*14=70)**

11. Explain the various activities covered by software project management.

OR

12. Explain portfolio management of software projects. Discuss with examples.
13. Illustrate SRUM in details

OR

14. Describe COCOMO model with appropriate data.
15. Discuss the steps in project scheduling.

OR

16. Explain resource allocation and cost scheduling in software projects.
17. Illustrate the salient features of fixed price and time and material contract models

OR

18. Elaborate on the procedure of change control
19. Discuss in detail about the team structures

OR

20. Explain the Oldham-Hackman job characteristic model.

Syllabus

Module 1: Project Planning (8 hrs)
Introduction to Software Project Management, Management tasks
Module 2: Project Cost Estimation (10 hrs)
Software process and Process Models, Cost Estimation
Module 3: Project Scheduling and Risk Management (11 hrs)
Project schedules, Critical Path Analysis, Risk identification
Module 4: Project Management And Control (9 hrs)
Framework for Management and control, Analysis and Project tracking
Module 5: Project Staffing (7 hrs)
Managing people, methods of staff selection, Team structures

Text Books

T1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Sixth Edition, Tata McGraw Hill, New Delhi, 2017

Reference Books

R1.Roger S. Pressman, Software Engineering: A practitioner's approach, 8th Edition (Indian Edition), McGraw Hill. 2019

R2.Harold Kerzner,Program Management-A System Approach Planning Scheduling And Controlling, 12th Edition, Wiley, 2017.

R3.Sunitha E.V, Sarath K.S, Software Project Management, Jyothis Publishers 2019.

R4.Jack Marchewka, Information Technology Project Management 5th edition. John Wiley & Sons (2012). ISBN: 978-1-118-91101-3. 2016.

Course Contents and Lecture Schedule

Sl. No	**Module 1: Project Planning**	**8hrs**
1.1	Introduction to Software Project Management – importance, Activities, Methodologies – types of Software Projects – Setting objectives.	2
1.2	Management Principles – Management Control – Project portfolio Management	2
1.3	Cost-benefit evaluation technology – Risk evaluation	2
1.4	Strategic program Management – Stepwise Project Planning.	2
	Module 2 Project Cost Estimation	**10 hrs**
2.1	Software process and Process Models – Rapid Application development – Agile methods	3
2.2	Extreme Programming – SCRUM – Managing interactive processes.	2
2.3	Basics of cost estimation – Effort and Cost estimation techniques – LOC, FP, COSMIC Full function points	3
2.4	COCOMO models - A Parametric Productivity Model.	2
	Module 3: Project Scheduling and Risk Management	**11 hrs**
3.1	Objectives of Activity planning – Project schedules – Activities	1
3.2	Sequencing and scheduling –Network Planning models – Forward Pass & Backward Pass techniques – Critical path (CRM) method.	3
3.3	Risk identification – Assessment – Monitoring – PERT technique	2
3.4	Monte Carlo simulation –Resource Allocation	2
3.5	Creation of critical patterns – Cost schedules.	3

	Module 4: Project Management And Control	**9hrs**
4.1	Framework for Management and control – Collection of data.	2
4.2	Project termination – Visualizing progress – Cost monitoring	2
4.3	Earned Value Analysis- Project tracking	2
4.4	Change control - Software Configuration Management	2
4.5	Managing contracts	1
	Module 5: Project Staffing	**7 hrs**
5.1	Managing people – Organizational behavior	1
5.2	Methods of staff selection – Motivation – The Oldham-Hackman job characteristic model	3
5.3	Ethical and Programmed concerns – Working in teams – Decision making – Team structures – Virtual teams – Communications genres – Communication plans.	3

SEMESTER –IV

HONOURS

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
ITT292	MATHEMATICAL FOUNDATION FOR NETWORKING	VAC	3	1	0	4

Preamble: The course is intended to provide the concepts of random variable, random processes and probability distribution. It also covers the basics of queuing theory and linear programming techniques.

Prerequisite: Background in calculus and linear algebra.

Course Outcomes: After the completion of the course the student will be able to

	Course outcomes	Bloom's Category
CO 1	Express linear programming and apply simplex method linear programming problem	Apply
CO 2	Apply sensitivity analysis on LPP and solve transportation problems	Apply
CO 3	Summarize the characteristics of random processes and demonstrate the applications of Poisson processes.	Understand
CO 4	Compare and Contrast the various queuing models	Understand
CO 5	Apply the queuing theory on different applications	Apply

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	3	2	-	-	1	-	1	-	1	3
CO 2	3	3	3	2	-	-	1	-	1	-	1	2
CO 3	3	3	3	2	-	-	1	-	1	-	1	2
CO 4	3	3	3	2	-	-	1	-	1	-	1	2
CO 5	3	3	3	2	-	-	1	-	1	-	1	3

3/2/1: high/medium/low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember	20	20	20
Understand	20	20	70
Apply	10	10	10
Analyse			
Evaluate			
Create			

Mark distribution

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 10marks
Continuous Assessment Test(2numbers) : 25 marks
Assignment/Quiz/Course project : 15marks

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contain 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 14 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

A progressive university has decided to keep its library open round the clock and gathered that the following numbers of attendants are required to re-shelve thebooks:

Time of day (hours)	Minimum number of attendants required
0–4	4
4–8	7
8–12	8
12–16	9
16–20	14
20–24	3

If each attendant works eight consecutive hours per day, formulate the problem of finding the minimum number of attendants necessary to satisfy the requirements above as a LP problem.

