Jodhpur Institute of Engineering & Technology

Teaching Scheme

(An Autonomous Institute affiliated with Bikaner Technical University)

Teaching & Examination Scheme

B. Tech.: Computer Science & Engineering

2nd Year – III Semester

SN	Category	Course		Contact hrs /week			Marks			Cr
		Code	Title	L	T	P	IA	ETE	Total	
THEORY										
1	BSC	3CS2-01	Linear Algebra and Optimization	**3**	**1**	**0**	**60**	**140**	**200**	**4**
2	HSMC	3CS1-02	Managerial Economics and Financial Accounting	**2**	**0**	**0**	**30**	**70**	**100**	**2**
3	ESC	3CS3-03	Digital Logic and Design	**3**	**0**	**0**	**45**	**105**	**150**	**3**
4	PCC	3CS4-04	Data Structures and Algorithms	**2**	**1**	**0**	**45**	**105**	**150**	**3**
5	PCC	3CS4-05	Programming in Java	**2**	**1**	**0**	**45**	**105**	**150**	**3**
6	PCC	3CS4-06	Discrete Mathematical Structures	**3**	**0**	**0**	**45**	**105**	**150**	**3**
Sub Total				**15**	**3**	**0**	**270**	**630**	**900**	**18**
PRACTICAL & SESSIONAL										
7	PCC	3CS4-21	Data Structures and Algorithms Lab in Python	**0**	**0**	**3**	**45**	**30**	**75**	**1.5**
8	PCC	3CS4-22	Object Oriented Programming in Java Lab	**0**	**0**	**3**	**45**	**30**	**75**	**1.5**
9	PCC	3CS4-23	Digital Logic and Design Lab	**0**	**0**	**2**	**30**	**20**	**50**	**1**
10	PSIT	3CS7-30	Industrial Training	**0**	**0**	**2**	**0**	**0**	**50**	**1**
11	SODECA	3CS8-00	Social outreach Discipline & Extra-Curricular Activities						**25**	**0.5**
Sub Total				**0**	**0**	**10**	**120**	**80**	**275**	**5.5**
TOTAL OF III SEMESTER				**15**	**3**	**10**	**390**	**710**	**1175**	**23.5**

Mandatory Non Credit course

1	MNC	3CS-MC1	Business Studies	**2**	**0**	0	**0**	**0**	100	**0**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*
ETE: *End Term Exam,* ***IA:*** *Internal Assessment*

Jodhpur Institute of Engineering & Technology

Teaching Scheme

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III – Semester (Computer Science & Engineering)

3CS2-01 –Linear Algebra & Optimization

Credit: 4 **Max. Marks: 200 (IA: 60, ETE: 140)**

3 L+1T+ 0P **End Term Exam: 3 Hours**

Unit	CONTENTS	HOURS
1	Vector Space: Introduction, Linear independence and dependence of vectors, basis and dimension; Linear transformations (maps): range and kernel of a linear map, inverse of a linear transformation, composition of linear maps, Matrix associated with a linear map.	**7**
2	Inner product spaces, orthogonal sets & Bases, Gram-Schmidt Orthogonalization process, Bilinear and quadratic forms.	**6**
3	Historical development, Engineering Applications of Optimization, Formulation of Design Problems as a Mathematical Programming Problems, Classification of Optimization Problems.	**8**
4	Classical Optimization using Differential Calculus: Single Variable and Multivariable Optimization with & without Constraints, Langrangian theory, Kuhn Tucker conditions.	**7**
5	Linear Programming: Simplex method, Two Phase Method and Duality in Linear Programming. Application of Linear Programming: Transportation and Assignment Problems.	**12**
	Total	**40**

Suggested Text/Reference Books

1. Linear Algebra, Jim Heceron, Third Ed.,ebook
2. A First course in linear Algebra, Robert A.Beezer, Congrunet Press.
3. Linear Algebra – Schaum Outline series by Saymour Lipschutz, Marc Lipson
4. Linear Algebra & its Applications, Gilbert Strang, Fourth Edition.
5. Linear Algebra Hoffman Kunze, Second edition Prentice Hall, New Jersey 1971.
6. Advanced Engineering Mathematics, Irvin Kreyszig, Wiley (2010)

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III – Semester (Computer Science & Engineering)

3CS1-02: Managerial Economics and Financial Accounting

Credit-2 **Max. Marks : 100 (IA:30,ETE:70)**

2L+0T+0P **End Term Exam: 2 Hours**

UNIT	CONTENTS	HOURS
1	**Basic economic concepts**: Meaning, Definition of economics and managerial economics, deductive vs inductive methods, static and dynamics, nature and scope of managerial economics, Economic problems: scarcity and choice. **Demand and Supply analysis Demand**-types of demand, determinants of demand, demand function, elasticity of demand, demand forecasting –purpose, determinants and methods, Supply-determinants of supply, supply function, elasticity of supply.	4
2	Production Function- Short run- law of variable proportions, Production Function- Long run- Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, laws of returns to scale, . Cost concepts-explicit and implicit cost, fixed and variable cost, opportunity cost, sunk costs, cost function, cost curves, cost and output decisions, cost estimation. Revenue analysis. Break-even-point Analysis	5
3	Introduction ofSole Proprietorship, Partnership, Joint Stock Company- Private ltd. Company and Public ltd. Company, price and output determination in perfect competition, Monopoly, Monopolistic competition, Oligopoly.	5
4	Basic Accounting concepts- Meaning and definition of Accounting, Final Accounts Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments.	4
5	Capital budgeting- Meaning, definition, features of capital budgeting proposals, Techniques of Capital Budgeting: Payback Method, Accounting Rate of return (ARR) and Net Present Value Method (simple problems). Ratio analysis- Liquidity ratio and profitability ratio.	8
	TOTAL	**26**

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III – Semester (Computer Science & Engineering)

3CS3-03: Digital Logic Design

Credit-3 **Max. Marks : 150 (IA:45,ETE:105)**

3L+0T+0P **End Term Exam: 3 Hours**

Unit	CONTENTS	HOURS
1	**BINARY SYSTEMS AND LOGIC GATES**: Digital Systems, Binary Numbers, Number base conversions, Octal and Hexadecimal Numbers, Signed binary numbers, Binary codes, Binary logic. Digital logic gates, integrated circuits.	7
2	**BOOLEAN ALGEBRA AND GATE – LEVEL MINIMIZATION**: Basic Definitions, Basic theorems and properties of Boolean algebra, Boolean functions, four-variable map, five-variable map, product of sums simplification ,don't-care conditions, NAND and NOR implementation ,Hardware Description Language	7
3	**COMBINATIONAL LOGIC** : Combinational Circuits, Binary Adder-Subtractor, Decimal Adder, Binary multiplier, magnitude comparator, Decoders, Encoders, Multiplexers, HDL for combinational circuits.	6
4	**SEQUENTIAL LOGIC:** SYNCHRONOUS AND ASYNCHRONOUS, Sequential circuits , Asynchronous circuits, latches, Flip-Flops Analysis of clocked sequential circuits, , State Reduction and Assignment, Design Procedure. HDL for sequential circuits	8
5	**REGISTERS AND MEMORY DEVICES**: Registers shift Registers, Ripple counters, synchronous counters. Random-Access Memory, Memory Decoding, Read-only memory, Programmable Array logic, Sequential Programmable Devices. HDL for Registers and counters.	8
	TOTAL	36

Text / Reference Books:

1. Digital Logic and Computer Design , M. Morris Mano, Pearson Education, New Delhi, 2011.
2. Digital Principles and Application, Malvino and Leech, TMH Pub., New Delhi, 6 th Edition.
3. Fundamentals of Digital Circuits, A. Anand Kumar, PHI Learning, New Delhi, 2nd Edition.
4. Morden Digital Electronics ,Jain, R P, TMH Education , New Delhi, 3 rd Edition or latest.
5. Digital Electronics, Kharate G.K., OXFORD University Press, 2010
6. Switching and Logic Design, C.V.S. Rao, Pearson Education

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III Semester: (Computer Science and Engineering)

3CS4-04: Data Structures and Algorithms

Credit-3 **Max. Marks: 150 (IA:45, ETE:105)**

2L+1T+0P **End Term Exam: 3 Hours**

Unit	CONTENTS	HOURS
1	**Array and Classes, Stacks**: Basic Stack Operations, Representation of a Stack using Static Array and Dynamic Array, Multiple stack implementation using single array, Stack Applications: Reversing list, Factorial Calculation, Infix to postfix Transformation, Evaluating Arithmetic Expressions and Towers of Hanoi.	9
2	**Queues:** Basic Queue Operations, Representation of a Queue using array, Implementation of Queue Operations using Stack, Applications of Queues- Round Robin Algorithm. Circular Queues, DeQueue Priority Queues. **Linked Lists**: Introduction, singly linked list, representation of a linked list in memory, Different Operations on a Singly linked list, reversing a singly linked list, Advantages and disadvantages of singly linked list, circular linked list, doubly linked list and Header linked list.	9
3	**Searching Techniques**: Sequential and binary search. Sorting Techniques: Basic concepts, Sorting by: bubble sort, Insertion sort, selection sort, quick sort, heap sort, merge sort, radix sort and counting sorting algorithms.	6
4	**Trees**: Definition, Properties, Binary Tree, Representation of Binary trees using arrays & linked lists, Operations on Binary Tree, Binary Tree Traversals (recursive), Binary search tree, B and B+ tree, AVL tree, Threaded binary tree.	6
5	**Graphs**: Basic concepts, Different representations of Graphs, Graph Traversals (BFS & DFS), Minimum Spanning Tree (Prims &Kruskal), Dijkstra's shortest path algorithms. Hashing: Hash function, Address calculation techniques, Common hashing functions, Collision resolution: Linear and Quadratic probing, Double hashing.	6
	TOTAL	36

TEXT / REFERENCE BOOKS

1. Data Structures and Algorithmic thinking with Python, Narasimha Karumanchi Career Monk Publications
2. Data Structures and Algorithms Using Python Rance D. Necaise John Wiley
3. Data Structure and Algorithms in Python Michael T. Goodrich and Roberto Tamassia , WILEY

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III Semester: (Computer Science and Engineering)

3CS4-05: Programming in JAVA

Credit-3 **Max. Marks : 150 (IA:45,ETE:105)**

2L+1T+0P **End Term Exam: 3 Hours**

Unit	CONTENTS	HOURS
1	Fundamental Concepts in Java Programming Introduction to Object-Oriented Programming, History of Java, Features of Java, Introducing the Java Environment, developing a Simple Java Program, Working with Java Tokens, Operator Precedence and Associativity, Data Types, Control Statements and arrays	**8**
2	Classes, Objects and Methods Classes, Objects, Constructors, The this Keyword-Garbage Collection- Finalize() method , Overloading methods, Using objects as parameters, Argument Passing and Returning Objects ,Recursion, Abstract Class, Nested Classes, Inner Class, Anonymous Inner Class, String Class , Command Line arguments	**8**
3	Inheritance , Interfaces and Packages Inheritance, Constructors in Inheritance, Multilevel Inheritance, Using the final Keyword, Interfaces in Java, dynamic Method Dispatch Understanding Packages in Java, Access Protection, Importing packages and Interfaces. Using Java API Packages.	**7**
4	Exception handling and Multithreading Exception handling fundamentals, Types of Exceptions, Using try, catch, throw, throws and finally. Multithreading: Creating a Thread , Creating multiple threads ,Thread priorities, synchronization ,Inter-thread communication	**7**
5	I/O STREAMS, UTILITY CLASSES I/O Streams: Byte Streams – Character Streams – Reading and Writing Files Legacy Classes and Interface: Vector, Stack, The Enumeration Interface Utility classes: String Tokenizer, Date, Calendar, Gregorian Calendar, Random, Scanner.	**6**
	TOTAL	**36**

Text Book:-

Java: The Complete Reference, Eleventh Edition, by Herbert Schildt (Author)McGraw-Hill(Publisher)
Core Java Volume I--Fundamentals: 1 (Core Series), Cay Horstmann, Pearsoned Education 2020

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III Semester: (Computer Science and Engineering)

3CS4-06: Discrete Mathematical Structure

Credit: 3 **Max. Marks: 150(IA:45, ETE:105)**

3L+0T+0P **End Term Exam: 3 Hours**

Unit	CONTENTS	HOURS
1	**Set Theory**: Definition of sets, countable and uncountable sets, Set operations, Partition of set, Cardinality (Inclusion-Exclusion & Addition Principles) Venn Diagrams, proofs of some general identities on sets. **Relation**: Types of relation, composition of relations, Pictorial representation, Equivalence, Partial ordering relation. **Function:** Definition, type of functions, one to one, into and onto function, inverse function, composition of functions, recursively defined functions, pigeonhole principle. Theorem proving Techniques: Mathematical induction.	**8**
2	Propositional Logic: Proposition, First order logic, Basic logical operation, truth tables, tautologies, Contradictions, Algebra of Proposition, logical implications, Normal Forms, Universal and existential quantifiers. 2 way predicate logic. Introduction to finite state machine Finite state machines as models of physical system equivalence machines, Finite state machines as language.	**7**
3	Posets, Hasse Diagram and Lattices: Introduction, ordered set, Hasse diagram of partially, ordered set, isomorphic ordered set, well ordered set, properties of Lattices, bounded and complemented lattices. Combinatorics: Introduction, Permutation and combination, Binomial Theorem, Multimodal Coefficients Recurrence Relation and Generating Function: Recurrence Relation and algorithms.	**8**
4	Algebraic Structures: Definition, Properties, types: Semi Groups, Monoid, Groups, Abelian group, properties of groups, Subgroup, cyclic groups, Cosets, factor group, Permutation groups, Normal subgroup, Homomorphism and isomorphism of Groups, standard results, Rings and Fields: definition and standard results.	**8**
5	Graph Theory: Introduction and basic terminology of graphs, Planer graphs, Multigraphs and weighted graphs, Isomorphic graphs, Paths, Cycles and connectivity, Shortest path in weighted graph, Introduction to Eulerian paths and circuits, Hamiltonian paths and circuits, Graph coloring, chromatic number, Isomorphism and Homomorphism of graphs, matching, vertex/edge covering.	**7**
	Total	**36**

Text / Reference Book:-

Discrete Mathematical Structures Paperback – 1 January 2015, by Kolman, Busbys, Pearsoned India
DISCRETE MATHEMATICAL STRUCTURES, 2017, Jean-Paul, R Manohar, TMH India

Jodhpur Institute of Engineering & Technology

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III Semester: (Computer Science and Engineering)

3CS4-21: Data Structures and Algorithms Lab

Credit-1.5 **Max. Marks :75 (IA:45,ETE:30)**

0L+0T+3P **End Term Practical Exam: 3 Hours**

Language to be used: Python

List of Experiments:-

1 Write functions to implement following operations on Array
   (a) Insert an element in array.
   (b) Delete an element in array.
   (c) Traverse an array.
   (d) Search an element in array.
   (e) Reverse of an array

2 Simulate a stack using a one-dimensional array as storage element. The program should implement the basic addition, deletion and traversal operations.

3 Simulate a queue, circular queue and dequeue using a one-dimensional array as storage element. The program should implement the basic addition, deletion and traversal operations.

4 Represent a 2-variable polynomial using array. Use this representation to implement addition of polynomials.

5 Represent a sparse matrix using array. Implement addition and transposition operations using the representation.

6 Implement singly, doubly and circularly connected linked lists illustrating operations like addition at different locations, deletion from specified locations and traversal.

7 Repeat exercises 2, 3 , 4 & 5 with linked structure.

8 Implementation of binary tree with operations like addition, deletion, traversal.

9 Depth first and breadth first traversal of graphs represented using adjacency matrix and list.

10 Implementation of binary search in arrays and on linked Binary Search Tree.

11 Implementation of different sorting algorithm like insertion, quick, heap, bubble and many more sorting algorithms.

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III Semester: (Computer Science and Engineering)

3CS4-22 : Object Oriented Programming Lab in Java

Credit-1.5 **Max. Marks :75 (IA:45,ETE:30)**

0L+0T+3P **End Term Practical Exam: 3 Hours**

List of Suggested Experiments.

