VIVEKANANDA GLOBAL UNIVERSITY

Syllabus of
Master of Computer Application

Program Outcomes

PO1:	**Critical Thinking:** Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational and personal) from different perspectives
PO2:	**Effective Communication:** Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.
PO3:	**Social Interaction:** Elicit views of others, mediate disagreements and help reach conclusions in group settings.
PO4:	**Effective Citizenship:** Demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering
PO5:	**Ethics**: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.
PO6:	**Environment and Sustainability:** Understand the issues of environmental contexts and sustainable development.
PO7:	**Self-directed and Life-long Learning:** Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes.

Program Specific Outcomes (PSO)

PSO 1: To work productively as IT professional both at supportive and leadership roles.

PSO 2: To advance successfully in their chosen career path utilizing technical abilities, leadership
qualities, communication and interpersonal skills with high regard to legal and ethical responsibilities.

PSO 3: To build their profession adaptable to the changes in the technology with lifelong learning.

Evaluation Scheme

Marks Distribution:

Marks	Theory	Practical	Dissertation/Thesis
Maximum Marks	100	100	100
Internal Marks	40%	60%	20%
External Marks	60%	40%	80%

Internal Marks (Continuous Evaluation)

Type of Component	**Weightage to be given**
Theory Paper	
MidTerm1	10%
MidTerm2	10%
Class work Quiz(Minimum 3)	20%
Class work (Minimum 4 Assignments and one Project/Case study)	
Practical Paper	
Test1(Conduction)	15%
Test2(conduction)	15%
Quiz/Viva/Project (Minimum 4 Assignments and one Project/Case study)	30%

Practical and theory courses are mentioned in the form of P, where
P- Practical

Program Elective courses are clearly mentioned as “Program Elective” if more than one than “Program Elective-I, II,…….”

Open Elective courses are clearly mentioned as “Open Elective” if more than one than “Open Elective-I, II,…….”

Any zero credit courses are Treated as Pass/Audit Course

TEACHING AND EXAMINATION SCHEME FOR MCA

SEMESTER I

Course Code	Course Type	Course Name	Teaching Scheme	
			Internal	External
	CORE COURSE	Mathematical Foundation for Computer Application	30	70
	CORE COURSE	Fundamental of Computer and Programming in C	30	70
	CORE COURSE	Operating Systems	30	70
	CORE COURSE	Database Management System	30	70
	CORE COURSE	Software Engineering and Project Management	30	70
	CORE COURSE	Virtualization and Cloud Technology	30	70
	CORE COURSE	Web Technology Lab	30	70
		Trans- Disciplinary Project		
TOTAL				

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TEACHING AND EXAMINATION SCHEME FOR MCA

SEMESTER II

Course code	Course Type	Course Name	Teaching Scheme	
			Internal	External
	CORE COURSE	Object Oriented Programming using Java	30	70
	CORE COURSE	Data Structures and Algorithms Using C	30	70
	CORE COURSE	Computer Networks	30	70
	CORE COURSE	Machine Learning with Python	30	70
	PEC	Program Elective I	30	70
	CORE COURSE	Linux and Shell Programming	30	70
		Trans- Disciplinary Project	-	-
TOTAL				

AI - Artificial Intelligence		CTIS - Cloud Technology & Information Security	
Course Code	**Program Elective I**	**Course Code**	**Program Elective I**
	Introduction to Data Science		Cloud Architectural Patterns
	Data Mining & Warehousing		Cyber Crime and IT Law
	Data Visualization		Data Visualization

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TEACHING AND EXAMINATION SCHEME FOR MCA

(Electives in AI)

SEMESTER-III

Course Code	Course Type	Course Name	Teaching Scheme	
			Internal	External
	CORE COURSE	Design & Analysis of Algorithm	30	70
	CORE COURSE	Deep Learning	30	70
	CORE COURSE	Natural Processing Language	30	70
	Elective	Program Elective II	30	70
	CORE COURSE	Artificial Intelligence and Intelligent Agents	30	70
		Seminar	-	-
		Summer Internship	-	-
		Trans-Disciplinary Project	-	-
		Total		

AI - Artificial Intelligence

Course Code	Program Elective II
	Big Data Analytics
	Knowledge Engineering & Expert Systems
	Pattern Recognition
	Blockchain

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TEACHING AND EXAMINATION SCHEME FOR MCA

(Electives in CTIS)

SEMESTER-III

Course Code	Course Type	Course Name	Teaching Scheme	
			Internal	External
	CORE COURSE	Design & Analysis of Algorithm	30	70
	CORE COURSE	Storage and Data Center	30	70
	CORE COURSE	Cloud Web Services	30	70
	Elective II	Program Elective II	30	70
	CORE COURSE	Cryptography and Network Security	30	70
		Seminar	-	-
		Summer Internship	-	-
		Trans- Disciplinary Project	-	-
		Total		

Course Code	Program Elective II
	Cyber Forensics
	Ethical Hacking
	Blockchain
	Security Architecture

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TEACHING AND EXAMINATION SCHEME FOR MCA

SEMESTER-IV

ourse code	ourse type	Course Name	Teaching Scheme		
			Internal	External	
	PSIT	Project Research Project/Industrial Project / Industry Internship/Project in an academic institute / lab of national importance (Research Publications)	-	-	
		Trans- Disciplinary Project	-	-	
		Total	-	-	

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MCA

MATHEMATICAL FOUNDATION FOR COMPUTER APPLICATION

Semester I

COURSE OVERVIEW AND OBJECTIVES: The main objectives of this course to introduce the mathematical fundamentals and develop an understanding of a wide range of concepts in mathematics which are necessary for the students of MCA.

COURSE OUTCOME: The student would be able:
CO1: Capable of inquiring and understanding a wide range of concepts in mathematics.
CO2: Able to understand the algebraic concepts of mathematics in sets, relations, functions, and Matrices.
CO3: Able to understand the concepts of analytical geometry and vectors.
CO4: Analyse propositions and arguments in logic using truth tables.
CO5: Relate and integrate analytical geometry and vectors into real life contexts.

OUTLINE OF THE COURSE

Unit No	Title of **Unit**	Time Required for **Unit**(Hours)
1.	Sets, relations and functions	5
2.	Mathematical Logic	6
3.	Matrices and Determinants	6
4.	Vectors	6
5.	Statistics	7

Detailed Syllabus

Unit 1: Sets: Sets, Subsets, Equal sets, Universal sets, Finite and Infinite sets, Union, Intersection and Complement of sets, Cartesian product, cardinality of a set, De-Morgan's Laws(with proof).

Unit 2: Relations: Properties of relations, Equivalence Relation Functions: Types of functions, Composite and Inverse functions. (Illustrative examples and problems)

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Unit 3: Mathematical Logic: Proposition and Truth Values, Logical Connectives and their truth tables, Converse, Inverse and Contra positive, Tautology and Contradiction, Logical Equivalence.

Unit 4: Normal forms: Disjunctive normal forms, Conjunctive normal forms, Principal Disjunctive normal forms and Principal Conjunctive normal forms.

Unit 5: Matrices: Review of fundamentals: Definition of a Matrix, order, Types of matrices: Zero, row, column, square, diagonal, scalar, **Unit**, symmetric, skew-symmetric.

Unit 6: Determinant: Value of determinant of order 2x2, 3x3, minors, cofactors, adjoint, inverse of a matrix. Eigen values and Eigen vectors (without any theorems) only of order 2x2 matrices.