Course Outcome 2 (CO2)

Find the solution of the following problem using Karmarkar's method:

Minimize $f = 2x_1 + x_2 - x_3$

subject to:

$x_2 - x_3 = 0$

$x_1 + x_2 + x_3 = 1$

$x_i \geq 0,\ i = 1, 2, 3$

Course Outcome 3(CO3):

Cars arrive at a gas station according to a Poisson process at an average rate of 12 cars per hour. The station has only one attendant. If the attendant decides to take a 2-minute coffee break when there are no cars at the station, what is the probability that one or more cars will be waiting when he comes back from the break, given that any car that arrives when he is on coffee break waits for him to get back?

Course Outcome 4 (CO4):

Consider an airport runway for arrivals only. Arriving aircraft join a single queue for the runway. Where, the service time is exponentially distributed with a rate μ = 27 arrivals / hour . And the Poisson arrivals with a rate λ = 20 arrivals / hour.

i. What will be the quantities of the queuing system?

ii. Suppose we are in holidays and the arrival rate increases λ = 25 arrivals / hour How will the quantities of the queuing system change?

iii. Now suppose we have a bad weather and the service rate decreases μ = 22arrivals / hour ‰ How will the quantities of the queuing system change?

Course Outcome 5 (CO5):

Consider a steady state open network with three exponential nodes with parameters (μ1, μ2, μ3) and Poisson arrivals to node 1. Customers follow one of two routes through the network: node1 to node2(with probability p) and3 (to node 2 with probability q=1-p).Write down the arrival rates λi at node i (i=1, 2, 3). Use Little's theorem and Jackson's theorem to obtain the mean waiting time spent by a customer in the network and show that if μ2= μ3, this is least when p = q=1/2.

Model Question paper

Course Code: ITT292

Course Name: MATHEMATICAL FOUNDATION FOR NETWORKING

Max.Marks:100 **Duration: 3Hours**

PART A

Answer all Questions. Each question carries 3 Marks

1. How do you solve a maximization problem as a minimization problem?
2. How many basic solutions can an LP problem have ?Why?

3. State the following LP problem in standard form:

$$\text{Maximize } f = -2x_1 - x_2 + 5x_3$$

subject to

$$x_1 - 2x_2 + x_3 \leq 8$$
$$3x_1 - 2x_2 \geq -18$$
$$2x_1 + x_2 - 2x_3 \leq -4$$

4. Write the dual of the following linear programming problem:

$$\text{Maximize } f = 50x_1 + 100x_2$$

subject to

$$2x_1 + x_2 \leq 1250$$
$$2x_1 + 5x_2 \leq 1000$$
$$2x_1 + 3x_2 \leq 900$$
$$x_2 \leq 150$$

where

$$x_1 \geq 0 \text{ and } x_2 \geq 0$$

5. University buses arrive at the Students' Centre to take students to their classes according to a Poisson process with an average rate of 5 buses per hour. Chris just missed the last bus. What is the probability that he waits more than 20 minutes before boarding a bus?

6. Calculate the autocorrelation function of the periodic function $X(t) = A\sin(\omega t + \varphi)$, where the period $T = 2\varphi/\omega$, and A, φ, and ω are constants.

7. Prove that the exponential distribution has both the lack of memory and the minimum property.

8. A monitor on a disk server showed that the average time to satisfy an I/O request was 100 milliseconds. The I/O rate was about 100 requests per second. What was the mean number of requests at the disk server?

9. Draw the state transition rate diagram of an M/M/C queueing model.

10. What do you mean by balking and reneging?

PART B

Answer any one Question from each module. Each question carries 14 Marks

11. a. Find the solution of the following LP problem graphically: **(7Marks)**

$$\text{Minimize } f = 3x_1 + 2x_2$$

subject to

$$8x_1 + x_2 \geq 8$$
$$2x_1 + x_2 \geq 6$$
$$x_1 + 3x_2 \geq 6$$
$$x_1 + 6x_2 \geq 8$$
$$x_1 \geq 0, x_2 \geq 0$$

b. Prove that the feasible region of a linear programming problem is convex. **(7 Marks)**

OR

12. A manufacturer produces three machine parts, A, B, and C. The raw material costs of parts A, B, and C are \$5, \$10, and \$15 per unit, and the corresponding prices of the finished parts are \$50, \$75, and \$100 per unit. Part A requires turning and drilling operations, while part B needs milling and drilling operations. Part C requires turning and

milling operations. The number of parts that can be produced on various machines per day and the daily costs of running the machines are given below:

Machine part	Number of parts that can be produced on		
	Turning lathes	Drilling machines	Milling machines
A	15	15	
B		20	30
C	25		10
Cost of running the machines per day	$250	$200	$300

Formulate the problem of maximizing the profit. **(14Marks)**

13. A metallurgical company produces four products, A, B,C, and D, by using copper and zinc as basic materials. The material requirements and the profit per unit of each of the four products, and the maximum quantities of copper and zinc available are given below:

	Product				Maximum quantity available
	A	*B*	*C*	*D*	
Copper (lb)	4	9	7	10	6000
Zinc (lb)	2	1	3	20	4000
Profit per unit ($)	15	25	20	60	

a. Find the number of units of the various products to be produced for maximizing the profit.
b. Find the effect of changing the profit per unit of product D to$30.
c. Find the effect of changing the available quantities of copper and zinc to 4000 and 6000 lb ,respectively.
d. If product C requires 5 lb of copper and 4 lb of zinc (instead of 7 lb of copper and 3 lb of zinc) per unit, find the change in the optimum solution.