Week 1	**Input/ Output Statements, Control Structures** • Ram and Shyam are playing with dice. In one turn, both of them roll their dice at once. They consider a turn to be good if the sum of the numbers on their dice is greater than 6. Given that in a particular turn Ram and Shyam got X and Y on their respective dices, find whether the turn was good. • Write a program to calculate area of circle, triangle, rectangle and square using switch case. • Write a program to display the first n terms of the Fibonacci series using recursive and non-recursive functions.
Week 2	**Class, Object, Method** • Create a class named *Student* with String variable *name* and integer variable *roll_no*. Assign the value of roll_no as *your roll number* and that of name as *your name* by creating an object of the class Student. • Create the two objects of Student class and initialize the value to these objects by invoking the *insertRecord* method. Display the data of the objects by invoking the *displayInformation()* method. • Write a class Result that contains roll no, name and marks of three subjects. The marks are stored in an array of integers. The class also contains the following member functions. (i) The input() method is used to input values (ii) The show() method is used to display values (iii) The total() returns the total marks a student (iv) The avg() method returns the average marks of a student
Week 3	Method Overloading Write a program to demonstrate different ways of method overloading in Java
Week 4	Array • Given an array A with N integers, find the count of unique integers in the array. • Robin likes the number 239. Therefore, he considers a number pretty if its last digit is 2, 3 or 9. Robin wants to watch the numbers between L and R (both inclusive), so he asked you to determine how many pretty numbers are in this range. • Given a matrix if an element in the matrix is 0 then you will have to set its entire column and row to 0 and then return the matrix.
Week 5	String • Write a java program to check whether a given string is palindrome. • Chef invented a modified wordle. There is a hidden word *S* and a guess word *T*, both of length 5. Chef defines a string *M* to determine the correctness of the guess word. For the i^{th} index: If the guess at the i^{th} index is correct, the i^{th} character of *M* is G. If the guess at the i^{th} index is wrong, the i^{th} character of *M* is B.

	Given the hidden word *S* and guess *T*, determine string *M*. • Given a positive integer *N*, Simran wants you to determine if it is possible to rearrange the digits of *N* (in decimal representation) and obtain a multiple of 5. Print YES if N is multiple of 5 and NO if not a multiple of 5. For example, when *N*=108, we can rearrange its digits to construct 180 = 36*5 which is a multiple of 5.
Week 6	Inheritance • Create a new class *RectangleFromSimpleGeometricObject* and extend it with *SimpleGeometricObject* class. Create an object for this class in the *TestCircleRectangle* class with a constructor receiving one parameter of colour. Add a method *setWidthHeight()* which accepts two double parameters width and height. Add another method *getWidthHeight* which returns width and height. Also call the *setColor()* method of the superclass from the constructor and call the *getColor()* method in *TestCircleRectangle* class for *RectangleFromSimpleGeometricObject* class.
Week 7	Overriding, Constructor • Create a new class *SalariedEmployee* that extends from class *Employee* and overrides the method *earnings( )* of class Employee to calculate the fixed monthly salary of each employee. Create object of *SalariedEmployee* class in *EmployeeTest* class(i.e, main class) to set the record for new employee and print it using *toString()* method. • Add a new method *drawShape( )* in *SimpleGeometricObject* (i.e., superclass) Class and overrides this method into subclass i.e., *RectangleFromSimpleGeometricObject* and *CirclefromGeometricObject* to draw a specific shape according to subclass specification.
Week 8	Polymorphism • Create a superclass *Shapes* having a method *area()* and subclasses of *Sahpes* are *Triangle, Circle, Rectangle*. Using polymorphism calculate the area of given shapes. • A company pays its employees on a weekly basis. The employees are of four types: Salaried employees are paid a fixed weekly salary regardless of the number of hours worked, hourly employees are paid by the hour and receive overtime pay (i.e., 1.5 times their hourly salary rate) for all hours worked in excess of 40 hours, commission employees are paid a percentage of their sales and base-salaried commission employees receive a base salary plus a percentage of their sales. For the current pay period, the company has decided to reward salaried-commission employees by adding 10% to their base salaries. The company wants to write an application that performs its payroll calculations polymorphically.
Week 9	Abstract classes, Interface • Create a class *monkey* with *jump( )* and *bite( )* methods. Create a class *human* which inherits this *monkey* class and implements *basicanimal* interface with *eat ( )* and *sleep().* • Create an interface *Language* having abstract method *getName().* The P*rogrammingLanguage* class implements the interface and provides the implementation for the method.
Week 10	Static members, Functions • Write a program to demonstrate the Printer sharing among various faculty members with the use of static member in a class.

	• Write a static method *equalize()* that takes two arrays of integers as arguments and returns *true* if they contain the same number of elements and all corresponding pairs of elements are equal, and *false* otherwise.

III Semester: (Computer Science and Engineering)

3CS4-23 : Digital Logic Design Lab

Credit-1 **Max. Marks :50 (IA:30,ETE:20)**

0L+0T+2P **End Term Practical Exam: 3 Hours**

List of Experiments:

1. Verify different logic gates.
2. Verify Universal gates NAND and NOR and design EXOR and EXNOR gates using Universal gates.
3. Implement Half adder, Full adder, Half subtractor and Full subtractor circuits.
4. Flip flops conversion JK to D, JK to T and D to TFF.
5. Implement logic equations using Multiplexer.
6. Implement digital circuits to perform binary to gray and gray to binary operations.
7. Verify different counter operations.
8. Write VHDL simulation code for different logic gates.
9. Write VHDL simulation code for combinational and sequential circuits.
10. Write VHDL simulation code for 4:1 Multiplexer, 2 line to 4 line binary decoder.

Design Experiments:

1. Design Clock pulse generator.
2. Design Clap operated remote control for Fan.
3. Design digital stop watch.
4. Write VHDL code to implement traffic light controller.

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III Semester: (Computer Science and Engineering)
3CS1-MNC: Business Studies

Credit: 0 **Max. Marks: 100(IA: 100)**
2L+0T+0P

UNIT	CONTENTS
1	**NATURE AND PURPOSE OF BUSINESS:** 1. Meaning of Business. 2. Nature/Characteristics of Business. 3. Objectives of Business. 4. Classification of Business Activities- Industry and commerce. 5. Business Risk- Concept. **6.** Case- studies
2	**FORMS OF BUSINESS ORGANISATION:** 1. Sole proprietorship. 2. Partnership. 3. Hindu Undivided Family 4. Co-operative Organisation. 5. Joint stock company. **6.** Case- studies
3	**EMERGING MODES OF BUSINESS:** 1. Meaning and Scope of E-Business. **2.** Business Process Outsourcing. **3.** Knowledge Process Outsourcing. **4.** Case- studies
4	**SOCIAL RESPONSIBILITY OF BUSINESS:** 1. Concept of Social Responsibility. 2. Business and Environment Protection. 3. Business Ethics. 4. Case- studies
5	**BUSINESS FINANCE:** **1.** Business Finance- Meaning, Nature and Significance **2.** Sources of Finance- Owners' funds **3.** Sources of Finance- Borrowed funds. **4.** Case- studies

.

Text/References:

1. Business Studies, Sandeep Garg, Dhanpat Rai publication.

2. Business studies & Management, Rajesh Kumar, Rakesh Dumar, D.N. Mishra, S. Chand Publication.

3. Business Studies, David Needham & Robert Dransfield, 2 nd edition.

Jodhpur Institute of Engineering & Technology
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Teaching & Examination Scheme
B. Tech.: Computer Science & Engineering
2nd Year – IV Semester

SN	Category	Course		Contact hrs /week			Marks			Cr
		Code	Title	L	T	P	IA	ETE	Total	
THEORY										
1	BSC	4CS2-01	Statistics & Probability theory	**3**	**1**	**0**	**60**	**140**	**200**	**4**
2	PCC	4CS4-02	Theory of Computation	**2**	**1**	**0**	**45**	**105**	**150**	**3**
3	ESC	4CS3-03	Computer Organization & Architecture	**2**	**1**	**0**	**45**	**105**	**150**	**3**
4	PCC	4CS4-04	Introduction to Web Technology	**3**	**0**	**0**	**45**	**105**	**150**	**3**
5	PCC	4CS4-05	Database Management System	**2**	**1**	**0**	**45**	**105**	**150**	**3**
6	PCC	4CS4-06	Computer Networks	**3**	**0**	**0**	**45**	**105**	**150**	**3**
Sub Total				**15**	**3**	**0**	**270**	**630**	**950**	**19**
PRACTICAL & SESSIONAL										
7	PCC	4CS4-21	Computer Architecture Lab	**0**	**0**	**2**	**30**	**20**	**50**	**1**
8	PCC	4CS4-22	Database Management System Lab	**0**	**0**	**2**	**30**	**20**	**50**	**1**
9	PCC	4CS4-23	Web Technology Lab	**0**	**0**	**2**	**30**	**20**	**50**	**1**
10	PCC	4CS4-24	N/W Programming Lab	**0**	**0**	**2**	**30**	**20**	**50**	**1**
11	SODECA	4CS8-00	Social Outreach, Discipline & Extra Curricular Activities	-	-	-	-	-	**25**	**0.5**
Sub Total				**0**	**0**	**12**	**150**	**100**	**225**	**4.5**
TOTAL OF IV SEMESTER				**15**	**3**	**10**	**420**	**730**	**1175**	**23.5**

Mandatory Non Credit Course

1	-	4CS-MC1	Environmental Engineering	**2**	**0**	0	**0**	**0**	100	**0**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*
ETE: *End Term Exam,* ***IA:*** *Internal Assessment*

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IV – Semester (Computer Science &Engineering)
4CS2-01-Statistics & Probability theory

Credit: 4 **Max. Marks: 200 (IA: 60, ETE: 140)**

3L+1T+0P **End Term Exam: 3 Hours**

UNIT	CONTENTS	HOURS
1	**INTRODUCTION & DISCRETE RANDOM VARIABLES:** Sample space, events, algebra of events, Bernoulli's trials, and Probability & Bayes' theorem. Random variable & their event space, probability generating function, Expectations, Moments, computations of Mean time to failure.	5
2	**DISCRETE & CONTINUOUS DISTRIBUTIONS:** Probability distribution & Probability densities: Binomial, Poisson, Normal, Rectangular and Exponential distribution & their PDF's, Moments and MGF's for above distributions.	11
3	**CORRELATION & REGRESSION:** Linear regression, Rank correlation, Method of least squares- Fitting of straight lines & Second degree parabola. Linear regression and Correlation analysis.	09
4	**QUEUING THEORY:** Pure birth, pure death and birth-death processes. Mathematical models for M/M/1,M/M/N, M/M/S and M/M/S/N queues.	7
5	**DISCRETE PARAMETER MARK ON CHAINS:** M/G/1 Queuing model, Discrete parameter birth-death process.	4
	Total	36

Text books/Reference Book:-

1. Statistics and Probability Theory by Gaur and NupurSrivastava, genius publication.
2. Statistics and Probability Theory by J.P.Narain,Shalini Jain,Sunil Joshi, Ashirwad publication
3. Statistics and Probability Theory by Khan, Chouhan, R.B.D.publication,Jaipur.
4. Statistics and Probability Theory by Jain &Rawat, CBCJaipur.
5. Fundamental of Mathematical Statistics by S.C.Gupta and V.K. Kapoor,SultanChand& sons.
6. Probability & Statistics, Iyenger, Gandhi, Ranganatham, Prasad by S.Chand.

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IV – Semester (Computer Science & Engineering)
4CS4-02: Theory Of Computation

Credit: 3
2L+1T+0P

Max. Marks: 150(IA:45, ETE:105)
End Term Exam: 3 Hours

S.NO	Contents	Hours
1	Finite Automata & Regular Expression: Basic machine, Finite state machine, Transition graph, Transition matrix, Deterministic and nondeterministic finite automation, Equivalence of DFA and NDFA, Decision properties, minimization of finite automata, Mealy & Moore machines. Alphabet, words, Operations, Regular sets, relationship and conversion between Finite automata and regular expression and vice versa, designing regular expressions, closure properties of regular sets, Pumping lemma and regular sets, Myhill- Nerode theorem , Application of pumping lemma, Power of the languages.	**7**
2	Context Free Grammars (CFG), Derivations and Languages, Relationship between derivation and derivation trees, leftmost and rightmost derivation, sentential forms, parsing and ambiguity, Simplification of CFG, normal forms, Greibach and Chomsky Normal form , Problems related to CNF and GNF including membership problem.	**8**
3	Nondeterministic PDA, Definitions, PDA and CFL, CFG for PDA, Deterministic PDA, and Deterministic PDA and Deterministic CFL , The pumping lemma for CFL's, Closure Properties and Decision properties for CFL, Deciding properties of CFL. 8	**8**
4	Turing Machines: Introduction, Definition of Turing Machine, TM as language Acceptors and Transducers, Computable Languages and functions, Universal TM & Other modification, multiple tracks Turing Machine. Hierarchy of Formal languages: Recursive & recursively enumerable languages, Properties of RL and REL, Introduction of Context sensitive grammars and languages, The Chomsky Hierarchy.	**8**
5	Tractable and Untractable Problems: P, NP, NP complete and NP hard problems, Un-decidability, examples of these problems like vertex cover problem, Hamiltonian path problem, traveling sales man problem.	**8**

Text Book:

1. "Introduction to Automata Theory, Languages, and Computation" By Johne E. Hopcroft, Rajeev Motwani, Jeffrey D. Ulman Publication: Pearson Education India.

Reference Book:

1. Introduction to the Theory of Computation" By Michael Sipser, Publisher: Cengage Learning.

Jodhpur Institute of Engineering & Technology
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IV – Semester (Computer Science & Engineering)
4CS3-03: Computer Organization & Architecture

Credit-3 **Max. Marks : 150 (IA:45,ETE:105)**

2L+1T+0P **End Term Exam: 3 Hours**

Unit	Contents	Hour
1	Introduction to Microprocessors, microcontroller; 8085 Microprocessor Architecture, pin description, Bus concept and organization, Micro Operations: Register Transfer language, Bus & Memory Transfer, Three state Bus Buffer Bus Architecture, Arithmetic, Logic & Shift Micro Operations.	6
2	Basic Computer Organization and Design Instruction code, computer register, common bus system, computer instructions, Instruction set completeness. Central Processing Unit: CPU Organization: General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Arithmetic And Logic Unit (ALU). RISC and CISC Characteristics	8
3	Pipeline and Vector Processing: Parallel Processing, Pipeline, Arithmetic and Instruction Pipeline, RISC Pipeline ,Vector Processing and Array Processor.	7
4	Computer Arithmetic Addition and subtraction , Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and Floating point arithmetic operation	7
5	Memory Organization: Basic concept and hierarchy, semiconductor RAM memories, ROM memories. Cache memories: concept and design issues & performance, address mapping and replacement, Associative memory, Auxiliary memories: magnetic disk, magnetic tape and optical disks, Virtual memory I/O Organization: Peripheral Devices, Input/output Interface, Interrupts: Interrupt Hardware, Types of Interrupts And Exceptions. Mode of Data Transfer: Strobe Programmed I/O, Interrupt Initiated I/O and Direct Memory Access	8
	Total	**36**

Text books / Reference Books:

1. Computer System Architecture - M. Mano
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky Computer Organization, McGraw-Hill, Fifth Edition, 2012
3. John P. Hayes, Computer Architecture and Organization, TMH, Third Edition, 1998. Reference books
4. William Stallings, Computer Organization and Architecture, Pearson Education, Seventh edition, 2006.
5. Behrooz Parahami, “Computer Architecture”, Oxford University Press, Eighth Impression, 2011.
6. David A. Patterson and John, “Computer Architecture-A Quantitative Approach”, Elsevier Fifth ed., 2012

Jodhpur Institute of Engineering & Technology
Teaching Scheme
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IV – Semester (Computer Science & Engineering)
4CS4-04: Introduction to Web Technology

Credit-3 **Max. Marks : 150 (IA:45,ETE:105)**

3L+0T+0P **End Term Exam: 3 Hours**

Unit	Contents	Hours
1	**Introduction:** Introduction to HTML, semantic tags, working with Text, working with Lists, Tables, iframes, working with Hyperlinks, Images, Working with Forms and controls. Introduction to CSS, CSS Styling (Background, Text Format, Controlling Fonts), Working with block elements, Working with Lists and Tables, CSS Id and Class, Box Model(Border properties, Padding Properties, Margin properties).	8
2	**JavaScript:** Introduction to JavaScript, JavaScript language – declaring variables, scope of variables, operators, data types, functions, arrays and array methods, strings,Form validation, Exception handling.	7
3	**Advance JavaScript**: JavaScript objects, classes, Asynchronous JavaScript, DOM (Methods, Elements, events, event listener, navigation, and nodes), BOM (window object, popup alert, timing events), ES5 and ES6, AJAX, JSON, jQuery.	7
4	**Animation using CSS and JavaScript:** Pseudo class, Manual Animation, Automated Animation, CSS transition(2D, 3D), CSS Animation methods, tooltips, DOM Animation, Introduction to jQuery- jQuery Effects (Fading, Sliding, stop animations, chaining), jQuery Traversing (ancestor, descendant, Siblings, filtering).	7
5	**Introduction to PHP**: Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio button, list etc., File Uploads. Connecting to database (MySQL as reference), Handling sessions and cookies.	7
	Total	36

Text/ Reference: books:

1. Web Technologies, Uttam K Roy, Oxford University Press
2. Ivan Bayross, HTML, DHTML, Java Script, Perl & CGI, BPB Publication
3. Beginning HTML, XHTML, CSS, and JavaScript, JohnDuckett, Wiley India, 2010
4. Ullman, PHP for the Web: Visual QuickStart Guide, Pearson Education
5. Ramesh Bangia, “Internet and Web Design” , New Age International
6. Web Programming, building internet applications, Chris Bates 2″ edition, Wiley Dreamtech
7. Professional AJAX 2nd Edition, Wiley India Edition, Nicholas C. Zakas, Jeremy McPeak, Joe Fawcett.
8. 8. Complete Reference php 5.2, McGraw Hill, Steven Holzner.