Unit 7: Cayley Hamilton theorem (only statement) – Verification of Cayley Hamilton theorem (only for 2x2 matices), Inverse of a matrix using Cayley- Hamilton theorem. (only for 2x2 matrices)

Unit 8: Vectors: Definition of vector and scalar, vector addition, dot and cross product,

Unit 9: projection of a vector on the other vector, area of parallelogram, area of a triangle, scalar triple product, volume of parallelepiped, vector triple product. (only Problems)

Unit 10: Statistics: Concepts of Random Variable, Probability & Probability Distribution, Mean & Variance of Probability Distribution, Statistical data,

Unit 11: Frequency Distributions, Mean, Variance & Standard Deviation of Data, Bivariate data

Unit 12: Concept of Dependent Independent Variable, Correlation, Linear Regression

Text Books:

1. Grewal, B.S., “Higher Engineering Mathematics”, 36th Edition
2. Satyrs S.S, “Engineering Mathematics”.
3. Peter V.O’Neil, “Advanced Engineering Mathematics”, 5th Edition.

Referential Books:

1. H.K. Dass, “Advanced Engineering Mathematics”, S. Chand & Comp
2. J.P. Chauhan, “MCA Mathematics Volume -1”, Krishna Publications.
3. Introduction to Mathematical Statistics - Hogg R V & Craig A L Tata Mc-Graw Hill

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CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7
CO1	2	-	2	3	3	—	—
CO2	1	2	3	2	2	—	—
CO3	3	1	2	3	3	—	—
CO4	1	2	1	1	2	—	—
CO5	2	1	2	1	1	—	—

CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	1	3	1
CO-2	—	—	—
CO-3	1	3	1
CO-4	—	—	—
CO-5	1	3	1

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MCA

FUNDAMENTAL OF COMPUTER AND PROGRAMMING IN C

Semester I

COURSE OVERVIEWAND OBJECTIVES:

- To setup the environment to run the C programs
- To understand concepts about Data Types and Looping techniques
- To understand and implement the different concepts of functions and arrays.
- To develop logics to solve problems using C language.

COURSE OUTCOME: After completion of this course students should be able to:-

CO1: To understand basics of computers and its peripheral devices..

CO2: To understand basics of C and use branching control statements and iterative control Statements.

CO3: Understand various categorization of operators into arithmetic, logical, relational, bitwise etc.

CO4: Debug the programs of any logical or syntactical errors to enhance problem solving skills.

CO5: Analyse the problem statement and decide their own logic to solve the problem using C Programming to improve employability.

OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the
1.	Introduction to Computers	10
2.	C Fundamentals and Control Statements	8
3.	Arrays	8
4.	Functions	8
5.	Structures	8

Detailed Syllabus

Unit 1: Introduction to computers: characteristics and limitations of computer, Block diagram of computer, types of computers, uses of computers, computer generations.

Unit 2: Input and output devices: Keyboard and mouse, inputting data in other ways, Types of

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Software: system software, Application software, commercial, open source, domain and free are software,

Unit 3: Memories: primary, secondary and cache memory. Windows basics: desktop, start menu, icons.

Unit 4: C Fundamentals: C structure, Simple I/O operations; Operators and Expressions: Operator precedence and associativity C program, bitwise operators, arithmetic expressions, evaluation of expressions;

Unit 5: Control Statements: Statements and blocks, switch–case statement, looping constructs; Decision Control Instructions, If, if-else, If-else-if, Nested if-else, Loop Control Instructions, For Loop, While Loop, Do While.

Unit 6: Arrays: arrays- Declaration Initialization, sorting;

Unit 7: Strings: String operations on strings, built-in string handling functions, programs on strings;

Unit 8: Functions: Modular programming, function declaration, definition and function call, Types of functions, function returning more values, function with operators,

Unit 9: function and Decision Statements, function and loop operators, function with Arrays

Unit 10: Structures: Declaring and Accessing Structure, variables Uses of Structures, Unions,
Unit 11: Storage Classes and Scoping: Automatic, Register, External, Static, Scope of a Variable,
Unit 12: File Input/Output: Command-line arguments,

Text Books:

1. E.Balaguruswamy, “Computing Fundamentals & C Programming”, TataMcGraw Hill, 2008.

Reference Books:

1. B. A. Forouzan & R. F. Gilberg “Computer Science – A structured programming Approach Using C”, 2011
2. E. Balaguruswamy, “Programming in ANSI” Tata McGraw Hill, 2011.

CO-PO Mapping

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COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7
CO1	3	3	2	—	—	2	—
CO2	3	3	-	—	—	-	—
CO3	2	2	2	—	—	3	—
CO4	3	3	2	—	—	2	—
CO5	2	2	2	-	-	2	-

CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	3	3	1
CO-2	2	3	1
CO-3	2	3	—
CO-4	3	2	—
CO-5	3	2	1

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PROGRAMMING IN C LAB

List of Experiments:

Basic Calculation:

1. Write a c program to display your Name, address and city in different lines.
2. Write a c program to perform all arithmetic operations.
3. Write a c program to convert the Fahrenheit into centigrade. Formula c= (F-32)/1.8
4. Write a c program to calculate the simple interest.
5. Write a c program to calculate the compound interest.
6. Write a program in C to display sum of first N natural numbers.
7. Write a c program to find the roots of the quadratic equation.

Conditional Statements

1. Write a C – program which used to determine type of triangle based on sides. Measure of sides input by the user. To check whether the triangle is isosceles, scalene or equilateral triangle. Hint: If all the sides are equal than equilateral, If any two sides are equal than isosceles otherwise scalene.
2. Write a program in C to which allow user to enter any arithmetic operator (+ - * /) and two integer values and display result according to selection of operator.
3. Write a program in C to calculate gross salary of employee using : 1. Gross Salary = Basic Pay + DA + HRA – PF. 2. DA = 30% If Basic Pay < 5000 otherwise DA = 45% of the Basic Pay. 3. HRA = 15% of Basic Pay. 4. PF = 12% of Basic Pay. Only basic pay will input by the user. Display Gross salary – DA – HRA – PF and basic salary
4. Student should fulfill the following criteria for admission: Mathematics >= 50 Physics >= 45 Chemistry >= 60 Total of all subject >= 170 OR Total of Mathematics + Physics >= 120 Accept the marks of all the three subjects from the user and check if the student is eligible for admission.
5. Write a program in C for grade calculation using if…else if ladder and switch Statement. Accept marks of 3 subjects calculate total and based on it calculate Grade.

Loop Programs

1. Program to display first N prime numbers. N is input by the user.
2. Program to display A to Z in upper case or lower case according to user selection.
3. Program which used to print A to Z and Z to A.
4. Program which ask for party to user until the user say yes (Using While)
5. Program which ask for party to user until the user say yes (Using Do While)
6. Program which check that whether the given number is palindrome or not.
7. Program to check that the given number is Armstrong or not.
8. Program which will display next nearest prime number of given integer number. For example next nearest prime of 5 is 7, for 8 is 11, for 7 is 11 (Using Do while)

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MCA

OPERATING SYSTEMS

Semester I

COURSE OVERVIEW AND OBJECTIVES: Understand the concept of system and its processes

COURSE OUTCOME:

The student would be able to:

CO1: Describe the basic components of an operating system and their role in implementations for general purpose, real-time, and embedded applications.

CO2: Define the concepts of processes, threads, asynchronous signals and competitive system resource allocation.

CO3: Explain what multi-tasking is and outline standard scheduling algorithms for multi-tasking.

CO4: Give an overview of system memory management.

CO5: Explain how file systems are implemented.

OUTLINE OF THE COURSE

Unit No	Title of **Unit**	Time Required for **Unit**(Hours)
1	OS concepts	6
2	Process management	5
3	Memory management	6
4	Inter process communication	7
5	Information management	7

Detailed Syllabus

Unit 1: Introduction- OS Concepts – Evolution of OS, OS Structures- Kernel, Shell, General Structure of MSDOS, Windows 2000, Difference between ANSI C and C++.

Unit 2: Introduction and need of operating system, layered architecture/logical structure of Operating system, Type of OS, operating system as resource manager and virtual machine,

Unit 3: OS services, BIOS, System Calls/Monitor Calls, Firmware- BIOS, Boot Strap Loader.