(14Marks)

OR

14. The Childfair Company has three plants producing child push chairs that are to be shipped to four distribution centers. Plants A, B, and C produce 12, 17, and 11 shipments per month, respectively. Each distribution center needs to receive 10 shipments per month. The distance from each plant to the respective distributing centers is given below:

	Distance			
	Distribution Centres			
	1	2	3	4

Plants	A	80 KM	130 KM	40 KM	70 KM
	B	110 KM	140 KM	60 KM	100 KM
	C	60 KM	120 KM	80 KM	90 KM

The freight cost for each shipment is Rs.100 per Kilometer. How much should be shipped from each plant to each of the distribution centers to minimize the total shipping cost?

a. Formulate this problem as a transportation problem by constructing the appropriate parameter table.
b. Draw the network representation of this problem.
c. Obtain an optimal solution.

(14 Marks)

15. Alan is conducting an experiment to test the mean lifetimes of two sets of electric bulbs labelled A and B. The manufacturer claims that the mean lifetime of bulbs in set A is 200 hours, while the mean lifetime of the bulbs in set B is 400 hours. The lifetimes for both sets are exponentially distributed. Alan's experimental procedure is as follows: He started with one bulb from each set. As soon as a bulb from a given set fails (or burns out), he immediately replaces it with a new bulb from the same set and writes down the lifetime of the burnt-out bulb. Thus, at any point in time he has two bulbs on, one from each set. If at the end of the week Alan tells you that 8 bulbs have failed, determine the following:

b. The probability that exactly 5 of those 8 bulbs are from set B.
c. The probability that no bulb will fail in the first 100hours.
d. The mean time between two consecutive bulb failures. **(14Marks)**

OR

16. Two random processes X(t) and Y(t) are defined as follows: **(14Marks)**

$$X(t) = A\cos(\omega 1 t + \Theta)$$
$$Y(t) = B\sin(\omega 2 t + \Phi)$$

where $\omega 1$, $\omega 2$, A, and B are constants, and Θ and Φ are statistically independent random variables, each of which is uniformly distributed between 0 and 2π.

a. Find the cross correlation function $R_{XY}(t, t + \tau)$, and show that X(t) and Y(t) are jointly wide-sense stationary.
b. If $\Theta = \Phi$, show that X(t) and Y(t) are not jointly wide-sense stationary.
c. If $\Theta = \Phi$, under what condition are X(t) and Y(t) jointly wide-sense stationary?

17. a. An airport has a single runway. Airplanes have been found to arrive at the rate of 15 per hour. It is estimated that each landing takes 3 minutes. Assuming a Poisson process for arrivals and an exponential distribution for landing times. Find the expected number of airplanes waiting to land and expected waiting time. What is the probability that the waiting will be more than5minutes? **(6marks)**

b. Explain Markovian Birth Death process and obtain the expressions for steady state probabilities. **(8marks)**

OR

18. a. A tax consulting firm has 3 counters in its office to receive people who have problems concerning their income, wealth and sales taxes. On the averages 48 persons arrive in an 8 hr day. Each tax advisor spends 15 mins on the average on an arrival. If the arrivals are Poisson distributed and service times are according to exponential distribution, find (i) the average number of customers in the system. (ii) the average number of customers waiting to be serviced. (iii) the average time a customer spends in the system. **(6marks)**

b. Derive Erlang B formula. **(8marks)**

19. a. What is Pollaczek-Khinchin formula? Derive the expression. **(8marks)**

b. Consider a closed Jackson network where the service time at each queue is independent of the number of customers at the queue. Suppose that for a given number of customers, the utilization factor of one of the queues, say queue I, is strictly larger than the utilization factors of the other queues. Show that as the number of customers increases, the proportion of time that a customer spends in queue I approaches unity. **(6marks)**

OR

20. a. State and prove Jackson's theorem. (**8marks)**

b. Write short notes on closed Jackson networks and cyclic queues. (**6marks)**

Syllabus

Module 1: 9 hours
(Text-1: Relevant topics from chapter-3) Linear Programming I: Simplex Method – Applications of Linear Programming – Standard Form of a Linear Programming Problem – Geometry of Linear Programming Problems– Definitions and Theorems – Solution of a System of Linear Simultaneous Equations – Pivotal Reduction of a General System of Equations – Identifying an Optimal Point – Improving a Nonoptimal Basic Feasible Solution – Two Phases of the Simplex Method
Module 2 : 10 hours
(Text-1: Relevant topics from chapter-4) Linear Programming II: Duality in Linear Programming – Symmetric Primal–Dual Relations – General Primal–Dual Relations – Primal–Dual Relations When the Primal Is in Standard Form – Duality Theorems – Dual Simplex Method – Sensitivity or Postoptimality Analysis – Changes in the Right-Hand-Side Constants b_i – Changes in the Cost Coefficients c_j – Addition of New Variables – Changes in the Constraint Coefficients a_{ij} – Transportation Problem – Karmarkar's Interior Method – Statement of the Problem – Conversion of an LP Problem into the RequiredForm.
Module 3: 9 hours
(Text-2: Relevant topics from sections-8.1-8.5, 8.7, 10.5)