IV – Semester (Computer Science & Engineering)

4CS4-05: Database Management System

Credit-3 **Max. Marks : 150 (IA:45,ETE:105)**

2L+1T+0P **End Term Exam: 3 Hours**

Unit	Contents	Hours
1	Overview of DBMS. File System v/s DBMS. Structure of a DBMS, Entity Relationship model: Overview of Data Design Entities, Attributes and Entity Sets, Relationship and Relationship Sets. Features of the ER Model- Key Constraints, Participation Constraints, Weak Entities, Class Hierarchies, Aggregation. SQL queries programming and Triggers: The Forms of a Basic SQL Query, Union, and Intersection and Except, Nested Queries, Correlated Nested Queries, Set-Comparison Operations, Aggregate Operators, Null Values and Embedded SQL, Dynamic SQL, ODBC and JDBC, Triggers and Active Databases.	9
2	Relational Algebra and Calculus: Relationship Algebra Selection and Projection, Set Operations, Renaming, Joints, Division, Relation Calculus, Expressive Power of Algebra and Calculus. Schema refinement & Normal forms: Schema Refinement, Functional Dependencies, Boyce-Code Normal Forms, Third Normal Form, Normalization - Decomposition into BCNF Decomposition into 3-NF.	7
3	Internal of RDBMS: Physical data organization in sequential, indexed, random and hashed files. Inverted and multilist structures.	6
4	Transaction Processing: Transaction State, Transaction properties, Concurrent Executions. Need of Serializability, Conflict vs. View Serializability, Testing for Serializability, Recoverable Cascadeless Schedules.	7
5	Concurrency Control: Implementation of Concurrency Lock-based protocols, Timestamp-based protocols, Validation-based protocols, Deadlock handling, Database Failure and Recovery: Database Failures, Recovery Schemes: Shadow Paging and Log-based Recovery, Recovery with Concurrent transactions.	7
	Total	**36**

Text / Reference Books:-

T1: Database Management Systems, 5thedition, McGraw Hill. Authored by- H.f. Korth and Silberschatz

T2: Database Management Systems, by Raghu Ramakrishnan and Johannes Gehrke

R1: Fundamentals of Database Systems, 3rd ed, Addison Wesley, 2000. Authored by- Elmasri & Navathe

R2: Database Systems, 2nd edition, Addison Wesley, 1999. Authored by- Connolly T, Begg C & Stachan.

Jodhpur Institute of Engineering & Technology
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IV – Semester (Computer Science & Engineering)
4CS4-06 Computer Networks

Credit-3 **Max. Marks : 150 (IA:45,ETE:105)**

3L+0T+0P **End Term Exam: 3 Hours**

Unit	Contents	Hours
1	**Introduction:** Introductory Concepts: Network hardware, Network software, topologies, Protocols and standards, OSI model, TCP model, TCP/IP model. **Physical Layer:** Digital and Analog Signals, Periodic Analog Signals, Signal Transmission, Limitations of Data Rate, Digital Data Transmission, Performance Measures, Line Coding, Digital Modulation, Media and Digital Transmission System.	8
2	**Data Link Layer:** Error Detection and Correction, Types of Errors, Two dimensional parity check, Detection verses correction, Block Coding, Linear Block Coding, Cyclic Codes, Checksum, Standardized Polynomial Code, Error Correction Methods, Forward Error Correction, Protocols: Stop and wait, Go-back-N ARQ, Selective Repeat ARQ, Sliding window, Piggy backing, Pure ALOHA, Slotted ALOHA, CSMA/CD, CSMA/CA.	8
3	**Network Layer:** Design issues, Routing algorithms: IPV4, IPV6, Address mapping: ARQ, RARQ, Congestion control, Unicast, Multicast, Broadcast routing protocols, Quality of Service, Internetworking.	8
4	**Transport Layer:** Transport service, Elements of transport protocols, User Datagram Protocol, Transmission Control Protocol, Quality of service, Leaky Bucket and Token Bucket algorithm.	6
5	**Application Layer:** WWW, DNS, Multimedia, Electronic mail, FTP, HTTP, SMTP, Introduction to network security.	6
	Total	**36**

Text / Reference Books

T1. Data Communication and Networking, Behrouz A Forouzan, TMH.
T2. Data and computer communication, Stalling 8TH ed. Pearson.
R1. Wireless Communications, 2/e, Rappaport, PHI.
R2. Data Communication and networking by S. Tanenbaum, 4th Ed., Pearson.
R3.Computer Networking, Kurose 3rd Ed., Pearson.

IV – Semester (Computer Science & Engineering)

4CS4-21: Computer Architecture Lab

Credit-1 **Max. Marks: 50(IA:30, ETE:20)**

0L+0T+2P **End Term Exam: 3 Hours**

List of Experiments:

1. WAP in assembly language to add the contents of memory locations 2021, 2022 & place the result in memory location 2023.
2. WAP in assembly language to add the 16 bit numbers stored in memory location & store the result in another memory location.
3. WAP in assembly language to transfer a block of data from one memory location to another memory location in forward & reverse order.
4. Write a program in assembly language to swap two blocks of data stored in memory.
5. Write a program in assembly language to find the square of a number.6
6. Write a main program and a conversion subroutine to convert Binary to its equivalent BCD.
7. Write a program in assembly language to find largest & smallest number from a given array.
8. Write a program to Sort an array in ascending & descending order.
9. Write a program to multiply two 8 bit numbers whose result is 16 bit.
10. Write a program of division of two 8 bit numbers.

IV – Semester (Computer Science & Engineering)

4CS4-22: Database Management System Lab

Credit-1 **Max. Marks: 50(IA:30, ETE:20)**

0L+0T+2P **End Term Exam: 3 Hours**

List of Experiments: -

Student should decide on a case study and formulate the problem statement.

Conceptual Designing using ER Diagrams (Identifying entities, attributes, keys and relationships between entities, cardinalities, generalization, specialization etc.)

Note: Student is required to submit a document by drawing ER Diagram to the Lab teacher.

Converting ER Model to Relational Model (Represent entities and relationships in Tabular form, represent attributes as columns, identifying keys)

Note: Student is required to submit a document showing the database tables created from ER Model.

Normalization -To remove the redundancies and anomalies in the above relational tables, Normalize up to Third Normal Form

Creation of Tables using SQL- Overview of using SQL tool, Data types in SQL, Creating Tables (along with Primary and Foreign keys), Altering Tables and Dropping Tables.

Practicing DML commands- Insert, Select, Update, Delete

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IV – Semester (Computer Science & Engineering)
4CS4-23: Web Technology Lab

Credit-1 **Max. Marks: 50(IA:30, ETE:20)**

0L+0T+2P **End Term Exam: 3 Hours**

1. **List of Experiments**:

    a. Create a webpage with HTML describing your department.
    b. Use paragraph and list tags.
    c. Apply various colors to suitably distinguish key words. Also apply font styling like italics, underline and two other fonts to words you find appropriate. Also use header tags
    d. Create links on the words e.g. “Wi-Fi” and “LAN” to link them to Wikipedia pages.
    e. Insert an image and create a link such that clicking on the image takes the user to another page.
    f. At the bottom create a link to take the user to the top of the page.

2. Create a table to show your class time-table using table tag.

3. Apply in-line CSS to change colors of certain text portions, bold, underline and italics certain words in your HTML web page. Also change the background color of each paragraph using in-line CSS. Write all the above styling in CSS in different file (.css) and link it to your webpage such that changes made in CSS file are immediately reflected on the page.

4. Create a simple form to submit user input like his name, age, address and favorite subject. Add a few form elements such as radio buttons, check boxes and password field. Add a submit button at last. Put validation checks on values entered by the user using JavaScript (such as age should be a value between 1 and 80).

5. Write a JavaScript program to add multiple events of different types to the same element.

6. Write a program to create an animated search using CSS.

7. Write a JavaScript program to dynamically bold, italic and underline words and phrases based on user actions.

8. Write a program to apply animation on a small box over a large container using JavaScript.

9. Write a program to apply the following jQuery effects: Hide/Show, Fade, Slide, and Animate.

10. Write a PHP script to a. Find the length of a string. b. Count the number of words in a string. c. Reverse a string. d. Search for a specific string.

11. Write a PHP script that reads data from the form and insert data into the database.
12. Write a PHP script to create a session on the login page and destroy the session at logout.

13. Design a website which includes all technologies completed in the lab.

IV – Semester (Computer Science & Engineering)

4CS4-24 Network Programming Lab

Credit- 1 **Max. Marks: 50(IA:30, ETE:20)**

0L+0T+2P **End Term Exam: 3 Hours**

List of Experiments:

1. Getting started with Basics of Network configurations files and Networking Commands in Linux.
2. Study of Different Type of LAN& Network Equipments.
3. Study and Verification of standard Network topologies i.e. Star, Bus, Ring etc.
4. LAN installations and Configurations.
5. Write a program to implement various types of error correcting techniques.
6. Write a program to implement various types of framing methods.
7. Write two programs in C: hello_client and hello_server
8. The server listens for, and accepts, a single TCP connection; it reads all the data it can from that connection, and prints it to the screen; then it closes the connection
9. The client connects to the server, sends the string “Hello, world!”, then closes the connection.
10. Write an Echo_Client and Echo_server using TCP to estimate the round trip time from client to the server. The server should be such that it can accept multiple connections at any given time.
11. Repeat Exercises 6 & 7 for UDP.
12. Repeat Exercise 7 with multiplexed I/O operations.
13. Implement and simulate algorithm for Distance vector routing protocol.
14. Implement and simulate algorithm for Link state routing protocol.

Jodhpur Institute of Engineering & Technology
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IV Semester: (Computer Science and Engineering)
4CS1-MNC: Environmental Engineering

Credit: 0 **Max. Marks: 100(IA: 100)**
2L+0T+0P

UNIT	Content	Hours
1	Importance and uses of safe water supply system. Domestic water requirements for urban and rural areas. Population forecasting methods, arithmetic mean method and geometric mean method.	5
2	Raw Water: Physical and Chemical and biological properties of water, common water treatment processes.	6
3	Waste Water: Properties of waste water, common domestic waste water treatment processes.	6
4	Air pollution: Types of pollutants, properties and their local and global effects on environment.	6
5	Solid Waste Management: Quantity, Characteristics and Disposal for Urban and Rural areas.	5
		28

Text Book:
1. Water Supply Engineering by BC Punmia(LAXMI PUBLICATIONS)
2. Waste Water Engineering by BC Punmia.(LAXMI PUBLICATIONS)

References:
1. Water Supply Engineering by SK Garg.(KHANNA PUBLISHERS)
2. Sewage Disposal and Air Pollution Engineering by SK Garg.(KHANNA PUBLISHERS)

Jodhpur Institute of Engineering & Technology
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Teaching & Examination Scheme
B. Tech.: Computer Science & Engineering
3rd Year – V Semester

THEORY											
S. No	**Category**	**Course**		**Contact hrs /week**			**Marks**			**Cr**
		Code	**Title**	**L**	**T**	**P**	**IA**	**ETE**	**Total**	
1	PCC	5CS4-01	Introduction to AI and Machine Learning	**3**	**0**	**0**	**45**	**105**	**150**	**3**
2	PCC	5CS4-02	Compiler Design	**2**	1	**0**	**45**	**105**	**150**	**3**
3	PCC	5CS4-03	Operating System	**3**	**0**	**0**	**45**	**105**	**150**	**3**
4	PCC	5CS4-04	Software Engineering	**2**	**0**	**0**	**30**	**70**	**100**	**2**
5	PCC	5CS4-05	Design and Analysis of Algorithms	**2**	**1**	**0**	**45**	**105**	**150**	**3**
Professional Elective I: (any one)				**2**	**0**	**0**	**30**	**70**	**100**	**2**
6	PEC	5CS5-11	Human-Computer Interaction							
		5CS5-12	Social Computing							
		5CS5-13	Advanced Computer Architecture							
Sub Total				**14**	**2**	**0**			**800**	**16**
PRACTICAL & SESSIONAL										
7	PCC	5CS4-21	Software Engineering lab	**0**	**0**	**3**	**45**	**30**	**75**	**1.5**
8	PCC	5CS4-22	Machine Learning lab	**0**	**0**	**3**	**45**	**30**	**75**	**1.5**
9	PCC	5CS4 23	Android App Development Lab	**0**	**0**	**3**	**45**	**30**	**75**	**1.5**
10	PSIT	5CS7-30	Industrial Training	**0**	**0**	**3**	**0**	**0**	**125**	**2.5**
11	SODECA	5CS8-00	Social Outreach, Discipline &Extra Curricular Activities						**25**	**0.5**
Sub Total				**0**	**0**	**12**	**135**	**90**	**375**	**7.5**
TOTAL OF V SEMESTER				**14**	**2**	**12**			**1175**	**23.5**

Mandatory Non Credit course

1	MNC	5CS-MC1	Professional Ethics in Engineering	**2**	**0**	0	**0**	**0**	100	**0**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*
ETE: *End Term Exam,* ***IA:*** *Internal Assessment*

Jodhpur Institute of Engineering & Technology
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V Semester: (Computer Science and Engineering)

5CS4-01: Introduction to AI and Machine Learning

Credit: 3 **Max. Marks: 150(IA: 45, ETE: 105)**

3L+0T+*0P* ***End Term Exam: 3 Hours***

S. No.	Contents	Hours
1	**Introduction**: what is AI, how AI is connected to ML, definition and types of ML, applications, ML and program, significance of ML, basic terms and terminologies, types of variables.	5
2	**Problem Solving by search:** Problem Solving Agents, Example Problems, Uninformed Search Strategies, Avoiding Repeated States in search, Heuristic Search Strategies (Greedy Best First Search, A* Search), Evolutionary algorithms, Local Search Algorithms (Hill-Climbing Search), Minimax & Alpha-Beta Pruning Algorithm, Imperfect Real-time decisions	9
3	**Supervised learning algorithm:** Regression: Linear Regression Model, Logistic Regression and Classification: Decision Tree, Naive Bayes classifier, Support Vector Machine, Random forest algorithm, K nearest neighbor.	8
4	**Unsupervised learning algorithm:** Clustering: k-means clustering, Hierarchical Clustering; Association rule mining, Apriori Algorithm, f-p growth algorithm, Gaussian mixture model.	7
5	**Introduction to Statistical Learning Theory,** Feature extraction - Principal component analysis, Singular value decomposition. Feature selection – feature ranking and subset selection, filter, wrapper and embedded methods, Evaluating Machine Learning algorithms and Model Selection.	7
		36

Textbooks:

1. Stuart Russell and Peter Norvig., Artificial Intelligence A Modern Approach, Prentice Hall, Second Edition (Indian reprint: Pearson Education).
2. Learning, Tomm. Mitchell, Mc Graw Hill Publication.
3. Machine Learning, V. K. Jain, Khanna Publication.
4. Machine Learning, Amit K Das Saikat Dutt, Subramanian Chandramouli, Pearson Publication.