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Unit 4: Process Management- Process & Threads – Process States - Process Control Block. Process Scheduling – Operations on Processes, Threads,

Unit 5: CPU Scheduler – Preemptive and Non- Preemptive; Dispatcher, Scheduling Criteria, Concurrent Processes, Co-operating Processes, Precedence Graph, Hierarchy of Processes,

Unit 6: Critical Section Problem, Two process solution, Synchronization Hardware, Semaphores – Deadlock- detection, handling, prevention, avoidance, recovery, Starvation, Critical Regions, Monitors, Inter process communication.

Unit 7: Memory Management - Objectives and functions, Simple Resident Monitor Program (No design), Overlays – Swapping; Schemes – Paging – Simple, Multi-level Paging; Internal and External Fragmentation;

Unit 8: Virtual Memory Concept, Demand Paging - Page Interrupt Fault, Page Replacement Algorithms; Segmentation – Simple, Multi-level, Segmentation with Paging, Cache Memory.

Unit 9: Inter Process Communication: Virtual Memory– Concept, virtual address space, paging scheme, pure segmentation and segmentation with paging scheme hardware support and implementation details, memory fragmentation,

Unit 10: Overview of IPC Methods, Pipes, popen, pclose Functions, Coprocesses, FIFOs, System V IPC, Message Queues, Semaphores, Interprocess Communication Shared Memory, Client-Server Properties, Stream Pipes, Passing File Descriptors, An Open Server-Version 1, Client-Server Connection Functions.

Unit 11: Information Management - Files and Directories – Directory Structure –Directory Implementation – Linear List - Hash Table.

Unit 12: Device Management: Dedicated, Shared and Virtual Devices - Serial Access Devices, Direct Access Devices, Direct Access Storage Devices – Channels and Control **Unit**s – Disk Scheduling methods.

TextBooks:

1. Operating Systems Concepts – Silberschatz, Galvin, Wiley Publications (2008)

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2. Modern Operating Systems - Andrew S. Tenenbaum, Pearson Education Asia / PHI (2005)
3. Operating Systems – William Stallings, Pearson Education Asia (2002)

Reference Books:

1. UNIX System Programming Using C++,by Terrence Chan: Prentice Hall India, 1999.
2. Advanced Programming in UNIX Environment, by W. Richard Stevens: 2nd Ed, Pearson Education, 2005.

CO-PO Mapping

CO and PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-
CO3	-	3	-	-	-	-	-
CO4	-	-	2	-	-	-	-
CO5	-	-	-	-	-	1	-

CO-PSO Mapping

CO and PSO	PSO1	PSO2	PSO3
CO1	2	-	-
CO2	3	-	-
CO3	2	-	-
CO4	1	-	-
CO5	2	-	-

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MCA

DATABASE MANAGEMENT SYSTEM

Semester I

COURSE OVERVIEWAND OBJECTIVES: Understanding and implementation of data storage and organization and its applications

COURSE OUTCOME

The student would be able to:

CO 1: Describe the fundamental elements of database management systems.

CO 2: Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL

CO 3: understand Query Language.

CO 4: evaluate database anomalies and normalization

CO 5: understand transaction concepts, data mining and warehousing

OUTLINE OF THE COURSE

Unit No	Title of **Unit**	Time Required for **Unit**(Hours)
1	Introduction	5
2	Relational model	6
3	Relational database design	6
4	Internet databases	7
5	Advanced topics	8

Detailed Syllabus

Unit 1: Introduction-Database Systems versus File Systems, View of Data, Data Models, database languages, Database Users and Administrators. Transaction Management, Decision Support Systems, Components of a Database management System, Distributed Processing and Client- Server Architecture,

Unit 2: Entity-Relationship Model–Basic Concepts, Constraints, Keys, Design Issues, E-R Diagrams

Unit 3: Relational Model -Structures of relational databases, Integrity Constraints, Logical

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database Design, Tables, Views, and Data Dictionary. Relational Algebra, Relational Calculus.

Unit 4: SQL–Basic Structures, Query Handling, Embedded SQL, Open Database Connectivity (ODBC),Java Database Connectivity(JDBC),Triggers, Security and Authorization.

Unit 5: Query By Example (QBE), User Interfaces and Tools, Forms and Graphical User Interfaces. Report Generators. Overview of Relational Query Optimization

Unit 6: Relational Database Design-Functional Dependencies, Multi-valued Dependencies, Normal Forms, Decomposition in to Normalized Relations,

Unit 7: Physical Database Design–File Structures. Object-Relational Databases–Nested Relations, Complex Data types, Object- Relational Features in SQL:1999.

Unit 8: Internet Databases –World Wide Web, Client Side Scripting and Applets, Web Serversand Sessions, Services, Server Side Scripting.

Unit 9: XML–Structure of XML Data, XML Document Schema, XQuery, Storage of XML Data, XML Applications.

Unit 10: Advanced Topics-Fundamental Concepts of Transaction Management, Concurrency Control, Recovery Systems,

Unit 11: Data Analysis and OLAP. Introduction to Data Mining, Data Farming, Data Warehousing,

Unit 12: Spatial and Geographic Databases, Temporal databases and Multimedia Databases.

Text Books:

1. Date C J, " An Introduction to Database Systems", Addision Wesley
2. Korth, Silbertz, Sudarshan," Database Concepts", McGraw Hill
3. Elmasri, Navathe, "Fudamentals of Database Systems", Addision Wesley

Reference Books:

1. Leon &Leon,"Database Management Systems", Vikas Publishing House
2. Bipin C. Desai, " An Introduction to Database Systems", Gagotia Publications
3. Majumdar & Bhattacharya, "Database Management System", TMH

CO-PO Mapping

CO and PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	-	-	-	-	-

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CO2	2	-	-	-	-	-	-
CO3	-	1	3	-	-	-	-
CO4	-	-	-	2	-	-	-
CO5	-	1	2	-	-	-	-

CO-PSO Mapping

CO and PSO	PSO1	PSO2	PSO3
CO1	2	-	-
CO2	-	1	-
CO3	-	3	-
CO4	-	2	-
CO5	1	-	-

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DATABASE MANAGEMENT SYSTEM LAB

List of Experiments:

Student can use MySql (preferred open source DBMS) or any other Commercial DBMS tool (MS-Access / ORACLE) at backend and C++ (preferred) Php/JAVA at front end.

1.

a. Write a C++ program to store students records (roll no, name, father name) of a class using file handling.(Using C++ and File handling).

b. Re-write program 1, using any DBMS and any compatible language.(C++/MySQL)

2.

a. Write a program to take a string as input from user. Create a database of same name. Now ask user to input two more string, create two tables of these names in above database.

b. Write a program, which ask user to enter database name and table name to delete. If database exist and table exist then delete that table.

3. Write a program, which ask user to enter a valid SQL query and display the result of that query.
4. Write a program in C++ to parse the user entered query and check the validity of query.(Only SELECT query with WHERE clause)
5. Create a database db1, having two tables t1 (id, name, age) and t2 (id, subject, marks).

a. Write a query to display name and age of given id (id should be asked as input).
b. Write a query to display average age of all students.
c. Write a query to display mark-sheet of any student (whose id is given as input).
d. Display list of all students sorted by the total marks in all subjects.

6. Design a Loan Approval and Repayment System to handle Customer's Application for Loan and handle loan repayments by depositing installments and reducing balances.
7. Design a Video Library Management System for managing issue and return of Video tapes/CD and manage customer's queries.