Random processes and classification, mean and autocorrelation, wide sense stationary (WSS) processes, autocorrelation and power spectral density of WSS processes and their properties, Poisson process-distribution of inter-arrival times, combination of independent Poisson processes(merging) and subdivision (splitting) of Poisson processes (results without proof)
Module 4: 9 hours
(Text-3: Chapter 1, Chapter 2 – Section 2.1 to 2.7) Introduction - Measures of System Performance, Characteristics of Queueing Systems, Little's Law, Some General Results. Stochastic Processes - Poisson Process, Exponential Distribution, Discrete Time Markov Chains, Continuous Time Markov Chains. Simple Markovian Queueing Models - Birth-Death Processes - Single-Server Queues (M/M/1) – Multi server Queues (M/M/c) - Choosing the Number of Servers, Queues with truncation (M/M/c/K), Erlang's loss formula (M/M/c/c), Queues with unlimited service
Module 5 : 8 hours
(Text-3: Chapter 2- Section 2.8 to 2.12, Chapter 4- Section 4.1 to 4.4) **(M/G/1 Queue – Text-4 : Chapter 3, Section 3.5)** Finite Source Queues, State Dependent Service, Queues with Impatience, Transient Period, Busy Period Analysis, M/G/1 Queue, Series Queues, Open Jackson Networks, Closed Jackson Networks, Cyclic Queues

Text Books

1. Singiresu S. Rao, "Engineering Optimization: Theory and Practice, 4th Edition", Wiley 2009
2. Oliver C. Ibe, "Fundamentals of Applied Probability and Random Processes (Second Edition)", Academic Press,2014
3. John F. Shortle, James M. Thompson, Donald Gross, Carl M. Harris, "Fundamentals of Queueing Theory, 5th Edition", Wiley2018
4. Dimitri P. Bertsekas and Robert G. Gallager, "Data Networks," (2nd edition) Prentice Hall, 1992, ISBN0132009161

Reference Books

1. Geoffrey R. Grimmett, David R. Stirzaker, Probability and Random Processes, Oxford University Press, USA; 3 edition,2001.
2. Douglas C. Montgomery and George C. Runger, Applied Statistics and Probability for Engineers, Wiley,2006.

3. Hamdy A. Taha, "Operations Research: An Introduction", 8th Edition, Pearson Education (2008).

4. G. V. Reklaitis, A. Ravindran, K. M. Ragsdell, "Engineering Optimization: Methods and Applications", Wiley(2006).

5. Leonard Kleinrock, "Queueing Systems. Volume 1: Theory", Wiley-Interscience,1975.

6. Leonard Kleinrock, "Computer Applications, Volume 2, Queueing Systems", Wiley-Interscience.1975.

7. Karlin, K. and Taylor, H. M.," A First Course in Stochastic Processes", Academic Press. 1975

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**MODULE 1**	**9 hours**
1.1	Linear Programming I: Simplex Method – Applications of Linear Programming – Standard Form of a Linear Programming Problem	2 Hrs
1.2	– Geometry of Linear Programming Problems– Definitions and Theorems	2 Hrs
1.3	Solution of a System of Linear Simultaneous Equations –Pivotal Reduction of a General System of Equations	2 Hrs
1.4	Identifying an Optimal Point	1 Hrs
1.5	Improving a Nonoptimal Basic Feasible Solution – Two Phases of the Simplex Method	2Hrs
2	**MODULE 2**	**10 hours**
2.1	Duality in Linear Programming – Symmetric Primal–Dual Relations – General Primal–Dual Relations – Primal–Dual Relations When the Primal Is in Standard Form – Duality Theorems – Dual Simplex Method	3 Hrs
2.2	Sensitivity or Postoptimality Analysis – Changes in the Right-Hand-Side Constants b_i – Changes in the Cost Coefficients c_j – Addition of New Variables – Changes in the Constraint Coefficients a_{ij}	3 Hrs
2.3	Transportation Problem – Karmarkar's Interior Method – Statement of the Problem–Conversion of an LP Problem into the Required Form	4 Hrs
3	**MODULE 3**	**9 hours**
3.1	Random processes and classification, mean and autocorrelation,	3 Hrs

3.2	wide sense stationary (WSS) processes, autocorrelation and power spectral density of WSS processes and their properties,	3 Hrs
3.3	Poisson process-distribution of inter-arrival times, combination of independent Poisson processes(merging) and subdivision (splitting) of Poisson processes (results without proof)	3 Hrs
4	**MODULE 4**	**9 hours**
4.1	Introduction - Measures of System Performance, Characteristics of Queueing Systems, Little's Law, Some General Results.	2 Hrs
4.2	Stochastic Processes - Poisson Process, Exponential Distribution, Discrete Time Markov Chains, Continuous Time Markov Chains.	3 Hr
4.3	Simple Markovian Queueing Models - Birth-Death Processes - Single-Server Queues (M/M/1) – Multi server Queues (M/M/c) -	2 Hrs
4.4	Choosing the Number of Servers, Queues with truncation (M/M/c/K), Erlang's loss formula (M/M/c/c), Queues with unlimited service	2 Hrs
5	**MODULE 5**	**8 hours**
5.1	Finite Source Queues, State Dependent Service	2 Hr
5.2	Queues with Impatience, Transient Period, Busy Period Analysis	3 Hr
5.3	M/G/1 Queue, Series Queues, Open Jackson Networks, Closed Jackson Networks, Cyclic Queues	3 Hrs

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
ITT294	NUMBER THEORY	VAC	3	1	0	4

Preamble:

Number theory doesn‟t suffer too much abstraction and the consequent difficulty in conceptual understanding. Hence it is an ideal topic which acts like an essential bridge or tool from Mathematics to Information Technology. Important topics such as congruence, divisibility, Chinese remainder theorem, Classical results in Number theory, Application to ciphers are included in this course. Enthusiastic students will be able to acquire knowledge to read and enjoy their own more applications of Number theory.