Reference:

1. George F.Luger, Artificial Intelligence, Pearson Education
2. Ben Coppin Artificial Intelligence Illuminated, Jones and Bartlett Publishers
3. Data Mining: Concepts and Techniques, Jiawei Han, Micheline Kamber, Jian Pei, Morgan Kaufmann Publication.
4. The Elements of Statistical Learning, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer publications.

Jodhpur Institute of Engineering & Technology
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V Semester: (Computer Science and Engineering)

5CS4-01: Introduction to AI and Machine Learning

Credit: 3 **Max. Marks: 150(IA: 45, ETE: 105)**

3L+0T+0P **End Term Exam: 3 Hours**

Course Outcomes

CO1	To understand the basic theory underlying artificial intelligence and machine learning.
CO2	To Develop skills to create small to medium sized Programs related with knowledge including propositional and predicate logic.
CO3	To Analyze how uncertainty is being tackled in the knowledge representation and reasoning process, in particular, techniques based on probability theory and possibility theory.
CO4	To understand a range of machine learning algorithms along with their strengths and weaknesses.
CO5	To apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.
CO6	To be able to apply Artificial Intelligence techniques for problem solving.

V Semester: (Computer Science and Engineering)

5CS4-02: Compiler Design

Credit: 3 **Max. Marks: 150(IA: 45, ETE: 105)**

2L+1T+0P **End Term Exam: 3 Hours**

UNIT	CONTENTS	HOURS
1	**Compiler structure**: analysis-synthesis model of compilation, various phases of a compiler, tool based approach to compiler construction. **Lexical analysis**: interface with input, parser and symbol table, token, lexeme and patterns. Difficulties in lexical analysis. Error reporting. Implementation. Regular definition, Transition diagrams. Introduction to YACC, LEX and FLEX	6
2	**Syntax analysis**: CFGs, ambiguity, associativity, precedence, top down parsing, recursive descent parsing, transformation on the grammars, predictive parsing, bottom up parsing, LR parsers (SLR, LALR, LR).	8
3	**Syntax Directed Translation**: Syntax directed definition**s**: Inherited and Synthesized attributes, Evaluation order of SDD's: Dependency graph, bottom up and top down evaluation of attributes, L-attributed definitions and S-attributed definitions. **Intermediate Code Generation:** Variants of Syntax Trees: DAG's for Expression, Constructing DAG's, Three Address Code	8
4	**Types and Declarations**: Type expressions, Type Equivalence, Type Checking: Rules for Type Checking, Type Conversions, overloaded functions and operators, Type Inference and Polymorphic Functions. **Run time Environments**: Storage Organization, Stack Allocation of Space: Activation Trees, Activation Records, Stack Allocation of Activation Records, Parameter Passing Mechanisms.	8
5	**Code Generation:** Issues in the design of Code Generator, Basic Blocks and Flow Graphs, **Optimization of Basic Blocks:** DAG representation of Basic Blocks, Dead Code Elimination, Code Generation from DAG. Peephole Optimization, Register Allocation and Assignment.	6

Books and References:

1. AV Aho, MS Lam, R Sethi, JD Ullman, Compiler Design: Principles, Techniques and Tools, 2nd Ed., Prentice-Hall, 2006
2. AW Appel, J Palsberg, Modern Compiler Implementation in Java, Cambridge University Press, 2002
3. AW Appel, M Ginsburg, Modern Compiler Implementation in C, Cambridge University Press, 2004.

Other references:

4. K Cooper, L Torczon, Engineering a Compiler, 2nd Ed., Morgan Kaufmann, 2011
5. KC Louden, Compiler Construction: Principles and Practice, Cengage Learning, 1997
6. D Grune, H Bal, C Jacobs, K. Langendoen, Modern Compiler Design, Wiley, 2000
7. Michael L Scott, Programming Language Pragmatics, 3rd Ed., Morgan Kaufmann, 2009
8. S Muchnick, Advanced Compiler Design and Implementation, Morgan Kaufmann/Elsevier(India), 2003.

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V Semester: (Computer Science and Engineering)

5CS4-02: Compiler Design

Credit: 3 **Max. Marks: 150(IA: 45, ETE: 105)**

3L+0T+0P **End Term Exam: 3 Hours**

Course Outcomes

The students will be able to

CO1	Understand the various phases of compiler and design the lexical analyzer,
CO2	Explore the similarities and differences among various parsing techniques and grammar transformation techniques,
CO3	Analyze and implement syntax directed translations schemes and intermediate code generation
CO4	Understand Type expressions, Type Equivalence, Type Checking: Rules for Type Checking, Type Conversions, overloaded functions and operators, Type Inference and Polymorphic Functions. They will also understand the different parameter passing techniques and how stack is used for allocating space
CO5	Understand the concepts of code generation and code optimization

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V Semester: (Computer Science and Engineering)

5CS4-03: OPERATING SYSTEMS

Credit: 3 **Max. Marks: 150(IA: 45, ETE: 105)**

3L+0T+0P **End Term Exam: 3 Hours**

S. No.	Contents	Hours
1	INTRODUCTION: Computer System Overview-Basic Elements, Basic Linux commands. Instruction Execution, Memory Hierarchy, Interrupts, Cache Memory, Direct Memory Access. Operating system overview-objectives and functions. History and generation of Operating System.	6
2	PROCESSES AND THREADS: The Process model, Process creation, Process Termination, Process Hierarchies, Process States, Implementation of Processes. Thread Usage, the classical Thread model, POSIX Threads, Implementing Threads in user space and Kernel, Pop up Threads. Processes and Threads in Windows.	6
3	INTERPROCESS COMMUNICATION: Race Conditions, Critical Regions, Mutual Exclusion, Semaphores, Monitors, Classical IPC Problems: The dining Philosophers Problem, Readers/Writers problem. SCHEDULING- Introduction to scheduling, Scheduling in interactive systems, scheduling in real time systems, policy versus mechanism, thread scheduling. DEADLOCKS: Resources, Introduction to Deadlocks, Deadlock Detection and Recovery, Deadlock avoidance, Deadlock prevention.	8
4	MEMORY MANAGEMENT: A memory abstraction: The notion of address space, Swapping, managing free memory. Virtual memory: Paging, Page tables, speeding up Paging, Page replacement algorithms: Optimal Page replacement algorithm, Not recently used Page replacement algorithm, FIFO Page replacement algorithm, LRU Page replacement algorithm. Segmentation, segmentation with paging. Memory management in Windows.	8
5	INPUT/OUTPUT AND FILE SYSTEMS: Principles of I/O Hardware: I/O devices, Device controllers, memory mapped I/O, Direct memory access. Principles of I/O software: Programmed I/O, Interrupt driven I/O, I/O using DMA. Interrupt Handlers, Device drivers, Device independent I/O software. Disk scheduling algorithm (FCFS, SSF), Disk cache. File System: Files, Directories, File system Implementation, File system management, Linux File system, Windows File system.	8
		36

Text Books:

1. Andrew S. Tannenbaum, "Modern Operating Systems", Prentice Hall,3rd Edition, 2007.
2. William Stallings, "Operating Systems – internals and design principles", Prentice Hall, 7th Edition, 2011. (Ch 1-9,11,12).

Reference Books:

1. Andrew S. Tannenbaum & Albert S. Woodhull, "Operating System Design and Implementation", Prentice Hall , 3rd Edition, 2006.
2. Silberschatz, Peter Galvin "Operating System Principles", Wiley India,7th Edition, 2006.

Jodhpur Institute of Engineering & Technology
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V Semester: (Computer Science and Engineering)

5CS4-03: OPERATING SYSTEMS

Credit: 3 **Max. Marks: 150(IA: 45, ETE: 105)**

3L+0T+0P **End Term Exam: 3 Hours**

Course Outcomes

CO1	Understand fundamental operating system functions.
CO2	Understand abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc.
CO3	Analyze important algorithms e.g. Process scheduling and memory management algorithms.
CO4	Categorize the operating system's resource management techniques, dead lock management techniques, memory management techniques.
CO5	To understand file system and DMA in OS like Unix, Linux, windows etc.

Jodhpur Institute of Engineering & Technology
Teaching Scheme
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V Semester: (Computer Science and Engineering)
5CS4-04: SOFTWARE ENGINEERING

Credit: 2 **Max. Marks: 100(IA: 30, ETE: 70)**
2L+0T+0P **End Term Exam: 3 Hours**

S. No.	Contents	Hours
1	**Introduction**: Software life-cycle models, Software requirements specification, formal requirements specification, verification, and validation. Software Process-Generic process model-Prescriptive process model-specialized, unified process-Agile development-Agile Process- Extreme Programming- Other agile Process models-Software engineering Knowledge-core Principles-Principles that guide each framework Activity.	10
2	**Software Project Management**: Objectives, Resources and their estimation, LOC and FP estimation, effort estimation, COCOMO estimation model, risk analysis, software project scheduling.	6
3	**Requirement Analysis**: Requirement analysis tasks, Analysis principles. Software prototyping and specification data dictionary, Finite State Machine (FSM) models. Structured Analysis: Data and control flow diagrams, control and process specification behavioral modeling.	6
4	Software Design: Design fundamentals, Effective modular design: Data architectural and procedural design, design documentation.	6
5	**UML:** Introduction to Unified Modeling Language, Types of UML diagram. **Software Testing**: Software Testing, Standards for Software Test Documentation, Testing Frameworks, Need for Software Testing, Test Cases and Test Suite, Types of Software Testing, Unit Testing, Integration Testing, System Testing.	8
		36

Text Books:

1. Software Engineering, Roger S Pressman, TMH
2. Software Engineering, a Precise Approach, Pankaj Jalote, Wiley India 2010

Reference Books:

1. Fundamentals of Software Engineering, Rajib Mall
2. Software Engineering (Principles & Practice), WamansJawedkar
3. Software Engineering Fundamentals, Behforooj and Fredrick, Oxford University Press

Jodhpur Institute of Engineering & Technology
Teaching Scheme
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V Semester: (Computer Science and Engineering)

5CS4-04: SOFTWARE ENGINEERING

Credit: 2 **Max. Marks: 100(IA: 30, ETE: 70)**

2L+0T+0P **End Term Exam: 3 Hours**

Course Outcomes

CO1	Plan a software engineering process life cycle , including the specification, design, implementation, and testing of software systems that meet specification, performance, maintenance and quality requirements
CO2	Given any software case problem, the students will be able to manage the roles of team members for project development, estimate resources required, completion time and risks involved.
CO 3	Analyze and translate a specification into a design, and then realize that design practically, using an appropriate software engineering methodology.
CO4	Given any Software case problem, the students will be able to perform requirement analysis tasks and apply the principles, Software Prototyping and develop Finite State Machine model and do structured analysis.
CO5	Given any Software problem, the students will be able to design effective modular designs and prepare Software Design Document.
CO6	Given any software problem, the students will be able to draw all UML diagrams and Learn about different techniques of testing a software, Design unit test cases to verify the functionality and locate bugs, if any.

Jodhpur Institute of Engineering & Technology
Teaching Scheme
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V Semester: (Computer Science and Engineering)
5CS4-05: Design and Analysis of Algorithms

Credit: 3 **Max. Marks: 150(IA: 45, ETE: 105)**
2L+1T+0P **End Term Exam: 3 Hours**

S. No.	Contents	Hours
1	**Foundation of Algorithm Analysis**: Algorithm and its properties, Time and Space Complexity, Asymptotic Notations: Big-O, Big-Ω and Big-Θ Notations Examples. **Recursive Algorithms:** Recurrence Relations, Solving Recurrences (Recursion Tree Method, Substitution Method, Masters Theorem) and calculating complexity.	08
2	**Divide and Conquer Approach**: Binary Search, Quick Sort, Merge Sort, Strassen's matrix multiplication algorithm. **Greedy Approach**: General Characteristics of greedy algorithms, Knapsack Problem, Job Sequencing, Optimal Merge Patterns, Huffman code.	08
3	**Dynamic Programming Approach**: Greedy Algorithms vs. Dynamic Programming, Matrix Chain Multiplication. Longest Common Subsequence and 0/1 Knapsack Problem. **Branch and Bound**: Traveling Salesman Problem and Lower Bound Theory. Backtracking Algorithms and Queens problem.	08
4	**Pattern Matching Algorithms**: Naïve and Rabin Karp string matching algorithms, KMP Matcher and Boyer Moore Algorithms. **Assignment Problems:** Formulation of Assignment and Quadratic Assignment Problem	06
5	**Randomized Algorithms-** Las Vegas algorithms, Monte Carlo algorithms, randomized algorithm for Min-Cut, randomized algorithm for 2- SAT. **Flow Network:** Network Flow Problem, Ford-Fulkerson Algorithm for Maximum Flow Problem, Max Flow-Min Cut theorem, Flow shop scheduling.	06
	Total	36

Text Books:

1. Cormen, Leiserson, Rivest: Introduction to Algorithms, Prentice Hall of India.
2. Horowitz and Sahani: Fundamental of Computer algorithms.
3. Aho A.V , J.D Ulman: Design and analysis of Algorithms, Addison Wesley

Reference Books:

1. Brassard: Fundamental of Algorithmics, PHI.

Jodhpur Institute of Engineering & Technology
Teaching Scheme
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V Semester: (Computer Science and Engineering)

5CS4-05: Design and Analysis of Algorithms

Credit: 3 **Max. Marks: 150(IA: 45, ETE: 105)**

2L+1T+0P **End Term Exam: 3 Hours**

Course Outcomes

CO1	Understand the basic concepts of algorithms and analyze the performance of algorithms.
CO2	Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divideand-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
CO3	Describe the Greedy and Dynamic-programming paradigm. Explain when an algorithmic design situation calls for it. Recite algorithms that employ these paradigms. Synthesize these algorithms, and analyze them.
CO4	Able to find the optimal solution for combinatorial, discrete, and general mathematical optimization problems using Branch & Bound. Be familiar with String matching algorithms and analyse the complexity of these algorithms.
CO5	To understand the methods of solving different assignment problems and the use of assignment models in industry and business. An understanding of the major categories of approaches to using randomness to solve problems, and the difference between Las Vegas and Monte Carlo algorithms.