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MCA

SOFTWAREENGINEERING AND PROJECT MANAGEMENT

Semester I

COURSE OVERVIEWAND OBJECTIVES: Understanding of software engineering principles of designing, testing and implementation details

COURSE OUTCOME

The student would be able to:

CO 1: Understand Software characteristics, Software components, Software applications
CO 2: Basic understanding of Models for Requirements analysis
CO 3: understand Overview of SA/SD Methodology
CO 4: understand Software testing strategies and Software Maintenance
CO 5: understand Project planning and Project scheduling with Quality Assurance

OUTLINE OF THE COURSE

Unit No	Title of **Unit**	Time Required for **Unit**(Hours)
1	Introduction	6
2	Software requirement specification	7
3	System design	5
4	Testing	6
5	Software project management	7

Detailed Syllabus

Unit 1: Introduction: Introduction to software Engineering, Software characteristics, Software components, Software applications, Software Engineering Principles, Software metrics and measurement, monitoring and control.

Unit 2: Software development life-cycle, Water fall model, prototyping model, Incremental model, Iterative enhancement Model, Spiral model.

Unit 3: Software Requirement Specification: Requirements Elicitation Techniques, Requirements analysis, Models for Requirements analysis, requirements specification,

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requirements validation.

Unit 4: System Design: Design Principles: Problem partitioning, abstraction. Top down and bottom up – design, structured approach,

Unit 5: Functional versus object oriented approach of design, design specification, Cohesiveness and Coupling.

Unit 6: Overview of SA/SD Methodology, structured analysis, data flow diagrams, extending DFD to structure chart

Unit 7: Testing: Verification and validation, code inspection, test plan, test case specification. Level of testing: Unit, Integration Testing,

Unit 8: Top down and bottom up integration testing, Alpha and Beta testing, System testing and debugging. functional testing, structural testing, Software testing strategies.

Unit 9: Software Maintenance: Structured Vs unstructured maintenance, Maintenance Models, Configuration Management, Reverse Engineering, Software Re-engineering

Unit 10: Software Project Management: Project planning and Project scheduling. Software Metrics: Size Metrics like LOC, Token Count, and Function Count.

Unit 11: Cost estimation using models like COCOMO. Risk management activities,

Unit 12: Software Reliability and Quality Assurance: Reliability issues, Reliability metrics, reliability models, Software quality, ISO 9000 certification for software industry, SEI capability maturity model.

Text Books:

1. R.S. Pressman, Software Engineering: A Practitioner's Approach, McGraw-Hill, Ed 7, 2010.
2. P. Jalote, An Integrated Approach to Software Engineering, Narosa Publishing House, Edition 3, 2011.
3. R. Mall, Fundamentals of Software Engineering, Prentice-Hall of India, 3rd Edition, 2009.

Reference Books:

1. Sommerville, Software engineering (9th edition), Addison Wesley, 2010

CO-PO Mapping

CO and PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7

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CO1	-	3	2	2	1	-	-
CO2	-	-	-	-	2	-	-
CO3	-	-	-	2	-	-	-
CO4	-	-	1	-	-	-	-
CO5	-	1	-	-	-	-	-

CO-PSO Mapping

CO and PSO	PSO1	PSO2	PSO3
CO1	-	1	-
CO2	-	2	-
CO3	-	2	-
CO4	-	1	-
CO5	-	3	-

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MCA

VIRTUALIZATION AND CLOUD TECHNOLOGY

Semester I

COURSE OVERVIEW AND OBJECTIVES: Understand the cloud concepts and architecture

COURSE OUTCOME
The student would be able to:
CO 1: Study importance of Cloud computing, various deployment and Service models.
CO 2: Analyse three Layered Architectural Requirement of Cloud computing.
CO 3: Study Comparative Analysis of Requirement at various layers.
CO 4: Understand various threats and security issues of cloud computing with solutions.
CO 5: Study how virtualization improves performance and capacity of cloud services.

OUTLINE OF THE COURSE

Unit No	Title of Unit	Time Required for Unit(Hours)
1	Understanding cloud computing	6
2	Cloud computing technology	7
3	Fault Tolerance	6
4	Security Management in Cloud	5
5	Virtualization	5

Detailed Syllabus:

Unit 1: Understanding cloud computing: Introduction to Cloud Computing -Benefits and Drawbacks –

Unit 2: Types of Cloud Service Development -Deployment models

Unit 3: Cloud Architecture Technology and Architectural Requirements The Business Case for Clouds -Hardware and Infrastructure – Accessing the cloud –

Unit 4: Cloud Storage – Standards- Software as a Service – Discovering Cloud Services Development tools.

Unit 5: Three Layered Architectural Requirement - Provider Requirements - Service Centric Issues - Interoperability – QoS.

Unit 6: Fault Tolerance Fault Tolerance - Data Management Storage and Processing – Virtualization Management - Scalability - Load Balancing –

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Unit 7: Cloud Deployment for Enterprises - User Requirement - Comparative Analysis of Requirement.

Unit 8: Security Management in Cloud Security Management Standards - Security Management in the Cloud Availability Management – SaaS Availability Management - PaaS Availability Management – IaaS Availability Management –

Unit 9: Access Control - Security Vulnerability, Patch, and Configuration Management –

Unit 10: Privacy in Cloud- The Key Privacy Concerns in the Cloud - Security in Cloud Computing

Unit 11: Virtualization Objectives - Benefits - Virtualization Technologies – Data Storage Virtualization – Storage Virtualization –

Unit 12: Improving Availability using Virtualization - Improving Performance using Virtualization.

Text Books:

1. Virtualization: A Manager's Guide by Dan Kusnetzky
2. Cloud Computing: Concepts, Technology & Architecture" by Thomas Erl, Ricardo Puttini, and Zaigham Mahmood

Reference Books:

1. David S Linthicum, “Cloud Computing and SOA Convergence in your Enterprise A Step by Step Guide”, Addison Wesley Information Technology Series.
2. Anthony T Velte, Toby J.Velte, Robert Elsenpeter, “Cloud computing A Practical Approach “, Tata McGraw Hill Publication
3. Tim Mather, Subra Kumaraswamy, Shahed Latif, “Cloud Security and Privacy
4. An Enterprise Perspective on Risks and Compliance” , O’Reilly Publications, First Edition
5. Michael Miller, “Cloud Computing – Web-Based Applications that Change the Way You Work and Collaborate Online”, Pearson Education, New Delhi, 2009.
6. Cloud Computing Specialist Certification Kit – Virtualization Study Guide

CO-PO Mapping

CO and PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	-	2	3	-	1	-	-
CO2	-	1	-	-	-	-	-
CO3	-	-	1	-	-	-	-
CO4	-	3	-	2	-	-	-

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CO5	-	-	-	-	1	-	-

CO-PSO Mapping

CO and PSO	PSO1	PSO2	PSO3
CO1	2	-	-
CO2	3	-	-
CO3	1	-	-
CO4	1	-	-
CO5	2	-	-

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MCA

WEB TECHNOLOGY LAB

Semester I

COURSE OVERVIEWAND OBJECTIVES: Understanding and implementation of data storage and organization and its applications

COURSE OUTCOME

The student would be able to:

CO1: Overview Object Web Technologies **CO2:** Basic Concept of Web Technologies **CO3:** Advance Programming

List of Experiments:

Develop static pages (using only HTML) of an online Book store. The pages should resemble: www.amazon.com pages. The website should consist the following Home page, Registration and user Login, User profile page, Books catalog, Shopping cart, Payment By credit card, order confirmation.

Write JavaScript to validate the following fields of the above registration page.
Name (Name should contains alphabets and the length should not be less than 6 characters).
Password (Password should not be less than 6 characters length).
E-mail id (should not contain any invalid and must follow the standard Pattern (name@domain.com)
Phone number (Phone number should contain 10 digits only).
Write an XML file which will display the Book information which includes the following:

- Title of the book
- Author Name
- ISBN number
- Publisher name
- Edition
- Price

Display the XML file as follows. The contents should be displayed in a table. The header of the table should be in color GREY and the Author names column should be displayed in one color and should be capitalized and in bold. Use your own colors for remaining columns. Use XML schemas XSL and CSS for the
above purpose.