Prerequisite: Linear Algebra and Calculus

Course Outcomes: After the completion of the course the student will be able to

CO No	Course Outcome(CO)	Bloom's Category
CO 1	Examine results involving divisibility, greatest common divisor, Least Common multiple and a few applications	Apply
CO 2	Demonstrate theory and methods to solve Linear Difference Equations	Understand
CO 3	Summarize theory of congruence	Understand
CO 4	Solve linear congruent equations	Apply
CO 5	Illustrate three classical theorems of Number theory and Apply number theory to ciphers.	Apply

Mapping of course outcomes with program outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	2	3	-	1	-	-	-	-	1	2
CO 2	3	3	2	2	-	1	2	-	-	-	1	2
CO 3	3	3	2	2	-	-	2	-	-	-	1	2
CO 4	2	2	2	2	-	1	-	-	-	-	1	2
CO 5	2	2	1	2	2	1	-	-	1	-	1	2

3/2/1: high/medium/low

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember	10	10	10
Understand	20	20	50
Apply	20	20	40

Mark distribution

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 10marks
Continuous Assessment Test(2numbers) : 25 marks
Assignment/Quiz/Course project : 15marks

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contain 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 14 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. State Division algorithm.

2. List the first 4 Catalan numbers.

3. Distinguish between Fibinacci and Fermat numbers.

Course Outcome 2 (CO2)

1. State Fundamental theorem of Arithmetic

2. What is 73 congruent modulo8.

3. State Chinese Remainder Theorem

Course Outcome 3(CO3):

1. State Fermat‟s little theorem
2. List first 3 Mersenne primes
3. Define Euler‟s Phi function

Course Outcome 4 (CO4):

1. Describe any two primality tests
2. Find primitive roots of23.
3. State Lagrange‟s theorem

Course Outcome 5(CO5):

1. Define Affine cipher
2. Define Hill ciphers
3. What is RSA cryptosystem.

Model Question paper

Course Code: IIT294

Course Name: NUMBERTHEORY

Max.Marks:100 **Duration: 3Hours**

PART A

Answer all questions. Each question carries 3marks

1. Define polygonal numbers with examples using recurrence relation.
2. Express 3ABCsixteen in base ten.
3. Prove that any two consecutive Fibanacci numbers are relatively prime.
4. Evaluate (2076;1776).
5. State Fermat‟s Little theorem.
6. Compute $\sum_{d|n} \varphi(d)$ for n =12.
7. Verify that 2 is a primitive root modulo9.
8. Explain perfect numbers and Mersenne primes with example
9. Using the exponentiation modulus p = 3037 and the enciphering key e = 31, encipher the message ‘ALL IS WELL ".
10. Briefly explain RSA-cryptosystem.

PART B

Answer one full question from each module. Each full question carries 14 marks

MODULE 1

11. (a) Find the number of positive integer less than 3076 which are

(i) Divisibleby19 (ii) Not divisibleby24 (iii) Divisible by17

(b) Prove that there are infinitely many primes

12. (a) Find a formula for $\sum_{i=1}^{n} F_i$

(b) Show that $641 \mid f_5$

MODULE 2

13. (a) Find the number of trailing zeros in234!

(b) Solve $12x \equiv 18 (\text{mod} 15)$

14. (a) Solve for x such that $x \equiv 1 (\text{mod}\, 3)$; $x \equiv 4 (\text{mod} 5)$; $x \equiv 6 (\text{mod} 7)$

(b) Find the canonical decomposition and positive factors of 2520

MODULE 3

15. (a) State and prove Wilson‟s theorem

(b) Determine if there exist a positive integer f(m) such that $a^{f(m)} \equiv 1 (\text{mod}\ m)$ for $m = 12$.

16. (a) Find the number of positive integers less than 500 and relative prime to 500. Also find the number and sum of positive divisors of500.

(b) Find the reminder when 24^{1947} is divided by 17.

MODULE 4

17. (a) Compute$\text{ord}_{21}5$

(b) Find the incongruent primitive roots modulo 19.

18. (a)StateLucas‟theoremandverifythat823isaprimeusingLucas‟theorem.(Takex=2)

(b) Solve $8x^5 \equiv 3 (\text{mod} 13)$

MODULE 5

19. (a) Using the matrix A = $A = \begin{bmatrix} 3 & 2 & 6 \\ 5 & 7 & 11 \\ 13 & 4 & 11 \end{bmatrix}$, encrypt the English proverb “A PROVERB IS THE CHILD OF EXPERIENCE ”.

(b) Using the RSA enciphering modulus n = 2773 and the enciphering key e = 21, encrypt the message “SILENCE IS GOLDEN”.

20. (a) Decrypt the cipher text message 0010 0325 2015 2693 2113 2398 2031 1857 that was created using the RSA enciphering key (e; n) = (21;2773).