Jodhpur Institute of Engineering & Technology
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V Semester: (Computer Science and Engineering)

5CS5-11: Human Computer Interaction

Credit: 2 **Max. Marks: 100(IA: 30, ETE: 70)**

2L+0T+0P **End Term Exam: 3 Hours**

S. No.	Contents	Hours
1	HCI Basics : -Disciplines involved in HCI, Why HCI study is important? The psychology of everyday things Donald A. Norman Principles of HCI, User-centered Design. Measurable Human factors.	04
2	UNDERSTANDING THE HUMAN and HUMAN INTERACTION: Input-output channels, Human memory, Human emotions, Individual differences, Psychology. Ergonomics, Human errors, Models of interaction, Paradigms of Interactions, Interaction styles, Interactivity, Context of interaction, User experience.	07
3	HCI MODELS AND THEORIES:- User Profiles, categorization of users, Goal and task hierarchy model, Linguistic model, Physical and device models, GOMS, Norman's 7 stage model, Cognitive architectures, Hierarchical task analysis (HTA)	07
4	DESIGN PROCESS:- Design Rules , Principles that support usability, Design standards, Design Guidelines, What is interaction design?, The software design process, User focus, Scenarios, Navigation Design, Screen Design, Prototyping techniques,	08
5	HCI GUIDELINES AND EVALUATION TECHNIQUES:- Using toolkits, User interface management system (UIMS), Goals of evaluation, Categorization of Evaluation techniques, Choosing an Evaluation Method. Heuristic Evaluation, cognitive walk through, Usability testing, FUTURE TRENDS:- Ubiquitous Computing, Design thinking, Challenges in designing interfaces for smart homes, smart devices, handheld devices, smart wristwatch, Future of HCI	10
	Total	36

Text Books:-

1. Dix A., Finlay J., Abowd G. D. and Beale R. Human Computer Interaction, 3rd edition, Pearson Education, 2005.
2. B. Shneiderman; Designing the User Interface, Addison Wesley 2000 (Indian Reprint).
3. Designing The User Interface: Strategies for Effective Human-Computer Interaction. Pearson Education Limited

Reference Books:-

1. Human –Computer Interaction, D. R. Olsen, Cengage Learning.
2. Donald A. Norman (2013). The Design of Everyday Things Basic Books

Jodhpur Institute of Engineering & Technology
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V Semester: (Computer Science and Engineering)

5CS5-11: Human Computer Interaction

Credit: 2 **Max. Marks: 100(IA: 30, ETE: 70)**

2L+0T+0P **End Term Exam: 3 Hours**

Course Outcomes (CO):

CO1	Describe and apply core theories, models and methodologies from the field of HCI. Design, implement and evaluate effective and usable User-centered Design
CO2	Describe and develop understanding of models, paradigms and context of interactions. Explain how to practice this approach to design interactive software systems with various Interaction styles
CO3	Analyze one after another the main features of interactive systems, and various types of users and cognitive architecture.
CO4	Conduct and design various guidelines to make an interactive design model with user focus.
CO5	Implement and perform usability testing or Evaluate of a user-interface design model
CO6	To understand the future trends of HCI like augmented reality and smart devices.

Jodhpur Institute of Engineering & Technology
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V Semester: (Computer Science and Engineering)

5CS5-12: Social Computing

Credit: 2 **Max. Marks: 100(IA: 30, ETE: 70)**

2L+0T+0P **End Term Exam: 3 Hours**

S. No.	Contents	Hours
1	Introduction: Introduction to Social network, Social networks the challenge, Google page rank, searching in a network, Link Prediction, the contagions, importance of acquaintances. Handling Real world Network Datasets: Introduction to Datasets, Ingredients Network, Synonymy Network, Web Graph, Introduction to Emergence of Connectedness, Programming Illustration of Emergence of Connectedness	04
2	Strong and Weak Relationships (Continued) & Homophily: Introduction to Homophily, Selection and Social Influence, Interplay between Selection and Social Influence. Homophily - Definition and measurement, Foci Closure and Membership Closure. Positive and Negative Relationships Creating graph, displaying it and counting unstable triangles, moving a network from an unstable to stable state, Forming two coalitions, Visualizing coalitions and the evolution	06
3	Link Analysis: The Web Graph, Collecting the Web Graph, Equal Coin Distribution, Random Coin Dropping, Google Page Ranking Using Web Graph, Implementing Page Rank Using Points , Distribution Method , Implementing PageRank Using Random Walk Method. Cascading Behaviour in Networks: Diffusion in Networks, Modelling Diffusion, Impact of Communities on Diffusion	06
4	Power Laws and Rich-Get-Richer Phenomena : Detecting the Presence of Powerlaw, Rich Get Richer Phenomenon: Barabasi-Albert Model, Erdos- Renyi Model, Epidemics- An Introduction, Simple Branching Process for Modeling Epidemics, SIR and SIS spreading models, Comparison between SIR and SIS spreading models	08
5	Small World Phenomenon: Small World Effect - An Introduction Milgram's Experiment, The Generative Model, Pseudocores (How to go viral on web): Programming illustration- Small world networks , Programming illustration	06
	Total	30

Social Network Data Analytics Hardcover – 23 March 2011 by Charu C. Aggarwal Springer

"Social Computing and Behavioral Modeling" by Huan Liu and John Salerno, Springer

"Web 2.0 and Social Computing" by Davina Rungen Lambert

Jodhpur Institute of Engineering & Technology
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V Semester: (Computer Science and Engineering)

5CS5-12: Social Computing

Credit: 2 **Max. Marks: 100(IA: 30, ETE: 70)**

2L+0T+0P **End Term Exam: 2 Hours**

Course Outcomes (CO):

CO1	Understand the range of social computing applications and concepts.
CO2	Understand and apply concepts of computational models underlying social computing
CO3	Carry out simple forms of social analytics, involving network and language models, applying existing analytic tools on social information.
CO4	Design and launch social computing applications.
CO5	Understand the broad aspects of, and implement, richer social computing models in social computing applications.
CO6	Evaluate emerging social computing applications, concepts, and techniques in terms of key principles.

Jodhpur Institute of Engineering & Technology
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V Semester: (Computer Science and Engineering)

5CS5-13: Advanced Computer Architecture

Credit: 2 **Max. Marks: 100(IA: 30, ETE: 70)**
2L+0T+0P **End Term Exam: 3 Hours**

S. No.	Contents	Hours
1	**PARALLEL COMPUTER MODELS** Evolution of Computer architecture, system attributes to performance, Multi processors and multi computers, Multi-vector and SIMD computers, PRAM and VLSI models-Parallelism in Programming, conditions for Parallelism-Program Partitioning and Scheduling-program flow Mechanisms-Speed up performance laws-Amdahl's law, Gustafson's law-Memory bounded speedup Model.	07
2	**MEMORY SYSTEMS AND BUSES** Memory hierarchy-cache and shared memory concepts-Cache memory organization-cache addressing models, Aliasing problem in cache, cache memory mapping techniques-Shared memory organization-Interleaved memory organization, Lower order interleaving, Higher order interleaving. Backplane bus systems-Bus addressing, arbitration and transaction.	07
3	**ADVANCED PROCESSORS** Instruction set architectures: CISC and RISC. Scalar processor and Vector Processors: Super scalar processors, VLIW architecture. Multivector and SIMD computers: Vector processing principles, Multivector Multiprocessor(Cray Y-MP 816 system).	08
4	**MULTI PROCESSOR AND MULTI COMPUTERS** Multiprocessor system interconnects- Cross bar switch, Multiport memory-Hot spot problem, Message passing mechanisms-Pipelined processors-Linear pipeline, on linear pipeline-Instruction pipeline design-Arithmetic pipeline design.	08
5	**DATA FLOW COMPUTERS AND VLSI COMPUTATIONS** Data flow computer architectures-Static, Dynamic-VLSI Computing Structures-Systolic array architecture, mapping algorithms into systolic arrays, Reconfigurable processor array-VLSI matrix arithmetic processors-VLSI arithmetic models, partitioned matrix algorithms, matrix arithmetic pipelines.	06
	Total	36

TEXT BOOKS:

1. Kai Hwang, Advanced Computer architecture Parallelism , scalablity , Programmablity , Mc Graw Hill, N.Y, 2003
2. Kai Hwang and F.A.Briggs , Computer architecture and parallel processor‖' Mc Graw Hill, N.Y, 1999

3.Wiley-Interscience; (April 21, 2008) Advanced Computer Architecture and Parallel Processing
4.Kai Hwang ,Naresh Jotwani ,Advanced Computer Architecture, 3e **Jan 2016 McGraw-Hill Education**

REFERENCES:

1. David A. Patterson and John L. Hennessey, ―Computer organization and design‖ Elsevier, Fifth edition, 2014.

V Semester: (Computer Science and Engineering)
5CS5-13: Advance Computer Architecture

Credit: 2 **Max. Marks: 100(IA: 30, ETE: 70)**
2L+0T+0P **End Term Exam: 3 Hours**

Course Outcomes (CO):

CO1	Demonstrate concepts of parallelism in hardware/software
CO2	Discuss memory organization and mapping techniques.
CO3	Describe architectural features of advanced processors.
CO4	Interpret performance of different pipelined processors
CO5	Explain data flow in arithmetic algorithms
CO6	Development of software to solve computationally intensive problems.

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V Semester: (Computer Science and Engineering)

5CS4-21: Software Engineering Lab

Credit: 1.5 **Max. Marks: 75(IA: 45, ETE: 30)**

0L+0T+3P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	To develop a complete project on the given problem. Development of the problem statement To prepare SRS: Develop requirements specification for a given problem (The requirements specification should include both functional and non-functional requirements)	4
2	To prepare design Document Develop DFD Model (Level 0, Level 1 DFD and data dictionary) of the sample problem (Use of a CASE tool required).	2
3	Develop Structured design for the DFD model developed. (for Class level 1, 2, and 3).	4
4	Develop UML Use case model for a problem (Use of a CASE tool any of Rational rose, Argo UML, or Visual Paradigm etc. is required) (for Class level 1, 2, and 3).	4
5	Develop Sequence Diagrams for any case studies.	4
6	Develop Flow-Charts to understand basic problem solving technique by the help of tool.	4
7	Perform various estimation techniques on the given problem	2
8	To develop test cases using various testing techniques (unit and integration testing)	2

Jodhpur Institute of Engineering & Technology
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V Semester: (Computer Science and Engineering)

5CS4-22: Machine Learning Lab

Credit: 1.5 **Max. Marks: 75(IA: 45, ETE: 30)**

0L+0T+3P **End Term Exam: 3 Hours**

Description:

1. The programs can be implemented in Python.
2. Data sets can be taken from standard repositories Kaggle or UCI repository like Swedish Auto Insurance Dataset, Wine Quality Dataset, Pima Indians Diabetes Dataset, Sonar Dataset, Banknote Dataset, Iris Flowers Dataset, Abalone Dataset, Ionosphere Dataset, Wheat Seeds Dataset, Boston House Price Dataset.

SN	Contents	Hours
1	Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file	3
2	Find out if there is any correlation between the two variables; find the best fit line for the dataset.	3
3	Apply linear regression on any of the standard datasets mentioned, interpret and predict the testing data.	3
4	Write a program to implement logistic regression on standard dataset. Identify confusion matrix and interpret the results.	3
5	Demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.	3
6	Implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.	3
7	Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Calculate the accuracy, precision, and recall for your data set.	3
8	Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.	3
9	Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions and also Write a program to implement Principal Component Analysis.	3
10	To Apply Apriori Algorithm on the dataset given below. Find association rules for the subsets.	3
12	To develop a complete real world application based on any algorithm used above	6

Jodhpur Institute of Engineering & Technology
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V Semester: (Computer Science and Engineering)

5CS4-23: Android App Development Lab

Credit: 1.5 **Max. Marks: 75(IA: 45, ETE: 30)**

0L+0T+3P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Design an application that contains phone contacts in vertical linear manner. Selected contact appears at the top of the list with a large italicized font and a blue background.	3
2	Create an application that uses Layout Managers and Event Listeners.	3
3	Develop a standard calculator application to perform basic calculations like addition, subtraction, multiplication and division.	3
4	Devise an application that draws basic graphical primitives (rectangle, circle) on the screen.	3
5	Build a mobile application that create, save, update and delete data in database.	3
6	Build an application that implements multi-threading	3
7	Develop a mobile application that uses GPS location information and also Implement an application that creates an alert upon receiving message.	3
8	To develop a real time application using all the above-mentioned.	9

Jodhpur Institute of Engineering & Technology
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V Semester: (Computer Science and Engineering)
5CS1-MNC: Professional Ethics in Engineering

Credit: 0 **Max. Marks: 100(IA: 100)**
2L+0T+0P

S. No.	Contents	Hours
1	**Introduction to Professional Ethics in Engineering-** Human Values: – Cooperation, Commitment, Empathy, and Self-confidence. **Engineering Ethics**: Models of professional roles, Theories about right action, Self-interest, Customs and Religion, Uses of Ethical Theories. **Engineering as Experimentation**: Engineers as responsible Experimenters, A Balanced Outlook on Law.	6
2	**Digital Information and Ethics -** Basics of Digital System and Digital Information, Digital Ethics and Privacy, Code of Ethics, Software Engineering Code of Ethics	5
3	**Plagiarism-** Introduction to plagiarism: Meaning, Types of plagiarism detection, Detection Techniques- Text based, citation-based, Software based plagiarism detection tools, Law Related to Plagiarism in India, Plagiarism checking tools.	5
4	**Intellectual Property rights and Copyright-** Basics of IPR and copyright: Definition, Types of IPR, IPR vs Copyright, Copyright vs. Trademarks and Patents, copyright laws, Types of Copyrights, Real-world Example for IPR violation and Methods for recovery, Commercialization of IPR.	6
5	**Ethics in AI and Algorithmic Colonialism-** Basics of Laws and ethics associated with AI, how to prevent information breach, Introduction to Algorithm colonialism: definition, Current Scenario**.**	6
	Total	28

Textbooks:

1. Mike W. Martin and Roland Schinzinger, ―Ethics in Engineering‖, Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, ―Engineering Ethics‖, Prentice Hall of India, New Delhi, 2004
3. Handbook on Intellectual property rights in India by Rajkumar S. Adukia
4. The little book of plagiarism what it is and how to avoid it, 5th edition, April 2016 University of Stirling
5. Digital Systems : Principles and design by Raj Kamal

Reference:

1. Charles B. Fleddermann, ―Engineering Ethics‖, Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, ―Engineering Ethics – Concepts and Cases‖, Cengage Learning, 2009.
3. Edmund G Seebauer and Robert L Barry, ―Fundamentals of Ethics for Scientists and Engineers‖, Oxford University Press, Oxford, 2001.

Jodhpur Institute of Engineering & Technology
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Teaching & Examination Scheme

B. Tech.: Computer Science & Engineering
3rd Year – VI Semester

THEORY											
SNo	Category	Course		Contact hrs /week			Marks			Cr
		Code	Title	L	T	P	IA	ETE	Total	
1	PCC	6CS4-01	Introduction to Data Science	3	0	0	45	105	150	3
2		6CS4-02	Introduction to Deep Learning	2	1	0	45	105	150	3
3		6CS4-03	Cryptography and Information security	3	0	0	45	105	150	3
4		6CS4-04	Computer Graphics & Multimedia	3	0	0	45	105	150	3
5		6CS4-05	Distributed Algorithms	3	0	0	45	105	150	3
Professional Elective II (any one)				3	0	0	45	105	150	3
6	PEC	6CS5-11	Cloud Computing							
		6CS5-12	Software Architecture and design							
		6CS5-13	High Performance Computing							
Sub Total				17	1	0			900	18
PRACTICAL & SESSIONAL										
7	PCC / PEC	6CS4-21	Data Science Lab in Python	0	0	2	30	20	50	1
8		6CS4-22	Neural Network lab	0	0	2	30	20	50	1
9		6CS4-23	Security Lab	0	0	2	30	20	50	1
10		6CS4-24	Distributed Algo (Hadoop) Lab	0	0	2	30	20	50	1
11		6CS4-25	Multimedia and Animation lab	0	0	2	30	20	50	1
12	SODECA	6CS8-00	Social Outreach, Discipline &Extra Curricular Activities						25	0.5
Sub Total				0	0	10			275	5.5
TOTAL OF VI SEMESTER				16	2	10			1175	23.5

Mandatory Non Credit course

1	MNC	6CS-MC1	Macro Economics and Indian Economy	2	0	0	0	0	100	0

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*
ETE: *End Term Exam,* ***IA:*** *Internal Assessment*

VI Semester: (Computer Science and Engineering)
6CS4-01: Introduction to Data Science

Credit: 3 **Max. Marks: 150(IA: 45, ETE:105)**
3L+0T+0P **End Term Exam: 3 Hours**

S.No.	Contents	Hours
1	Introduction to Data Science – Evolution of Data Science – Data Science Roles – Stages in a Data Science Project – Applications of Data Science in various fields – Data Security Issues. Overview of data science tools- R and Python	7
2	Data Collection and Data Pre-Processing Data Collection Strategies – Data Pre-Processing Overview – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization.	8
3	Exploratory Data Analytics Descriptive Statistics – Mean Standard Deviation, Skewness , Kurtosis and Correlation Statistics	8
4	Model Development Simple and Multiple Regression – Model Evaluation using Visualization – Residual Plot – Distribution Plot – Polynomial Regression and Pipelines – Measures for In-sample Evaluation – Prediction and Decision Making.	7
5	Model Evaluation Generalization Error – Out-of-Sample Evaluation Metrics – Cross Validation – Overfitting – Under Fitting and Model Selection – Prediction by using Ridge Regression – Testing Multiple Parameters by using Grid Search.	6
		36

Textbooks:

1. Machine Learning, Tomm. Mitchell, Mc Graw Hill Publication.
2. The hundred-page Machine Learning, Andriy Burkov Publication.
3. Machine Learning, V. K. Jain, Khanna Publication.
4. Machine Learning, Amit K Das Saikat Dutt, Subramanian Chandramouli, Pearson Publication.