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Design a web page using CSS (Cascading Style Sheets) which includes the following: 1) Use different font, styles: In the style definition you define how eachselector should work (font, color etc.). Then, in the body of your pages, you refer to these selectors to activate the styles

Install TOMCAT web server and APACHE. While installation assign port number 4040 to TOMCAT and 8080 to APACHE. Make sure that these ports are available i.e., no other process is using this port.

Access the above developed static web pages for books web site, using these servers by putting the web pages developed in week-1 and week-2 in the document root.

Install a database (Mysql or Oracle). Create a table which should contain at least the following fields: name, password, email-id, phone number(these should hold the data from the registration form). Practice 'JDBC' connectivity.

Write a java program/servlet/JSP to connect to that database and extract data from the tables and display them.

Experiment with various SQL queries. Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page.

CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO- 5	PO- 6	PO- 7
CO1	2	–	–	–	3	–	–
CO2	3	–	–	–	2	–	–
CO3	3	–	–	–	2	–	–
CO4	2	3	–	–	3	–	–
CO5	3	–	3	–	2	–	–

CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	–	3
CO-2	–	–	–
CO-3	2	–	2
CO-4	2	–	–
CO-5	–	–	3

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MCA

OBJECT ORIENTED PROGRAMMING USING JAVA

Semester II

COURSE OVERVIEWAND OBJECTIVES: Understand JAVA programming constructs

COURSE OUTCOME

The student would be able to:

CO 1: Introduction part of Java Programming.
CO 2: Be competent with writing computer programs to implement given simple programs.
CO 3: Describe Packages and Interfaces.
CO 4: Describe Exception Handling and How we can handle it.
CO 5: Be familiar with reading and programming for applet.

OUTLINE OF THE COURSE

Unit No	Title of **Unit**	Time Required for **Unit**(Hours)
1	Java	6
2	Control statements	6
3	Objects and classes	7
4	String handling	6
5	Concurrency	8

Detailed Syllabus

Unit 1: Java - Introduction to Object Orientated Programming, Abstraction, Object Oriented Programming Principles, Features of JAVA, Introduction to Java byte code, Java Virtual machine.

Unit 2: PROGRAM ELEMENTS: Primitive data types, variables, assignment, arithmetic, short circuit logical operators, Arithmetic operators, bit wise operators, relational operators, Boolean logic operators, the assignment operators, operator precedence

Unit 3: Control Statements - Decision and control statements, arrays, Java's Selection Statements, if statement, switch statement, Iteration Statements,

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Unit 4: Loops- while, do-while, for, for-each, Nested Loops, Jump Statements, Using break, Using continue, return.

Unit 5: Objects And Classes - Objects, constructors, returning and passing objects as parameter, Nested and inner classes,

Unit 6: Inheritance: Single and Multilevel Inheritance, Extended classes, Access Control,

Unit 7: Overloading and Overriding: usage of super, Overloading and overriding methods, Abstract classes, Using final with inheritance.

Unit 8: PACKAGE AND INTERFACES: Defining package, concept of CLASSPATH, access modifiers, importing package, Defining and implementing interfaces.

Unit 9: String Handling - String constructors, special string operations, character extraction, searching and comparing strings string Buffer class.

Unit 10: Exception Handling: Exception handling fundamentals, Exception types, uncaught exceptions, try, catch and multiple catch statements. Usage of throw, throws and finally

Unit 11: FILE HANDLING: I/O streams, File I/O.

Unit 12: Concurrency - Processes and Threads, Thread Objects, Defining and Starting a Thread, Pausing Execution with Sleep, Interrupts, Joins, Synchronization. APPLET: Applet Fundamentals, using paint method and drawing polygons.

Text Books:

1. Herbert Schildt: JAVA 2 - The Complete Reference, TMH, Delhi
2. Deitel: How to Program JAVA, PHI

Reference Books:

1. U.K. Chakraborty and D.G. Dastidar: Software and Systems – An Introduction, Wheeler Publishing, Delhi.
2. Joseph O'Neil and Herb Schildt: Teach Yourself JAVA, TMH, Delhi.

CO-PO Mapping

CO and PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	-	1	2	-	-	-	2
CO2	-	1	-	-	-	1	-
CO3	-	-	2	-	-	-	-
CO4	-	1	-	-	-	-	-
CO5	-	-	1	-	-	1	-

`

CO-PSO Mapping

CO and PSO	PSO1	PSO2	PSO3
CO1	1	-	-
CO2	2	-	-
CO3	3	-	-
CO4	2	-	-
CO5	1	-	-

`

OBJECT ORIENTED PROGRAMMING LAB

List of Experiments:

1. Creation of classes and use of different types of functions.
2. Count the number of objects created for a class using static member function.
3. Write programs on interfaces and packages.
4. Write programs using function overloading.
5. Programs using inheritance
6. Programs using IO streams.
7. Programs using files.
8. Write a program using exception handling mechanism.
9. Programs using AWT
10. Programs on swing.
11. Programs using JDBC

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MCA
DATA STRUCTURES AND ALGORITHMS

Semester III

COURSE OVERVIEW AND OBJECTIVES: This course will teach you the necessary theory and applications to properly understand the advanced algorithms and data structures that are critical to various problems and how to implement them.

COURSE OUTCOME: The student would be able:
CO1: Explain the basics of data structure.
CO2: Solve problems using trees.
CO3: Implement the sorting.
CO4: Implement and develop graphs.
CO5: Implement and develop algorithms.

OUTLINE OF THE COURSE

Unit No	Title of **Unit**	Time Required for **Unit**(Hours)
1	Introduction to Data Structure	5
2	Trees	8
3	Sorting	5
4	Graphs	6
5	Algorithms	8

Detailed Syllabus

Unit 1: Problem solving concepts, ADT, Stack, Operations on stack

Unit 2: Infix, prefix and postfix notations, Conversion of an arithmetic expression from Infix to postfix, Applications of stacks,

Unit 3: Queue, Array representation of queue, Types of queue: Simple queue, Circular queue, Double ended queue (deque), Priority queue, Operations on all types of Queues,

Unit 4: List, Components of linked list, Representation of linked list, Advantages and Disadvantages of linked list.

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Unit 5: Types of linked list: Singly linked list, doubly linked list, Circular linked list, Operations on singly linked list: creation, insertion, deletion, search and display.

Unit 6: Preliminaries, Binary Trees, Binary Search Trees, AVL Trees, Tree Traversals

Unit 7: Hashing, Hash Function, Hash families Separate Chaining, Open addressing.

Unit 8: Basic Search Techniques: Sequential search: Iterative and Recursive methods, Binary search: Iterative and Recursive methods, Preliminaries

Unit 9: Insertion Sort, Shell sort, Heap sort

Unit 10: Merge sort–Quick sort– External Sorting, Topological Sort.

Unit 11: Graph connectivity, Random walks on graph, online paging algorithm, adversary models.

Unit 12: Randomized algorithm, a min-cut algorithm, Random treaps, Mulmuley games, Markovs chains.

Textbooks

1. Goodrich Michael T, "Data Structures and Algorithms in Python ", Wiley publication, 2016.
2. Rance D. Neclase, "Data Structures and Algorithms in Python", Wiley Publication (2016)

Reference Books

1. E. Horowitz, S.Sahni and Dinesh Mehta, Fundamentals of Data structures in C++, University Press, 2009.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Third Edition, Pearson Education, Asia.2007.

CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7
CO1	–	2	–	–	–	3	–
CO2	–	–	3	–	–	2	–
CO3	–	1	–	–	–	–	–
CO4	–	–	–	3	–	–	–
CO5	2	2	2	2	–	–	–

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CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	1	—	—
CO-2	1	—	—
CO-3	2	—	—
CO-4	2	—	—
CO-5	1	—	—

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DATA STRUCTURES AND ALGORITHM LAB

List of Experiments:

1. Program on array searching, sorting (Bubble sort, Quick sort, Marge sort etc.)
2. Program to insert element at desire position, replacing element, deletion in array.
3. Various matrices operations.
4. Various strings programs.
5. Implementation of stack and queue using array
6. Implementation of stack and queue using link lists
7. Implementation of circular queue using link lists.
8. Polynomial addition, multiplication.
9. Two-way link lists programs.
10. Infix to postfix/prefix conversion.
11. BST implementation (addition, deletion, searching).
12. Stack ADT (array implementation) Implementing basic operation of stack (push, pop) using array implementation

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MCA

COMPUTER NETWORKS

Semester II

COURSE OBJECTIVE: To understand the basics of networking and its underlying principles. This course enables learners to understand computer networking concepts, how they work, operate, communicate with ports and Protocols. Standards and models associated with networking technology and their troubleshooting mechanisms.

COURSE OUTCOME:

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

CO1: Explain the types of Network and its architecture

CO2: Identify the function of each layer in OSI and TCP/IP Models

CO3: Discuss the functionality of networking devices **CO4:** Demonstrate the IPv4 and IPv6 addressing types **CO5:** Practice Network troubleshooting.

OUTLINE OF THE COURSE

Unit No	Title of Unit	Time Required for Unit(Hours)
1	Networking Fundamentals	5
2	Basics of Network, Transport and Application Layers	6
3	Basics of Network Devices	5
4	WAN Technology	6
5	Troubleshooting Network	6

Detailed syllabus:

Unit 1: Networking Fundamentals Basics of Network & Networking, Advantages of Networking, Types of Networks, Types of Network Architecture, Workgroup Vs. Domain.

Unit 2: Network Topologies, Types of Topologies, Logical and physical topologies, selecting the Right Topology

Unit3: Types of Transmission Media, Communication Modes, Wiring Standards and Cabling, media connectors

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Unit 4: Introduction of OSI model, Functions of the seven layers, Introduction of TCP/IP Model, Comparison between OSI model & TCP/IP model.

Unit 5: Basics of Network Devices Network Devices- NIC- functions of NIC, installing NIC, Hub, Switch, Bridge, Router, Gateways, And Other Networking Devices, Repeater, CSU/DSU, Modem, Ethernet standards, Ethernet Components, Point-to-Point Protocol, Address Resolution Protocol, Message format, transactions,

Unit 6: Benefits of Wireless Technology, Types of Wireless Networks, Wireless network Components, wireless LAN standards, wireless security Protocols.

Unit 7: Basics of Network, Transport and Application Layers Network Layer: Internet Protocol (IP), IP standards, versions, functions

Unit 8: The IPv4 and IPv6 Datagram Format, IPv4 addressing, IPv4 Subnetting, CIDR and VLSM, IPv6 Addressing, , Internet Control Message Protocol , Internet Group Management Protocol

Unit 9: Introduction to Routing and Switching concepts, Transport Layer: Transmission Control Protocol(TCP), User Datagram Protocol (UDP), Overview of Ports & Sockets, Application Layer Protocols

Unit 10: WAN Technology Introduction to WAN, WAN Switching techniques, connecting to the Internet, Satellite-Based Services, Cellular Technologies, Technologies used for Connecting LANs, Remote Access Connections and technologies, Authentication and Authorization, Tunnelling and Encryption Protocols, Security Appliances and Security Threats.

Unit 11: Troubleshooting Network Trouble Shooting Networks: Command-Line Interface Tools, Network and Internet Troubleshooting, Troubleshooting Model, identify the affected area, probable cause, implement a solution, test the result, recognize the potential effects of the solution, document the solution,

Unit 12: Using Network Utilities: ping, traceroute, tracert, ipconfig, arp, nslookup, netstat, nbtstat, Hardware trouble shooting tools, system monitoring tools.

Text Books:

1. Data Communication And Networking(Sie), Forouzan, TMH
2. Computer Network, Tanenbaum, Pearson

Reference Books:

1. CCNA Cisco Certified Network Associate: Study Guide (With CD) 7th Edition (Paperback), Wiley India, 2011
2. CCENT/CCNA ICND1 640-822 Official Cert Guide 3 Edition (Paperback), Pearson, 2013
3. Routing Protocols and Concepts CCNA Exploration Companion Guide (With CD) (Paperback),

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Pearson, 2008
4. CCNA Exploration Course Booklet: Routing Protocols and Concepts, Version 4.0 (Paperback), Pearson, 2010

CO-PO Mapping

CO and PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	-	1	2	-	-	-	2
CO2	-	1	-	-	-	1	-
CO3	-	-	2	-	-	-	-
CO4	-	1	-	-	-	-	-
CO5	-	-	1	-	-	1	-

CO-PSO Mapping

CO and PSO	PSO1	PSO2	PSO3
CO1	1	-	-
CO2	2	-	-
CO3	3	-	-
CO4	2	-	-
CO5	1	-	-

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COMPUTER NETWORKS LAB

List of Experiments:

1. Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and
   traceroute PDUs using a network protocol analyzer and examine.
2. Write a HTTP web client program to download a web page using TCP sockets.
3. Applications using TCP sockets like: a) Echo client and echo server b) Chat c) File Transfer
4. Simulation of DNS using UDP sockets.
5. Write a code simulating ARP /RARP protocols.
6. Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.
7. Study of TCP/UDP performance using Simulation tool.
8. Simulation of Distance Vector/ Link State Routing algorithm.
9. Performance evaluation of Routing protocols using Simulation tool.
10. Simulation of error correction code (like CRC).

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MCA

MACHINE LEARNING WITH PYTHON

Semester II

COURSE OVERVIEW AND OBJECTIVES: To impart knowledge about the concepts of machine learning. To introduce the fundamental concepts of distributed nature of operating system, network, data and processes.

COURSE OUTCOME: The student would be able:
CO1: Develop an understanding of what is involved in learning models from data.
CO2: Understand a wide variety of learning algorithms.
CO3: Apply principles and algorithms to evaluate models generated from data.
CO4: Apply the algorithms to a real-world problem.
CO5: To implement supervised and unsupervised techniques.

OUTLINE OF THE COURSE

Unit No	Title of **Unit**	Time Required for **Unit**(Hours)
1	Introduction	5
2	Different Techniques	8
3	Probability and Classification	5
4	Linear Classifiers	6
5	Ensemble Methods	8

Detailed Syllabus

Unit 1: Introduction to Machine Learning, Problems, data, and tools, Visualization tools, Decision Tree Learning.

Unit 2: Artificial Neural Networks, Bayesian Learning, Deep Learning, Instance-Based Learning
Unit 3: Regression Techniques, Linear regression, SSE, gradient descent, closed form, normal equations, features

Unit 4: Overfitting and complexity, training, validation, test data, Classification problems, decision boundaries, nearest neighbor methods.

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Unit 5: Probability and classification, Bayes optimal decisions, Naive Bayes and Gaussian class-conditional distribution.

Unit 6: Linear classifiers: Bayes Rule and Naive Bayes Model, Logistic regression, online gradient descent, Kernel Methods

Unit 7: Radial Basis Function Networks, Support Vector Machines

Unit 8: Genetic Algorithms, Reinforcement Learning,

Unit 9: Ensemble methods: Bagging, random forests, boosting

Unit 10: Unsupervised learning: clustering, k-means, hierarchical agglomeration, Latent space methods, PCA,

Unit 11: Text representations, naive Bayes and multinomial models, clustering and latent space models,

Unit 12: VC-dimension, structural risk minimization, margin methods and support vector achines (SVM), Machine Learning Applications.