(b) Draw a block diagram for conventional cryptosystem and explain the terms.

Syllabus

Module 1 (9 hours)
Polygonal numbers – Pyramidal numbers – Catalan numbers – Division algorithm – Base b representations – Number patterns – Prime and composite numbers – Fibonacci and Lucas numbers – Fermat numbers
Module 2 (9 hours)
Greatest common divisor – Euclidean algorithm – Fundamental theorem of arithmetic – Least common multiple – Linear Diaophantine Equations – Congruences – Linear congruences – divisibility tests – Modular designs – Check digits – Chinese remainder theorem – General Linear systems - 2×2 Linear systems
Module 3 (11 hours)
Wilson‟stheorem–Fermat‟slittletheorem–Euler‟stheorem–Euler‟sPhifunction–Tau and Sigma function – Perfect numbers – Mersenne Primes
Module 4 (8 hours)
Order of a positive integer – Primality tests – Primitive roots of primes – Composites with primitive roots – The algebra of indices
Module 5 (8 hours)
Affine ciphers - Hill ciphers - Exponentiation ciphers – RSA Crypto system

Text Book

1. Thomas Koshy , “Elementary Number Theory with Applications (2/e)”, Elsever Academic Press, 2007, ISBN: 978-0-12-372487-8.

Reference Books

1. David M Burton, “Elementary Number Theory (7/e)”, McGraw Hill, 2011, ISBN : 978-0-07-338314-9

2. Gareth A Jones and J Mary Jones , “Elementary Number Theory”, Springer Undergraduate Mathematics series, 1998, ISBN :978-3-540-76197-6

3. Kenneth H Rosen, “Elementary Number Theory” (6/e)”, Pearson Education, 2018, ISBN: 9780134310053

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Module 1**	**9 Hours**
1.1	Polygonal numbers – Pyramidal numbers	1
1.2	Catalan numbers	1
1.3	Division algorithm	1
1.4	Base b representations – Number patterns	1
1.5	Prime and composite numbers	1
1.6	Fibonacci and Lucas numbers	3
1.7	Fermat numbers	1
2	**Module 2**	**9 Hours**
2.1	Greatest common divisor – Euclidean algorithm	1
2.2	Fundamental theorem of arithmetic - Least common multiple	1
2.3	Linear Diaophantine Equations	1
2.4	Congruences – Linear congruences	2
2.5	divisibility tests – Modular designs – Check digits	1
2.6	Chinese remainder theorem	2
2.7	General Linear systems - 2×2 Linear systems	1
3	**Module 3**	**11 Hours**
3.1	Wilson‟s theorem – Fermat‟s little theorem	4
3.2	Euler‟s theorem – Euler‟s Phi function	4
3.3	Tau and Sigma function	2
3.4	Perfect numbers – Mersenne Primes	1
4	**Module 4**	**8 Hours**
4.1	Order of a positive integer	2
4.2	Primality tests	3
4.3	Primitive roots of primes – Composites with primitive roots	2
4.4	The algebra of indices	1
5	**Module 5**	**8 Hours**
5.1	Affine ciphers	2
5.2	Hill ciphers	2
5.3	Exponentiation ciphers	2
5.4	RSA Crypto system	2

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
ITT296	MICROPROCESSOR AND MICROCONTROLLER PROGRAMMING	VAC	2	1	1	4

Preamble: Microprocessor and Micro controller programming course is intended to deliver students the concepts of Microprocessors and Micro-controllers. It also helps them to learn how to write an 8051 program assembly language and also in C programming language. Introduction to Interfacing of micro-controllers, its use and applications are also covered in the syllabus.

Prerequisite: C programming

Course Outcomes: After the completion of the course the student will be able to

CO No	Course Outcome(CO)	Bloom's Category
-CO 1	Describe the basic architectures of microprocessor based systems	Understand
CO 2	Develop a simple assembly program for a 8086 microprocessor	Apply
CO 3	Design a basic 8051 program in Assembly language	Apply
CO 4	Simulate assembly programs using simulation tools and design 8051 programs in C programming language	Apply
CO 5	Utilize various interfacing techniques of micro-controllers	Apply

Mapping of course outcomes with program outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	1	-
CO2	3	3	3	-	2	-	-	-	-	-	1	3
CO3	3	3	3	-	2	-	-	-	-	-	1	3
CO4	3	3	3	-	3	-	-	-	-	-	1	3
CO5	3	-	-	-	3	3	-	-	3	2	3	3

3/2/1: High/Medium/Low

Assessment Pattern

Bloom's Category	**Continuous Assessment Test**		**End Semester Examination**
	1	**2**	
Remember	**15**	**15**	**30**
Understand	**15**	**15**	**30**
Apply	**20**	**20**	**40**
Analyse			
Evaluate			
Create			

Mark distribution

Total Marks	**CIE**	**ESE**	**ESE Duration**
150	50	100	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 10marks
Continuous Assessment Test (2 numbers) : 25 marks
Assignment/Quiz/Course project : 15marks

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contain 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 14 marks.

Sample Course Level Assessment Questions

Course Outcome 1 (CO1):
1. Differentiate CISC and RISC processors
2. With the help of an example show the set and reset conditions of CY, AC and P flag of 8051 microcontroller

Course Outcome 2 (CO2):
1. Write an 8086 program to sort N numbers.