Reference:

1. David Dietrich, Barry Heller, Beibei Yang, “Data Science and Big data Analytics”, EMC 2013
2. Raj, Pethuru, “Handbook of Research on Cloud Infrastructures for Big Data Analytics”, IGI Global.

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6CS4-01: Introduction to Data Science

Credit: 3 **Max. Marks: 150(IA: 45, ETE:105)**

3L+0T+0P **End Term Exam: 3 Hours**

Course Outcomes (CO):

CO1	To Understand the fundamental concepts of data science
CO2	To be able to evaluate the data analysis techniques for applications handling large data and demonstrate the data science process
CO3	To Understand concept of machine learning used in the data science process
CO4	To apply data pre-processing techniques and utilize Matrix decomposition techniques to perform data analysis
CO5	To visualize and present the inference using various tools.
CO6	To Learn to think through the ethics surrounding privacy, data sharing.

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VI Semester: (Computer Science and Engineering)
6CS4-02: Introduction to Deep Learning

Credit: 3 **Max. Marks: 150(IA: 45, ETE:105)**
2L+1T+0P **End Term Exam: 3 Hours**

S. No.	Contents	Hours
1	**Introduction:** A Neural Network, Human Brain, Models of a Neuron, Neural Networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence, and Neural Networks.	5
2	**Single Layer Perceptron:** Adaptive Filtering Problem, Unconstrained Organization Techniques, Linear Least Square Filters, Least Mean Square Algorithm, Learning Curves, Learning Rate Annealing Technique, Perceptron - Convergence Theorem. Multilayer Perceptron: Representation Power of MLPs, Sigmoid Neurons, Gradient Descent.	8
3	**Convolutional Neural Networks**: TensorFlow: Creating and Manipulating TensorFlow Variables, TensorFlow Operations, Neurons in Human Vision, Convolutional Layer, building a Convolutional Network, Visualizing Learning in Convolutional Networks, Learning Lower Dimensional Representations, Principal Component Analysis (PCA), Autoencoder Architecture, Implementing an Autoencoder in TensorFlow.	8
4	**Recurrent Neural Networks:** Recurrent Neural Networks, Challenges with Vanishing Gradients, Long Short-Term Memory (LSTM) Units. Tensor Flow Primitives for RNN Models, implementing a Sentiment Analysis Model, solving seq2seq Tasks with Recurrent Neural Networks, Memory Augmented Neural Networks: Neural Turing Machines, Attention Based Memory Access, Differentiable neural Computers (DNC), Memory Reuse, Temporal Linking, DNC Controller Network, Visualizing Implementing the DNC in TensorFlow.	8
5	**Reinforcement Learning**: Markov decision process (MDP), Markov decision process (MDP), policy evaluation using Monte Carlo, Policy iteration and Value iteration, Q-Learning, State-Action-Reward-State Action (SARSA).	7
		36

Textbooks:

1. Neural Networks a Comprehensive Foundations, Simon Haykin, PHJ edition
2. Artificial Neural Networks - B. Yegnanarayana Prentice Hall oflndia P Ltd 2005
3. Neural Networks in Computer Intell ige nce , Li-Min Fu MCGRAW HILL EDUCATION 2003
4. Nikhil Buduma, Nicholas Locascio, "Fundamentals of Deep Learning: Designing Ncx t-Gcneration Machine Intelligence Algorithms ", O'Reilly Media, 2017.
5. Li Deng and Dong Yu "Deep Learning Methods and Applications", Foundations and Trends in Sign Processing

Reference:

1. Neural Networks -James A Freeman David M S Kapura Pearson Education 2004 .
2. Introduction to Artificial Neural Systems Jacek M. Zurada, .JAICO Publishing House Ed . 2006.
3. Ian Goodfellow, Yoshua Bcngio, Aaron Courville, "Deep Learning (Adaptive Computation and Machine Leaming series", MlT Press, 20 I 7.
4. Sandro Skansi "Introduction to Deep Learning From Logical Calculus to Artificial intelligence " Springer 2018. 3. Michael Nielsen, Neural Networks and Deep Learning , Detennination Pr s, 2015.

VI Semester: (Computer Science and Engineering)

6CS4-02: Introduction to Deep Learning

Credit: 3 **Max. Marks: 150(IA: 45, ETE:105)**

2L+1T+0P **End Term Exam: 3 Hours**

Course Outcomes (CO)

CO1	To understand Model Neuron and Neural Network, and to analyze ANN learning, and its applications
CO2	Understanding different single layer/multiple layer Perception learning algorithms.
CO3	To understand the design of CNN using deep learning principles
CO4	To understand the design of RNN and its challenges.
CO5	To understand the concept of Reinforcement Learning with respect to various algorithms.
CO6	Applying the concept of artificial neural network and deep learning algorithms on real life scenarios.

VI Semester: (Computer Science and Engineering)
6CS4-03: Cryptography and Information security

Credit: 3 **Max. Marks: 150(IA: 45, ETE: 105)**
3L+0T+0P **End Term Exam: 3 Hours**

UNIT	CONTENTS	Hours
I	Overview of security: Threats, risks, consequences, sources of threat, Classification of attacks, Preventive measures. Cryptography Techniques: Historical Perspective, Substitution Ciphers, Transpositions. The DES (Data Encryption Standard) algorithm, The AES(Advanced Encryption standard) Encryption Algorithm. Public Key Cryptography: sharing a secret key using Diffe-Hellman, RSA cryptosystem, Rabin cryptosystem, Elgamal cryptosystem, Elliptic curve cryptosystem	8
II	Cryptographic Hash Functions and their applications: Simple hash functions, its requirements and security, Hash functions based on Cipher Block Chaining, Secure Hash Algorithm (SHA). Message Authentication Codes, its requirements and security, MACs based on Hash Functions, Macs based on Block Ciphers. Digital Signature, its properties, requirements and security, various digital signature schemes (Elgamal and Schnorr).	8
III	Program Security: Secure Programs, Non malicious Program Errors, Viruses and other malicious code, Targeted malicious code, Controls against program threats, Protection in operating system, memory and address protection. File protection Mechanisms, User Authentication, designing trusted operating system security polices, models of security, trusted O.S design.	8
IV	Data base Security: Security requirements, Reliability and integrity, Sensitive data, Inference, multilevel database, proposals for multilevel security. Security in Network: Threats in Network, Network Security Controls, Firewalls, Intrusion Detection Systems, Secure E-Mail.	6
V	Administering Security: Security Planning, Risk Analysis, Organizational Security policies, Physical Security. Legal Privacy and Ethical Issues in Computer Security: Protecting Programs and data, Information and the law, Rights of Employees and Employers, Software failures, Computer Crime, Praia, Ethical issues in Computer Security	6

Text Books:

1. Security in Computing, Fourth Edition, by Charles P. Pfleeger, Pearson Education
2. Understanding Cryptography: A Textbook for Students and Practitioners by Christof Paa and Jan Pelzl , Springer ISBN: 3642041000
3. Modern Cryptography: Theory and Practice, by Wenbo Mao, Prentice Hall.

VI Semester: (Computer Science and Engineering)
6CS4-03: Cryptography and Information security

Credit: 3 **Max. Marks: 150(IA: 45, ETE:105)**
3L+0T+0P **End Term Exam: 3 Hours**

Course Outcomes (CO):

After Successful completion of this course, the students will be able to :

CO1	Impart the basic concepts of Cryptography and Network Security, and relate it to mathematical concepts of substitution and transposition techniques along with types of ciphers.
CO2	Acquire the knowledge of various modes of block of ciphers techniques and design the concepts of DES and AES algorithms.
CO3	Understand the various private and public key algorithms such as RSA, Elgamal etc., implemented in network security along with its encryption and decryption.
CO4	Acquire the knowledge of message authentication using well-known signature scheme. And also describe existing authentication protocols such as SHA, MD5.
CO5	Acquire the knowledge of key distribution protocols with respect to X.509, PGP protocols, and also Understand the various security aspects with regard to SSL and HTTPS.
CO6	Evaluate the various types of cryptography techniques and implement a problem-based solution in computer system.

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VI Semester: (Computer Science and Engineering)
6CS4-04: Computer Graphics & Multimedia

Credit: 3 **Max. Marks: 150(IA: 45, ETE: 105)**
3L+0T+0P **End Term Exam: 3 Hours**

S.No.	Contents	Hours
1	Basic of Computer Graphics: Basic of Computer Graphics, Applications of computer graphics, Display devices, Random and Raster scan systems, Graphics input devices, Graphics software and standards.	4
2	Scan Conversion: Points, lines, circles and ellipses as primitives, scan conversion algorithms for primitives. Character attributers. Aliasing and introduction to Anti-Aliasing (No anti-aliasing algorithm).	8
3	2D & 3D Co-ordinate system : Transformations (translation, rotation, scaling), matrix representation, homogeneous coordinates, composite transformations, reflection and shearing, viewing pipeline and coordinates system, window-to-viewport transformation, clipping including point clipping, line clipping (cohen-sutherland, Liang- bersky, NLN), polygon clipping.	9
4	Illumination and Colour Models: Image and Object space, Depth Buffer Methods, Hidden Facets removal, Scan line algorithm, Area based algorithms. Curves and Splines: Parametric and Non parametric Representations, Bezier curve, Bspline Curves. Basic illumination model, diffuse reflection, specular reflection, phong shading, Gourand shading, ray tracing, color models like RGB, YIQ, CMY, HSV	8
5	Multimedia & Animation: Multimedia components, Multimedia Input/output Technologies: Storage and retrieval technologies, Architectural considerations, file formats. Animation: Introduction, Rules, problems and Animation techniques.	7
		36

Text Books:

1. "Computer Graphics", by Hearn and Baker, Pub:PHI.
2. Multimedia Systems Design, Prabhat Andleigh and Thakkar, PHI.

Reference Books:

1. "Computer Graphics-Principles and Practice" by J.Foley, J.Hughes, Pub: Pearson.
2. Multimedia Information Networking, N.K.Sharda, PHI.

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VI Semester: (Computer Science and Engineering)

6CS4-04: Computer Graphics & Multimedia

Credit: 3 **Max. Marks: 150(IA: 45, ETE:105)**

3L+0T+0P **End Term Exam: 3 Hours**

Course Outcomes (CO):

CO1	Understand the basics of computer graphics, different graphics systems and applications of computer graphics.
CO2	Understand the working of graphics hardware and become familiar with building approach of graphics system components and algorithms related with them.
CO3	Apply geometrical transformations on graphical problem solving and become familiar with techniques of clipping and filling in 2D and 3D Co-ordinate system.
CO4	Provide an understanding of how to scan convert the basic geometrical primitives, how to transform the shapes to fit them as per the picture definition and their representation.
CO5	Prepares students for activities involving in design, development and testing of modeling, rendering, shading and its related technologies example like virtual reality.
CO6	Develop skill to generate computer graphics animation software and multimedia.

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VI Semester: (Computer Science and Engineering)

6CS4-05: Distributed Algorithms

Credit: 3 **Max. Marks: 150(IA: 45, ETE: 105)**

3L+0T+0P **End Term Exam: 3 Hours**

S. No.	Contents	Hours
1	Properties of distributed algorithms: Time and message complexity, Safety and liveliness properties, Time in an asynchronous system. Leader election in synchronous ring networks. Leader election in rings. Basic computational tasks in general synchronous networks: leader election. Breadth-first search. Broadcast and converge cast. Shortest paths.	8
2	Fault-tolerant consensus. Link failures: the two general's problem. Process failures (stopping, Byzantine). Algorithms for agreement with stopping and Byzantine failures. Exponential information gathering.	7
3	Synchronizers. Synchronizer applications. Synchronous vs. asynchronous distributed systems. Time, clocks, and the ordering of events. State-machine simulation. Vector timestamps. Stable property detection. Distributed termination. Global snapshots. Deadlock detection.	7
4	Asynchronous shared-memory systems. The mutual exclusion problem. Mutual exclusion algorithms. Shared-memory multiprocessors. Contention, caching, locality. Practical mutual exclusion algorithms. Reading/writing locks.	7
5	Self-stabilizing algorithms Timing-based systems. Modeling and verification. Timing-based algorithms for mutual exclusion and consensus. Clock synchronization.	7
	Total	36

Text Books:

1. Lynch, Nancy. *Distributed Algorithms*. Burlington, MA: Morgan Kaufmann, 1996. ISBN: 9781558603486.
2. Gerlad Tel, "Introduction to Distributed Algorithms" Cambridge University Press.
3. Dolev, Shlomi. *Self-Stabilization*. Cambridge, MA: MIT Press, 2000. ISBN: 9780262041782.

Jodhpur Institute of Engineering & Technology
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VI Semester: (Computer Science and Engineering)

6CS4-05: Distributed Algorithms

Credit: 3 **Max. Marks: 150(IA: 45, ETE:105)**

3L+0T+0P **End Term Exam: 3 Hours**

Course Outcomes (CO):

CO1	To Understand the design principles in distributed systems and the architectures for distributed systems.
CO2	Apply various distributed algorithms related to clock synchronization, con currency control, deadlock detection, load balancing, voting etc.
CO3	Analyze the design and functioning of existing distributed systems and file systems.
CO4	Implement different distributed algorithms over current distributed platforms
CO5	Analyze fault tolerance and recovery in distributed systems and algorithms for the same.
CO6	To implement basic algorithms for failure detection, leader elections, broadcast and multicast, basic shared memory in distributed systems, agreement protocols, and group communication.

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VI Semester: (Computer Science and Engineering)

6CS5-11 Cloud Computing

Credit: 3 **Max. Marks: 150(IA: 45, ETE: 105)**

3L+0T+0P **End Term Exam: 3 Hours**

S. No.	Contents	Hours
1	Introduction: Objective, scope and outcome of the course. Cloud Computing: Nutshell of cloud computing, Enabling Technology, Historical development, Vision, feature Characteristics and components of Cloud Computing. Challenges, Risks and Approaches of Migration into Cloud. Ethical Issue in Cloud Computing, Evaluating the Cloud's Business Impact and Economics, Future of the cloud. Networking Support for Cloud Computing. Ubiquitous Cloud and the Internet of Things.	8
2	Cloud Computing Architecture: Cloud Reference Model, Layer and Types of Clouds, Services models, Data center Design and interconnection Network, Architectural design of Compute and Storage Clouds. Cloud Programming and Software: Fractures of cloud programming, Parallel and distributed programming paradigms-Map Reduce, Hadoop, High level Language for Cloud. Programming of Google App engine.	8
3	Virtualization Technology: Definition, Understanding and Benefits of Virtualization. Implementation Level of Virtualization, Virtualization Structure/Tools and Mechanisms, Hypervisor VMware, KVM, Xen. Virtualization: of CPU, Memory, I/O Devices, Virtual Cluster and Resources Management, Virtualization of Server, Desktop, Network, and Virtualization of data-center.	8
4	Securing the Cloud: Cloud Information security fundamentals, Cloud security services, Design principles, Policy Implementation, Cloud Computing Security Challenges, Cloud Computing Security Architecture. Legal issues in cloud Computing. Data Security in Cloud: Business Continuity and Disaster Recovery, Risk Mitigation, Understanding and Identification of Threats in Cloud, SLA-Service Level Agreements, Trust Management.	7
5	Scientific Applications – Health care, Geosciences and Biology. Business and Consumer Applications CRM and ERP, Social Networking, Media Applications and Multiplayer Online Gaming. Cloud Platforms in Industry: Amazon web services , Google App Engine, Microsoft Azure Design, Aneka: Cloud Application Platform -Integration of Private and Public Clouds Cloud applications: Protein structure prediction, Data Analysis, Satellite Image Processing, CRM	7
	Total	36

Text Books:

1. Mastering cloud Computing by Rajkumar Buyya, Christian Vecchiola Publisher : McGraw Hill Education
2. George Reese Cloud Application Architectures, First Edition, O"Reilly Media 2009.
3. Cloud Computing, Kamal Kant Hiran, Ruchi Doshi, Temitayo Fagbola, Mehul Mahrishi, BPB Publications.