Text Books

1. Introduction to Machine Learning by EthemAlpaydin, PHI Learning.
2. Machine Learning: An Algorithmic Perspective by Stephen Marsland, Chapman and Hall/CRC.
3. Machine Learning by Tom Mitchell, McGraw Hill Education.

Reference Books

1. Pattern Recognition and Machine Learning by Christopher M. Bishop, Springer.

CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7
CO1	1	–	2	–	–	–	–
CO2	–	3	–	–	–	–	–
CO3	2	1	3	–	–	–	–
CO4	–	–	–	3	–	–	–
CO5	2	2	2	2	–	–	–

CO-PSO Mapping

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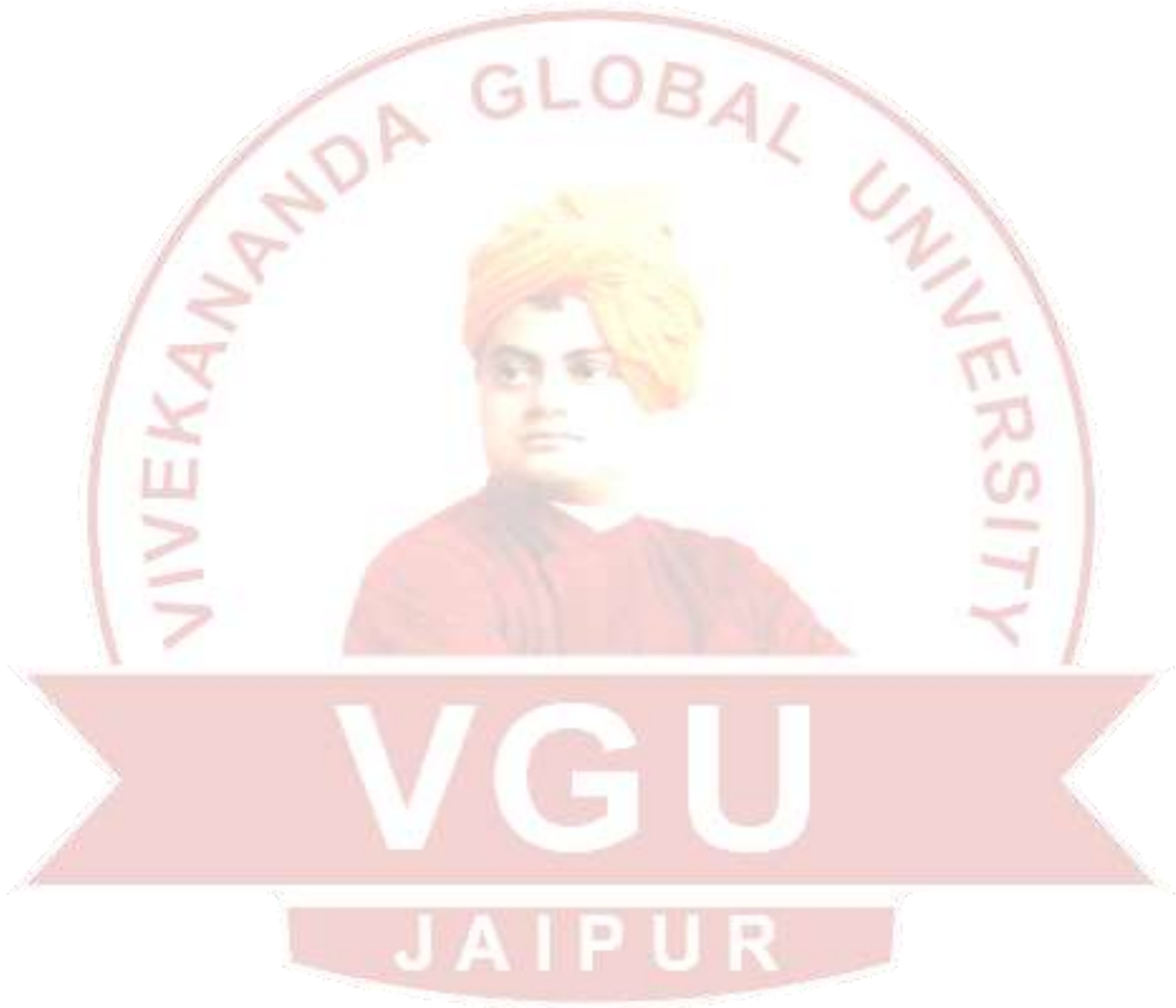
COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	1	–	–
CO-2	1	–	–
CO-3	2	–	–
CO-4	2	–	–
CO-5	1	–	–



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MACHINE LEARNING LAB

List of Experiments:

1. The probability that it is Friday and that a student is absent is 3 %. Since there are 5 school days in a week, the probability that it is Friday is 20 %. What is the probability that a student is absent given that today is Friday? Apply Baye's rule in python to get the result. (Ans: 15%)
2. Extract the data from database using python
3. Implement k-nearest neighbours classification using python
4. Given the following data, which specify classifications for nine combinations of VAR1 and VAR2 predict a classification for a case where VAR1=0.906 and VAR2=0.606, using the result of kmeans clustering with 3 means (i.e., 3 centroids)

VAR1	VAR2	CLASS
1.713	1.586	0
0.180	1.786	1
0.353	1.240	1
0.940	1.566	0
1.486	0.759	1
1.266	1.106	0
1.540	0.419	1
0.459	1.799	1
0.773	0.186	1

5. The following training examples map descriptions of individuals onto high, medium and low credit-worthiness. medium skiing design single twenties no -> highRisk high golf trading married forties yes -> lowRisk low speedway transport married thirties yes -> medRisk medium football banking single thirties yes -> lowRisk high flying media married fifties yes -> highRisk low football security single twenties no -> medRisk medium golf media single thirties yes -> medRisk medium golf transport married forties yes -> lowRisk high skiing banking single thirties yes -> highRisk low golf unemployed married forties yes -> highRisk
6. Input attributes are (from left to right) income, recreation, job, status, age-group, home- owner. Find the unconditional probability of `golf' and the conditional probability of `single' given `medRisk' in the dataset?
7. Implement linear regression using python.