2. Write an 8086 program to find the sum of N numbers

Course Outcome 3 (CO3):

1. Write an 8051 program to find the factorial of a given number.
2.Write an 8051 assembly code to generate look up table for Fibonacci numbers.

Course Outcome 4 (CO4):

1. Write an 8051 C program to toggle bits of P1 ports continuously with 250ms.
2. Write an 8051 C program to convert 11111101(FDH) to decimal and display the digits on port p0, p1 andp2.

Course Outcome 5 (CO5):

1. Explain the function of pins of 9 pin RS 232connector
2. Illustrate different modes of operations of 8255 with respect to control words.

Model Question Paper

PARTA (10*3=30)

(Each question carries 3 Marks)

1.Compare microprocessor, microcomputer and micro-controller

2.Differentiate PIC and AVR Micro-controllers

3.List the instructions which are used for memory operation in 8088microprocessor.

4.Explain the purpose of the following signals in8086

(i) READY (ii)HOLD

5.Write a program to do data conversions from HEX to ASCII in 8051 assembly code.

6.Explain MOV, MOVC, MOVX instructions of 8051Micro-controller.

7. Discuss any three data types of 8051C.

8. Illustrate with an example how arrays are used in 8051 C programs.

9.Describe different modes of operation of the following peripheral ICs:

i)8255 ii)8257

10.Write the Control Word Format in8255.

PARTB (5*14=70)

(Each full question carries 14 marks)

11. a) Explain Van Neumann and Harvard Architecture. (6marks)

b) Draw the memory map and briefly explain the memory organization for 128 byte internal RAM of8051micro-controller. (8 marks)

OR

12.a) Explain the functions of ports in 8051 micro-controller. How can P1 be used as both output and input port? (5marks)

b) Draw the pin diagram of 8051 micro-controller and explain the function of each pin.(9 marks)

13. a) Compare the architectural features of 8086 and8088processors. (7marks)

b) An array of 10 numbers is stored in the internal data RAM starting from location 30 H. Write an assembly language program to sort the array in ascending order starting from location40H. (7marks)

OR

14. a) Draw the architectural diagram of 8086 microprocessor and explain. (9marks)

b) Write an assembly program to add N numbers. (5marks)

15. a) Assuming crystal frequency of 11.0592 MHz, write an 8051 assembly program to generate a square wave of 50Hz frequency on pin P2.0 of 8051Micro-controller.
[Hint: Interfacing is not to be considered here for generating squarewave] (6marks)

b) Discuss the addressing modes of 8051Instructionset. (8marks)

OR

16. a) Write an 8051 based assembly language program to perform addition of two 2x2matrices. (7 marks)

b) Write an 8051 based assembly language program to covert a hexadecimal number to a BCD. Number. (7marks)

17. a) Write an 8051 C program to generate the 500us time delay using T1M2(timer1 andmode2). (7 marks)

b) Write an 8051 C program to read the P1.0 and P1.1 bits and then issue an ASCII character to P0 based on the following conditions. That is if the data from P1.1 and P1.0 is 00, send '0' if 01 send '1', if 10 send'2'. (7 marks)

OR

18. a) Write an 8051 C to get a byte of data from port P0. If the data is greater than 100 send it to P1 otherwise send ittoP2. (7 marks)

b) Write an 8051 C program to toggle all the bits of P0, PI, and P2 continuously with a 250 ms delay.' Use the sfr keyword to declare the port addresses. (7 marks)

19. a) Explain the architecture of programmable interruptcontroller8259. (7 marks)

b)Explain the interfacing of 8 bit ADC using8051 micro-controller. (7marks)

OR

20. a) Explain Keyboard Displaycontroller8279. (5marks)

b) Give the advantage of using 8279 for keyboard/display interface? What are scan lines used for? Explain (i) Encoded Scan Mode and (ii) Decoded scan mode. (9 marks)

Syllabus

Module 1:(8 hours)
Microprocessor Based Systems: Digital Computer, Microprocessor, Microcomputer, Micro-controller, Van Neumann and Harvard Architecture, CISC and RISC Processors; **Micro-controllers:** Historical background; organization and architectural features of micro-controller 8051 ,Introduction to AVR and PIC micro-controllers
Module 2:(10 hours)
Organization and architectural features of microprocessor 8086,Introduction to 8088 microprocessors, **Introduction of assembly language program-**Complete 8086 instruction set and Basic programs in assembly language for 8086 should be covered & asked in the exam.
Module 3:(9 hours)
8051 programming in Assembly language : Introduction to instruction set: instruction format, addressing modes of 8051, Data transfer instructions, I/O Port programming, Arithmetic and Logical instructions, Bit level instructions, Branching instructions , Concept of stack, subroutine and related instructions, writing programs (like time delay using loop, data conversions HEX to ASCII, BCD to ASCII, use of look up table etc) in assembly language 8051
Module 4:(10 hours)
Introduction to Program Development Environment (IDE)Tools: Introduction to a simulator: Edge Simulator- Edsim - Programming &Testing using IDE. **8051 Programming in C:**Data types, programming for time delay, I/O programming, Logic operations, Control statements and loops, Functions and Arrays in embedded C, Data conversion programs in 8051 C, Accessing code of ROM space & Data serialization using 8051C.
Module 5:(8 hours)