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VI Semester: (Computer Science and Engineering)

6CS5-11: Cloud Computing

Credit: 3 **Max. Marks: 150(IA: 45, ETE:105)**

3L+0T+0P **End Term Exam: 3 Hours**

Course Outcomes (CO):

CO1	Articulate the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing.
CO2	Identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.
CO3	Understanding the hardware necessary for cloud computing & compare the operation, implementation and performance of cloud computing systems, and the relative merits and suitability of each for complex data-intensive applications.
CO4	Explain the core issues of cloud computing such as security, privacy, and interoperability & choose the appropriate technologies, algorithms, and approaches for the related issues.
CO5	Make recommendations on cloud computing solutions for an enterprise & work in teams to contribute, evaluate, and feedback on case studies on different cloud computing solutions.
CO6	Install and use current cloud technologies AWS, Microsoft Azure, GAE, Aneka.

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VI Semester: (Computer Science and Engineering)

6CS5-12: Software Architecture and Design

Credit: 3 **Max. Marks: 150(IA: 45, ETE: 105)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction: Software Architecture, Software Design, Goal of Architecture, Role of Software Architect, Quality Attributes, Key Principles: Architectural Design, Types of Architecture, Design Process, Key Principles of Architecture and design.	6
3	Architecture Models: UML, Architecture View Model, Architecture Description Language, Object Oriented Paradigm: Introduction, Object Oriented Analysis, Object Oriented Design, Data Flow Architecture: Batch Sequential, Pipe and Filter Architecture	6
4	Data Centered Architecture: Repository and Block board Architecture Hierarchical Architecture: Main-subroutine, Master-Slave, Virtual Machine Architecture, Layered Style, Interaction Oriented Architecture: Model-View-Controller (MVC), MVC Applications, Presentation-Abstraction-Control (PAC).	8
5	Distributed Architecture: Centralized System vs. Distributed System, Client-Server Architecture, Multi-Tier Architecture (n-tier Architecture), Broker Architectural Style, Service-Oriented Architecture (SOA). Component Based Architecture: What is a Component? , Principles of Component−Based Design, Component-Level Design Guidelines, Conducting Component-Level Design.	8
6	User Interface: Graphical User Interface, Design of User Interface, User Interface Development Process, Design Considerations of User Interface. Architecture Techniques: Iterative and Incremental Approach, Architecture Review.	7
	Total	36

Text Books:

1. Head First Design Patterns. *O'Reilly, Freeman and Freeman.*
2. Design Patterns. *Erich Gamma, Richard Helm, Ralph Johnson and John Vlissides,* . Addison-Wesley, 1995.
3. An Introduction to Software Architecture. *David Garlan and Mary Shaw.*
4. Software Architecture – Foundations, Theory and Practice. *Taylor, Medvidovic, Dashofy.* Wiley 2009.
5. Exercises in Programming Style. Cristina Lopes, CRC Press, 2014.

Jodhpur Institute of Engineering & Technology
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VI Semester: (Computer Science and Engineering)

6CS5-12: Software Architecture and Design

Credit: 2 **Max. Marks: 150(IA: 45, ETE:105)**

3L+0T+0P **End Term Exam: 3 Hours**

Course Outcomes (CO):

CO1	Understand the architecture, creating it and moving from one to any, different structural patterns.
CO2	Analyze the architecture and build the system from the components.
CO3	Design creational and structural patterns.
CO4	Understand the behavioral patterns.
CO5	Understand a system using n-Tier architecture in SOA
CO6	Do a case study in utilizing architectural structures.

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VI Semester: (Computer Science and Engineering)

6CS5-13: High Performance Computing

Credit: 3 **Max. Marks: 150(IA: 45, ETE: 105)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Computational Science and Engineering, Applications, Review of Computational Complexity, Performance: metrics and measurements, Granularity and Partitioning, Locality: temporal/spatial/stream/kernel, Basic methods for parallel programming, Real-world case studies (drawn from multiscale, multi-discipline applications)and Parallel Processing Concepts), Levels of parallelism (instruction, transaction, task, thread, memory), Models (SIMD, MIMD, SIMT, SPMD, and Architectures: N-wide superscalar architectures, multi-core, multi-threaded	8
2	**High-End Computer Systems :** Memory Hierarchies, Multi-core Processors: Homogeneous and Heterogeneous, Shared-memory Symmetric Multiprocessors, Vector Computers, Distributed Memory Computers, Supercomputers and Petascale Systems, Application Accelerators / Reconfigurable Computing, Novel computers: Stream, multithreaded, and purpose-built	6
3	**Parallel Algorithms:** Parallel models: ideal and real frameworks, Basic Techniques: Balanced Trees, Pointer Jumping, Divide and Conquer, Partitioning, Regular Algorithms: Matrix operations and Linear Algebra, Randomization: Parallel Pseudo-Random Number Generators, Sorting, Monte Carlo techniques, Fundamental Design Issues in Parallel Computing: Synchronization, Mapping Parallel Algorithms onto Parallel Architectures	6
4	**Parallel architecture:** Inter-process communication, Synchronization, Mutual exclusion, Basics of parallel architecture, Parallel programming with message passing using MPI, Task and Functional Parallelism, Task Scheduling, Synchronization Methods,	8
5	**Parallel Programming:** Parallel Primitives (collective operations), I/O and File Systems, Parallel Matlabs (Parallel Matlab, Star-P, Matlab MPI), Partitioning Global Address Space (PGAS) languages (UPC, Titanium, Global Arrays) **Practical Examples of tree search uses MPI or Static and dynamic partitioning.**	8
	Total	36

Text Books:

1. High Performance Cluster Computing, Volume 1, Architecture and Systems, Rajkumar Buyya, Pearson Education.
2. Berman, Fox and Hey, Grid Computing – Making the Global Infrastructure a Reality, Wiley India.

REFERENCE BOOKS:

1. Kai Hwang, Zhiwei Xu, Scalable Parallel Computing: Technology, Architecture, Programming, McGraw Hill, 1998.
2. Parallel Computer Architecture: A hardware/Software Approach", by David Culler Jaswinder Pal Singh, Morgan Kaufmann, 1999.

Jodhpur Institute of Engineering & Technology
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VI Semester: (Computer Science and Engineering)

6CS5-13: High Performance Computing

Credit: 3 **Max. Marks: 150(IA: 45, ETE:105)**

3L+0T+0P **End Term Exam: 3 Hours**

Course Outcomes (CO):

CO1	To understand the role of HPC in science and engineering.
CO2	To be familiar with popular parallel programming paradigms.
CO3	To understand commonly used HPC platforms with particular reference to Cluster system.
CO4	To understand the means by which to measure, assess and analyse the performance of HPC applications.
CO5	To understand the role of administration, workload and resource management in an HPC management software.
CO6	To understand the mechanisms for evaluating the suitability of different HPC solutions to solving scientific problems.

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VI Semester: (Computer Science and Engineering)

6CS4-21: Data Science Lab in Python

Credit: 1 **Max. Marks: 50(IA: 30, ETE: 20)**

0L+0T+2P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	Working with Data in Python a) Reading files with open b) Writing files with open c) Loading data with Pandas d) Working with and Saving data with Pandas	2
2	Importing Datasets a) Understanding the Domain b) Understanding the Dataset c) Python package for data science d) Importing and Exporting Data in Python e) Basic Insights from Datasets	2
3	Cleaning and Preparing the Data a) Identify and Handle Missing Values b) Data Formatting c) Data Normalization Sets d) Binning e) Indicator variables	2
4	Summarizing the Data Frame a) Descriptive Statistics b) Basics of Grouping c) ANOVA d) Correlation	2
5	Model Development: Simple and Multiple Linear Regression on available datasets	4
6	Model Evaluation Using Visualization a) Introduction to Data Visualization b) Introduction to Matplotlib c) Basic Plotting with Matplotlib d) Using the available Datasets e) Line Plots	2
7	Working with Visualization Tools using available datasets a) Area Plots /Histograms/Bar Charts/Pie Charts b) Box Plots/Scatter Plots/Bubble Plots	6
8	Creating Maps and Visualizing Geospatial Data using available datasets a) Introduction to Folium b) Maps with Markers c) Choropleth Maps	2

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VI Semester: (Computer Science and Engineering)

6CS4-22: Neural Network Lab

Credit: 1 **Max. Marks: 50(IA: 30, ETE: 20)**

0L+0T+2P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	To Design and train a perceptron for AND Gate	2
2	To Design and train a perceptron for OR Gate	2
3	To design and train a perceptron training for EX-OR gate	2
4	To design and train a perceptron for NOT gate	2
5	To design and train a perceptron for identifying ODD and EVEN number.	2
6	To implement multi-layer feed forward network.	2
7	To demonstrate the line of separation.	2
8	To train a neural network to classify two clusters in a 2-dimensionalspace	2
9	Program to check whether a point in two dimension is above a line or below a line.	2
10	Program to create data sets and plotting the data values.	2
11	To implement Perceptron with one neuron on output using a bias value.	2
12	Make Prediction with k-nearest neighbors on the Iris Flowers Database.	2

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VI Semester: (Computer Science and Engineering)

6CS4-23: Security Lab

Credit: 1 **Max. Marks: 50(IA: 30, ETE: 20)**

0L+0T+2P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	Implement the following SUBSTITUTION & TRANSPOSITION TECHNIQUES concepts: a) Caesar Cipher b) Playfair Cipher c) Hill Cipher d) Vigenère Cipher e) Rail fence – row & Column Transformation	6
2	Implement the following algorithms a) DES b) RSA Algorithm c) Diffie-Hellman d) MD5 e) SHA-1	6
3	Implement the Signature Scheme - Digital Signature Standard	2
4	Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures (GnuPG)	2
5	Setup a honey pot and monitor the honeypot on network (KF Sensor)	2
6	Installation of rootkits and study about the variety of options	2
7	Perform wireless audit on an access point or a router and decrypt WEP and WPA.(Net Stumbler)	2
8	Demonstrate intrusion detection system (ids) using any tool (snort or any other s/w)	2

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VI Semester: (Computer Science and Engineering)

6CS4-24: Distributed Algo (Hadoop) Lab

Credit: 1 **Max. Marks: 50(IA: 30, ETE: 20)**

0L+0T+2P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	Implementation FTP Client	4
2	Implementation of Name Server including Name Node and Data Node (Client and Server)	2
3	Understanding of Working of NFS/DFS (includes exercises Configuration of NFS)	2
4	Implement Map and reduce Architecture including Map-Reduce Version 1 and Version 2	4
5	Implement Map and reduce Architecture including Spark.	4
6	Implement a word count application which counts the number of occurrences of each word a large collection of documents Using Map Reduce model.	4
7	Develop a real world application	4

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VI Semester: (Computer Science and Engineering)
6CS4-25: Multimedia and Animation Lab

Credit: 1 **Max. Marks: 50(IA: 30, ETE: 20)**
0L+0T+2P **End Term Exam: 2 Hours**

SN	Contents	Hours
Graphics Programming on 2D and 3D objects		
1	To implement Line, Circle and ellipse Attributes	4
2	To implement line drawing algorithms DDA line algorithm, Bresenham's line algorithm and also edge detection process.	2
3	To perform 2D and 3D transformations	2
4	To perform animation using any Animation software (Create Frame by Frame Animations using multimedia authoring tools)	4
Basics of Animation using open source image authoring tools		
5	To develop a presentation for a product using techniques like Guide Layer, masking and onionskin using authoring tools.	4
6	To perform basic operations on image using any image editing software	4
7	To implement the following features: Intensity, non-inversion, color effects of an image editing tool on JPEG image.	2
To show Multimedia effects using COCOS2D tool		
8	To simulate a basic game interface and create various image effects on interface using COCOS2D tool	4
9	To play various audio and video effects on image interface using COCOS2D tool	4

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VI Semester: (Computer Science and Engineering)
6CS1-MNC: Macroeconomics and Indian Economic Development

Credit: 0 **Max. Marks: 100(IA: 100)**
2L+0T+0P

UNIT	CONTENTS
1	**Money and Banking**: Money – meaning and functions, supply of money, Money creation by the commercial banking system. Banking- Meaning of Bank, Central bank and its functions, Control of Credit through Monetary Policy.
2	**National Income and Related Aggregates** : Meaning of National Income, Aggregates related to National Income: Gross National Product (GNP), Net National Product (NNP), Gross Domestic Product (GDP) and Net Domestic Product (NDP) – at market price, at factor cost; Methods of calculating National Income – Value Added or Product method, Expenditure method, Income method.
3	**Fiscal Policy and Business Cycle** :Fiscal policy- Meaning, Objective, types and components- Government expenditure and Government revenue, Business cycle- meaning and stages.
4	**Indian Economic Development**: A brief introduction of the state of Indian economy on the eve of independence. Economic Reforms since 1991: Features and appraisals of liberalization, globalization and privatization (LPG policy).
5	**Current challenges facing Indian Economy**: Rural development: Key issues – credit and marketing – role of cooperatives; agricultural diversification; alternative farming – organic farming. Employment: Growth and changes in work force participation rate in formal and informal sectors; problems and policies. Sustainable Economic Development: Meaning, Effects of Economic Development on Resources and Environment, including global warming

Text/References:

1. Macroeconomics, Stephen D. Williamson, Sixth Edition, Pearson publication.
2. Advanced Macroeconomics, David Romer, Fifth edition, MC Graw Hill Publication.
3. Macroeconomics (For MBA Students), Debes Mukherjee.
4. Macroeconomics, K.R. Gupta, R.K. Mandal, Amit Gupta.
5. Macro Economics, Dr. Amita Saxena, Dr. Saroj Kumar.

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Teaching & Examination Scheme
B. Tech.: Computer Science & Engineering
4th Year – VII Semester

SN	Category	Course		Contact hrs /week			Marks			Cr
		Code	Title	L	T	P	IA	ETE	Total	
THEORY										
1	PCC / PEC	7CS5-01	Internet of Things	**3**	**0**	**0**	**45**	**105**	**150**	**3**
2		7CS5-02	Information Retrieval	**3**	**0**	**0**	**45**	**105**	**150**	**3**
4	List of Open Elective Course I offered by the institute			**3**	**0**	**0**	**45**	**105**	**150**	**3**
	OEC									
Sub Total				**9**	**0**	**0**	**90**	**360**	**450**	**9**
PRACTICAL & SESSIONAL										
5	PEC	7CS5-21	IoT Lab	**0**	**0**	**3**	**45**	**30**	**75**	**1.5**
6	PSIT	7CS7-30	Industrial Training & Seminar(4 months training)	**0**	**0**	**3**	**195**	**130**	**325**	**6.5**
7	PSIT	7CS7-40	Project I	**0**	**0**	**2**	**60**	**40**	**100**	**2**
8	SODECA	7CS8-00	Social Outreach, Discipline &Extra Curricular Activities						**25**	**0.5**
Sub Total				**0**	**0**	**14**	**300**	**200**	**525**	**10.5**
TOTAL OF VII SEMESTER				**9**	**0**	**14**	**390**	**560**	**975**	**19.5**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*
ETE: *End Term Exam,* ***IA:*** *Internal Assessment*

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VII Semester: (Computer Science and Engineering)
7CS5-01: Internet of Things

Credit: 3 **Max. Marks: 150(IA: 45, ETE: 105)**
3L+0T+*0P* ***End Term Exam: 3 Hours***

S. No.	Contents	Hours
1	**Introduction to IoT:** Definition and characteristics of IoT, Design of IoT: Physical design of IoT, Logical Design of IoT- Functional Blocks, communication models, communication APIs, IoT enabling Technologies- Wireless Sensor Networks, Cloud computing, big data analytics, embedded systems. IOT Levels and deployment templates.	7
2	**IoT Hardware and Software:** Sensor and actuator, Humidity sensors, Ultrasonic sensor, Temperature Sensor, Arduino, Raspberry Pi, Lite OS, RIoT OS, Contiki OS, Tiny OS.	8
3	**Architecture and Reference Model:** Introduction, Reference Model and architecture, Representational State Transfer (REST) architectural style, Uniform Resource Identifiers (URIs). Challenges in IoT- Design challenges, Development challenges, Security challenges, and Other challenges. **IoT and M2M:** M2M, Difference and similarities between IoT and M2M, Software-defined networks, network function virtualization, the difference between SDN and NFV for IoT.	8
4	**IoT Physical Servers and Cloud Offerings:** Introduction to cloud storage models and communication API's, WAMP-AutoBahn for IoT, Python web application framework, Designing a RESTful web API, AMAZON web services for IoT, SkyNet IoT messaging platform, IoT case studies: Home Automation, Cities, Environment	9
5	**Case study of IoT Application Domain-specific** IOTs- Home automation, Cities, environment, Energy, Retail, Logistics, Agriculture, Industry, Health, and Lifestyles.	8
		40

Text / Reference Books:

1. Internet of Things: A Hands-on Approach by Vijay Madisetti & Arshdeep Bahga,
2. Internet of Things by Raj Kamal, Tata McGraw Hill Publication
3. The Internet of Things: Connecting Objects by Hakima Chaouchi Wiley publication."
4. Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and Beagle Bone Black by Donald Norris, The McGraw Hill publication.
5. The Silent Intelligence: The Internet of Things by Daniel Kellmereit

Jodhpur Institute of Engineering & Technology
Teaching Scheme
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VII Semester: (Computer Science and Engineering)
7CS5-01: Internet of Things

Credit: 3 **Max. Marks: 150(IA: 45, ETE: 105)**
3L+0T+*0P* ***End Term Exam: 3 Hours***

Course Outcomes

CO1:	Students will be able to able to understand building blocks of Internet of Things and its characteristics and Applications and the key components that make up an IoT system differentiate between the levels of the IoT stack.
CO2:	Students will be able to understand IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power and sensing modules along with the operating systems.
CO3:	Students will be able to understand the reference model and architecture on which IoT applications are developed and the challenges associated with them like security, design, development etc.
CO4:	Students will be able to learn about cloud storage and different communication APIs and how they work.
CO5:	Students will be able to prepare case studies for IoT In different domains like Industries, Healthcare, Agriculture, Lifestyle etc.
CO6:	Students will be able to Design IoT applications with the help of preparing projects designed for Raspberry Pi and Arduino.

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VII Semester: (Computer Science and Engineering)
7CS5-02: Information Retrieval

Credit: 3 **Max. Marks: (IA:45 , ETE: 105)**
3L+0T+0P **End Term Exam: 3 Hours**

S. No.	Contents	Hours
1	Introduction: Objective, scope and outcome of the course. Information Retrieval: Early Developments, The IR Problem, The User's Task. Information versus Data Retrieval, The IR System, The Software Architecture of the IR System The Retrieval and Ranking Processes, The Web: The e-Publishing Era, How the web changed Search. Practical Issues on the Web, How People Search, Search interfaces today, Visualization in Search Interfaces.	8
2	MODELING AND RETRIEVAL EVALUATION - Basic IR Models: Boolean Model, TF-IDF (Term Frequency/Inverse Document Frequency) Weighting, Vector Model, Probabilistic Model, Latent Semantic Indexing Model. Retrieval Evaluation: Retrieval Metrics, Precision and Recall, Reference Collection. User-based Evaluation, Relevance Feedback and Query Expansion, Explicit Relevance Feedback.	8
3	TEXT CLASSIFICATION AND CLUSTERING: A Characterization of Text Classification, Unsupervised Algorithms: Clustering, Naïve Text Classification. Supervised Algorithms: Decision Tree, KNN Classifier, SVM Classifier. Feature Selection or Dimensionality Reduction, Evaluation metrics, Accuracy and Error Organizing the classes, Indexing and Searching, Inverted Indexes, Sequential Searching Multi-Dimensional Indexing.	8
4	WEB RETRIEVAL AND WEB CRAWLING – The Web Search Engine Architectures: Cluster based Architecture, Distributed Architectures. Search Engine Ranking: Link based Ranking, Simple Ranking Functions, Learning to Rank, Evaluations -- Search Engine Ranking, Search Engine User Interaction: Browsing, Applications of a Web Crawler, Taxonomy, Architecture and Implementation, Scheduling Algorithms, Evaluation.	8
5	RECOMMENDER SYSTEM - Recommender Systems Functions, Data and Knowledge Sources. **Recommendation Techniques**: Basics of Content-based Recommender Systems, High Level Architecture, Advantages and Drawbacks of Content-based Filtering. Collaborative Filtering, Matrix factorization models, Neighborhood models.	8
	Total	40

Text / Reference Books:

1. Ricardo Baeza- Modern Information Retrieval: behind Search, 2nd Edition, ACM Press Books, 2011.
2. Ricci, F, Rokach, L. Shapira, B.Kantor, ―Recommender Systems Handbook‖, First Edition, 2011.
3. C. Manning, P. Raghavan, and H. Schütze, ―Introduction to Information Retrieval, Cambridge University Press, 2008.
4. Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, ―Information Retrieval: Implementing and Evaluating Search Engines, The MIT Press, 2010.

Jodhpur Institute of Engineering & Technology
Teaching Scheme
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VII Semester: (Computer Science and Engineering)
7CS5-02: Information Retrieval

Credit: 3 **Max. Marks: (IA:45 , ETE: 105)**
3L+0T+0P **End Term Exam: 3 Hours**

Course Outcomes

CO1	Demonstrate genesis and diversity of information retrieval situations for text and hyper media.
CO2	Describe hands-on experience store, and retrieve information from www using semantic approaches.
CO3	Demonstrate the usage of different data/file structures in building computational search engines.
CO4	Analyze the performance of information retrieval using advanced techniques such as classification, clustering, and filtering over multimedia.
CO5	Analyze ranked retrieval of a very large number of documents with hyperlinks between them.
CO6	Demonstrate Information visualization technologies like Cognition and perception in the Internet or Web search engine.

Jodhpur Institute of Engineering & Technology
Teaching Scheme
(An Autonomous Institute affiliated with Bikaner Technical University)

VII Semester: (Computer Science and Engineering)
7CS5-21: IoT LAB

Credit: 3 **Max. Marks: 75 (IA: 45, ETE:30)**
L+0T+3P **End Term Exam: 3 Hours**

1	Study the fundamental of IoT software's and components. Start Raspberry Pi and try various Linux commands in command terminal window: ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo, cron, chown, chgrp, ping etc.
2	Perform following experiment using Raspberry Pi/Arduino a) Light an LED through Python program b) Get input from two switches and switch on corresponding LEDs c) Flash an LED at a given on time and off time cycle, where the two times are taken from a file.
3	To design logical circuit for display of decimal number on 7-segment LED display using Arduino/Raspberry Pi.
4	To interface LED/Buzzer with Arduino / Raspberry Pi and write a program to turn on LED for 1 second after every 2 seconds.
5	To interface push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn on LED when push button is pressed or at sensor is detected.
6	To interface DHT 11 sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.
7	Write a program on Arduino/ Raspberry Pi to upload temperature and humidity data to ThingSpeak Cloud using ThingSpeak MQTT broker.
8	Real Time Projects based on IoT like: Weather Monitoring System Home Automation System Smart Irrigation System

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Teaching & Examination Scheme
B. Tech.: Computer Science & Engineering
4th Year – VIII Semester

SN	Category	Course		Contact hrs /week			Marks			Cr
		Code	Title	L	T	P	IA	ETE	Total	
THEORY										
1	PEC	8CS5-01	Natural Language Processing	**3**	**0**	**0**	**45**	**105**	**150**	**3**
		8CS5-02	Computer Vision	**3**	**0**	**0**	**45**	**105**	**150**	**3**
2	List of Open Elective Course II offered by the institute			**3**	**0**	**0**	**45**	**105**	**150**	**3**
Sub Total				**9**	**0**	**0**	**90**	**360**	**450**	**9**
PRACTICAL & SESSIONAL										
4	PEC	8CS6-21	NLP LAB	**0**	**0**	**3**	**45**	**30**	**75**	**1.5**
5	PEC	8CS6-22	Computer Vision Lab	**0**	**0**	**3**	**45**	**30**	**75**	**1.5**
6	PSIT	8CS7-31	Project II	**0**	**0**	**8**	**90**	**60**	**150**	**3**
7	SODECA	8CS8-00	Social outreach Discipline & Extra-Curricular Activities						**25**	**0.5**
Sub Total				**0**	**0**	**14**	**180**	**120**	**375**	**6.5**
TOTAL OF VIII SEMESTER				**9**	**0**	**14**	**270**	**480**	**725**	**15.5**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*
ETE: *End Term Exam,* ***IA:*** *Internal Assessment*

Jodhpur Institute of Engineering & Technology
Teaching Scheme
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VIII Semester: (Computer Science and Engineering)
8CS5-01: Natural Language Processing

Credit: 3 **Max. Marks: (IA: 45, ETE:105)**
3L+0T+0P **End Term Exam: 3 Hours**

S. No.	Contents	Hours
1	**Introduction To NLP:** Phases of NLP, Knowledge in Speech and Language Processing, Ambiguity, Models and Algorithms. **Words:** Regular Expressions, Survey of English Morphology, Text Normalization: Word and Sentence Tokenization, Stemming and Lemmatization. Minimum Edit distance. **N-gram:** Counting Words in Corpora, Simple (Unsmoothed) N-gram, Evaluating Language Models (Perplexity).	**8**
2	**Syntactic Analysis:** English Word Classes, The Penn Treebank Part-of-Speech Tag set. **Part-of-Speech Tagging:** Rule-Based and HMM Part-of-Speech Tagging. Markov Chain, The Hidden Markov Model.	**8**
3	**Semantic Analysis:** Representation of Sentence Meaning: Computational Desiderata for Representations, Model Theoretic Semantics, First-Order Logic, Event and State Representations, Description Logics, Semantic roles, Semantic Role labelling.	**8**
4	**Sequence Parsing with Recurrent Networks:** Simple Recurrent Networks, Applications of RNNs and Deep Networks: Stacked and Bidirectional RNNs, Managing Context in RNNs: LSTMs and GRUs, Words, Characters, and Byte-Pairs.	**10**
5	Case Study: Sentiment Classification, Dialog Systems, and Chabot's.	**6**
	Total	**40**

Text Books/ References:

1. James A.. Natural language Understanding 2e, Pearson Education, 1994. (E-book)
2. Bharati A., Sangal R., Chaitanya V.. Natural language processing: a Paninian perspective, PHI, 2000 (E-book)
3. Siddiqui T., Tiwary U. S.. Natural language processing and Information retrieval, OUP, 2008.

Jodhpur Institute of Engineering & Technology
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VIII Semester: (Computer Science and Engineering)
8CS5-01: Natural Language Processing

Credit: 3 **Max. Marks: (IA: 45, ETE:105)**
3L+0T+0P **End Term Exam: 3 Hours**

Course Outcomes

The students will be able to:

CO1	Understand the basics of NLP Phases and Ambiguities in Language and will be able to do text normalization.
CO2	Understand how information can be extracted from text automatically using concepts and methods from natural language processing including POS tagging, and parsing using the Penn Treebank POS Tag set.
CO3	Represent the various models using first order logic and semantic role labeling.
CO4	Recognize the Sequence Parsing with Recurrent Networks using managing context in RNNs by LSTMs and GRUs.
CO5	Determine the most appropriate NLP-based AI systems for question answering, text summarization, and machine translation

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VIII Semester: (Computer Science and Engineering)

8CS6-02 : Computer Vision

Credit: 3 **Max. Marks: 150(IA:45, ETE:105)**

3L+0T+0P **End Term Exam: 3 Hours**

S.No.	Contents	Hours
1	Introduction: Computer Vision, Relation between Computer Vision and Image Processing. Image Digitization (Sampling and Quantization), Image acquisition, color image representation.	4
2	Image Transformation & Filtering: Intensity transform functions, histogram processing, Spatial filtering, Frequency domain filters, Basics of Wavelet Transforms. Image Restoration: Image degradation and restoration process, Noise Models, Noise Filters, degradation function, Inverse Filtering.	12
3	Image Segmentation & Representation: Point, Line and Edge Detection, Thresholding, Edge and Boundary linking, Region Based Segmentation, Boundary representation, Boundary Descriptors. Image Compression: Coding redundancy, Interpixel redundancy, Psychovisual redundancy, JPEG Compression.	8
4	Object recognition: Hough transforms and other simple object recognition methods, Shape correspondence and shape matching, Principal component analysis; Shape priors for recognition.	8
5	Motion Estimation- Basic Concept of Motion Estimation, Forwards Prediction, Picture Encoding, Iframe, Matching criterion, Search window, Displacement, Matching Pixel Count.	8
		40

Reference Books:-

1. R. C. Gonzalez and R. E. Woods, “Digital Image Processing”, Addison Wesley Longman, Inc
2. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill.

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VIII Semester: (Computer Science and Engineering)

8CS6-02 : Computer Vision

Credit: 3 **Max. Marks: 150(IA:45, ETE:105)**

3L+0T+0P **End Term Exam: 3 Hours**

Course Outcomes

The students will be able to:

CO1	Students will be able to identify basic concepts, terminology, theories, models and methods in the field of image processing and computer vision.
CO2	Students will be able to describe known principles of human visual system, ·
CO3	Evaluate the techniques for image enhancement and image restoration.
CO4	Students will be able to describe basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, motion and object recognition.
CO5	Students will be able to interpret image motion estimation techniques

Jodhpur Institute of Engineering & Technology
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VIII Semester: (Computer Science and Engineering)

8CS6-21: Natural Language Processing Lab

Credit: 3 **Max. Marks: 75(IA:45, ETE:30)**

0L+0T+3P **End Term Exam: 3 Hours**

S. No.	List of Experiments
1	To convert the text into tokens and find the word frequency.
2	To demonstrate a bigram language model.
3	To demonstrate a trigram language model
4	To perform Lemmatization and Stemming on word/sentence
5	To generate a regular expression for the given text.
6	To Identify parts-of Speech using Penn Treebank tag set.
7	To build a Chunker.
8	To find the synonym of a word using WordNet
9	To implement RNN for sequence labelling
10	To implement semantic role labelling to identify named entities
11	To translate the text using First-order logic
12	To implement POS tagging using Neural Language Model and LSTM
13	To implement Named Entity Recognizer
14	To implement word sense disambiguation by LSTM/GRU

Jodhpur Institute of Engineering & Technology
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VIII Semester: (Computer Science and Engineering)

8CS6-22: Computer Vision Lab

Credit: 1.5 **Max. Marks: 75(IA:45, ETE:30)**

0L+0T+3P **End Term Exam: 3 Hours**

S.No.	List of Experiments
1	To Perform Basic Image Handling and Processing operations on image - Read and Write an image file in java - Find the height and width of image - Print the RGB value of each pixel of an image
2	To perform Image Conversion - Convert Coloured image to Grayscale image - Generate Negative Image of Input image - Highlight Red, Green, Blue, Cyan, Magenta, Yellow colour of an image. - Coloured Image to Sepia Image Conversion
3	To Generate Mirror Image - Along x-axis, - Along y-axis - Along Diagonal
4	To perform Geometric transformation Translation, Rotation, Scaling, Cropping on an image
5	Drawing Functions - Circle, Line, Rectangle, Ellipse, Polylines, Arrowed lines Adding Text on Image
6	T perform Image Enhancement - Contrast Enhancement - Brightness Enhancement - Sharpness Enhancement
7	To insert Watermark in an Image
8	To perform image Filtering - Box Filters - Inverse Filter - Bilateral Filter
9	To perform Edge Detection - Canny Edge Detection - Hough Line Detection
10	To perform Face Detection.
11	To Detect the key points of an image Match the key points of two images
12	To Blend two images Draw Image Contours