Interfacing of micro-controllers: Interfacing of memory devices-data transfer techniques and I./O ports(8255);keyboard and display devices(8279)-programmable interrupt and DMA controllers(8257)-sensors, transducers, actuators, A/D and D/ A Converters-standard interfaces-RS232,USB,Simple interfacing programs using 8051-(Group Mini projects can be given. Can be evaluated as Assignments. Interfacing programs need not be asked for exams)

Text Books

1. R. Gaonkar, Microprocessor Architecture, Programming, and Applications with the 8085, 6/e,Penram International Publishers.
2. A. Pal, Microprocessors: Principles and Applications, 1990,TataMcGraw-Hill.
3. K. J. Ayala, The 8051 Microcontroller Architecture, Programming and Applications, 2/e, Penram International Publishers.
4. Mazidi ,Mazidi, McKinlay, Microcontroller and Embedded Systems, 2/e, Pearson Education.
5. R. Kapadia, 8051 Microcontroller and Embedded Systems, 1/e, Jaico Publishing House.
6. Abubeker K M, 80C51 μC - Embedded C & ALP Programming-ISBN-978-1648921216, Notionpress publications, Singapore, 2020 , first edition.

Course Content and Course Schedule

Module 1: Microprocessor Based Systems and Micro controllers		**8 hours**
1.1	Introduction to Digital Computer and Microprocessor	1 hour
1.2	Introduction to Microcomputer, Micro-controller	1 hour
1.3	Introduction to Van Neumann and Harvard Architecture	1 hour
1.4	Introduction to CISC and RISC Processors,	1 hour
1.5	Micro-controllers: Historical background	1 hour
1.6	Architecture of micro-controller 8051	1 hour
1.7	Register and memory organization of 8051	1 hour

1.8	Introduction to AVR, PIC and ARM micro controllers	1 hour
Module 2: Architecture of 8086 & Introduction of assembly language program		**10 hours**
2.1	Architecture of microprocessor8086	1 hour
2.2	Memory Organization of 8086	1 hour
2.3	Introduction to 8088 microprocessor	1 hour
2.4	Introduction of assembly language program	1 hour
2.5	Instruction Types and Addressing modes	1 hour
2.6	Data transfer instructions, I/O Port programming, Arithmetic instructions	1 hour
2.7	Logical and Bit level instructions, Branching instructions	1 hour
2.8	Introducing Sample assembly language programs for 8086 (Square, Square Root & Cube Root of a Number, Factorial of an 8-bit Number, Generation of Fibonacci Series, HCF and LCM of Two Numbers, Bubble Sorting, Largest and Smallest Number of an Array, Code conversion – HEX to Decimal & ASCII to HEX, HEX to ASCII, BCD to ASCII and Matrix Addition. These programs can be done during tutorial/practical)	1 hour
2.9	Writing/Doing the above set of programs in assembly language for 8086 - Tutorial/Practical	1 hour
2.10	Writing/Doing the above set of programs in assembly language for 8086 - Tutorial/Practical	1 hour
Module 3: 8051 programming in Assembly language		**9 hours**
3.1	Introduction to instruction types and instruction format	1 hour
3.2	Introduction to Instruction sets and addressing modes of 8051	1 hour
3.3	Data transfer instructions, I/O Port programming, Arithmetic instructions	1 hour
3.4	Logical and Bit level instructions	1 hour
3.5	Branching instructions (Jump and loop Jump and call)	1 hour
3.6	Writing /Doing Programs in 8051-Tutorial/Practical	1 hour
3.7	Concept of stack, subroutine and related instructions	1 hour

3.8	Writing programs (like time delay using loop, data conversions HEX to ASCII, BCD to ASCII, use of look up table etc)in assembly language 8051	1 hour
3.9	Writing /Doing Programs in 8051-Tutorial/Practical	1 hour
Module 4: Introduction to Tools & 8051 Programming in C		**10hours**
4.1	Introduction to Program Development Tools (IDE): Concept of IDE, Editor, Assembler, Compiler, Linker, Simulator, Debugger and assembler directives.	1 hour
4.2	Introduction to a simulator: EdgeSimulator- Edsim - Programming using Simulator-Testing programs using IDE	1 hour
4.3	Writing /Doing Programs in 8051 using Tools -Practical in Lab	1 hour
4.4	8051 Programming in C: Data types in 8051 C	1 hour
4.5	Programming for time delay, I/O programming in 8051 C	1 hour
4.6	Logic operations in 8051 C, Control statements and loops in embedded C	1 hour
4.7	Doing Programs in 8051 using Tools - Practical in lab	1 hour
4.8	Functions and Arrays in embedded C, Data conversion programs in 8051 C	1 hour
4.9	Accessing code ROM space using 8051 C, Data serialization using 8051 C	1 hour
4.10	Doing Programs in 8051in C -Practical in lab	1 hour
Module 5: Interfacing of micro-controllers		**8 hours**
5.1	Introduction to Interfacing of micro-controllers: Use and Applications	1 hour
5.2	Interfacing of memory devices; data transfer techniques and I/O ports (8255)	1 hour
5.3	Interfacing of keyboard and display devices(8279)	1 hour
5.4	Programmable interrupt and DMA controllers (8257)	1 hour
5.5	Doing Interfacing programs in 8051 using Tools - Practical in lab	1 hour
5.6	Interfacing of sensors, transducers, actuators	1 hour
5.7	A/D and D/A Converters - standard interfaces - RS232, USB	1 hour
5.8	Doing Interfacing programs in 8051 using Tools - Practical in lab	1 hour