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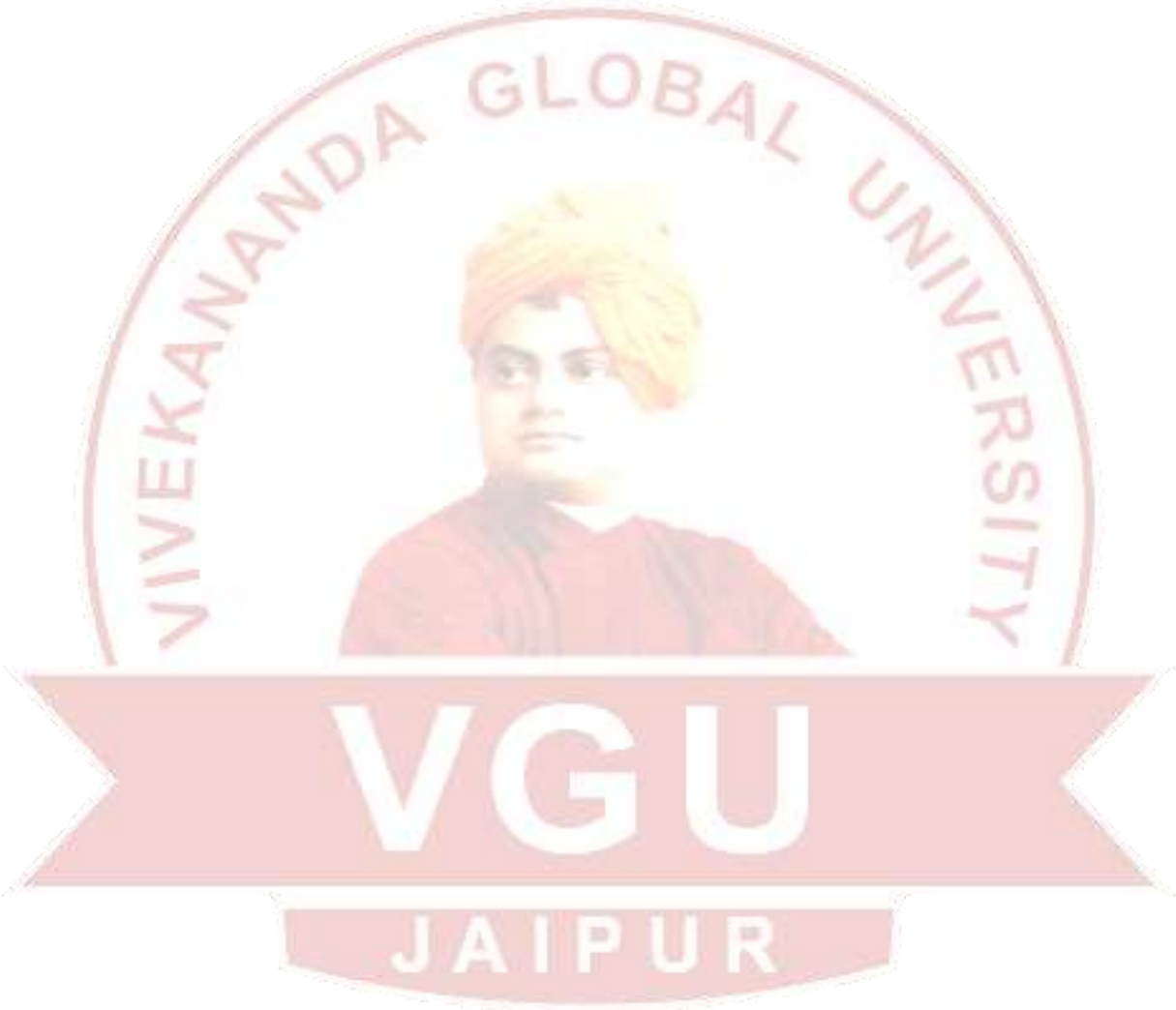
8. Implement Naïve Bayes theorem to classify the English text
9. Implement an algorithm to demonstrate the significance of genetic algorithm
10. Implement the finite words classification system using Back-propagation algorithm.



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PROGRAM ELECTIVE I

Semester II

INTRODUCTION TO DATA SCIENCE

COURSE OVERVIEW AND OBJECTIVES: Knowledge and expertise for data scientist

COURSE OUTCOME:

Students will be able to:

CO 1: Understand how data is collected.
CO 2: To describe the key concepts in data science
CO 3: Analyze data set
CO 4: evaluate data visualizations
CO 5: understand management scripts

OUTLINE OF THE COURSE

Unit No	Title of **Unit**	Time Required for **Unit**(Hours)
1	Introduction	5
2	Data Collection	6
3	Data Analysis	7
4	Data Visualization	6
5	Applications	7

Detailed Syllabus Unit 1: Introduction
Introduction, Terminology, data science process, data science toolkit, Types of data

Unit 1: Introduction, Terminology, data science process, data science toolkit, Types of data

Unit 2: Data Collection: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data,

Unit 3: Data storage and management, using multiple data sources

Unit 4: Data Analysis: Introduction, Terminology and concepts

Unit 5: Introduction to statistics, Central tendencies and distributions, Variance

Unit 6: Distribution properties and arithmetic, Samples/CLT

Unit 7: Basic machine learning algorithms, Linear regression, SVM,

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Unit 8: Data Visualization: Introduction, Types of data visualization,

Unit 9: Data for visualization: Data types, Data encodings, Retinal variables

Unit 10: Mapping variables to encodings, Visual encodings

Unit 11: Applications: Applications of Data Science

Unit 12: Technologies for visualization, Bokeh (Python)

Text Book:

1. Practical Statistics for Data Scientists — by Peter Bruce

Reference/Text Book:

1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk from The Frontline. O'Reilly.
2. The Art of Data Science by Roger D. Peng and Elizabeth Matsui

CO-PO Mapping

CO and PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	-	1	2	-	-	-	-
CO2	-	-	-	-	-	1	-
CO3	-	-	2	-	-	-	-
CO4	-	1	-	-	-	-	-
CO5	-	-	-	-	-	1	-

CO-PSO Mapping

CO and PSO	PSO1	PSO2	PSO3
CO1	1	-	-
CO2	2	-	-
CO3	3	-	-
CO4	2	-	-
CO5	1	-	-

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DATA MINING & WARE HOUSING
Semester I

COURSE OVERVIEWAND OBJECTIVES: Understand the concepts of mining data and knowledge discovery

COURSE OUTCOME

The student would be able to:

CO 1: Understand data mining functionalities and concept of interesting patterns
CO 2: Ability to understand Data Preprocessing.
CO 3: Understanding of association rules.
CO 4: Describe Clustering algorithms and Partitioning methods
CO 5: Explain binary classification

OUTLINE OF THE COURSE

Unit No	Title of **Unit**	Time Required for **Unit**(Hours)
1	Introduction	6
2	Data	7
3	Association and correlation analysis	5
4	Clustering algorithms and cluster analysis	6
5	Classification	6

Detailed Syllabus

Unit 1: Introduction - Basic concepts of data mining, including motivation and definition; different types of data repositories; data mining functionalities;

Unit 2: concept of interesting patterns; data mining tasks; current trends, major issues and ethics in data mining

Unit 3: Data - Types of data and data quality; Data Preprocessing: data cleaning, data integration and transformation, data reduction, discretization and concept hierarchy generation;

Unit 4: Exploring Data: summary statistics, visualization, multidimensional data analysis

Unit 5: Association And Correlation Analysis - Basic concepts: frequent patterns, association rules - support and confidence; frequent itemset generation

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Unit 6: Apriori algorithm, FP-Growth algorithm; Rule generation, Applications of Association rules; Correlation analysis.

Unit 7: Clustering Algorithms and Cluster Analysis - Concept of clustering, measures of similarity,

Unit 8: Clustering algorithms: Partitioning methods - k-means and k-medoids, CLARANS,

Unit 9: Hierarchical methods - agglomerative and divisive clustering, BIRCH, Density- based methods - Subspace clustering, DBSCAN; Graph-based clustering - MST clustering; Cluster evaluation; Outlier detection and analysis.

Unit 10: Classification: Binary Classification - Basic concepts, Bayes theorem and Naive Bayes classifier, Association based classification, Rule based classifiers, Nearest neighbour classifiers, Decision Trees, Random Forest; Perceptrons;

Unit 11: Multi-category classification; Model overfitting, Evaluation of classifier performance - cross validation, ROC curves.

Unit 12: Applications: Text mining, Web data analysis, Recommender systems. Prerequisites: Familiarity with basic Linear Algebra and Probability will be assumed.

Text Books:

1. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Introduction to Data Mining. Pearson (2005), India. ISBN 978-8131714720
2. Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann, 3rd edition (July 2011). 744 pages. ISBN 978-0123814791
3. Ian H. Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques, Morgan Kaufmann, 3rd edition (January 2011). 664 pages. ISBN 978- 0123748560.

Reference Books:

1. T. Hastie, R. Tibshirani and J. H. Friedman, The Elements of Statistical Learning, Data Mining, Inference, and
2. Prediction. Springer, 2nd Edition, 2009. 768 pages. ISBN 978- 0387848570
3. C. M. Bishop, Pattern Recognition and Machine Learning. Springer, 1st edition, 2006. 738 pages. ISBN 978- 0387310732

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CO-PO Mapping

CO and PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	-	1	2	-	-	-	-
CO2	-	-	-	3	-	1	-
CO3	-	-	2	-	-	-	-
CO4	-	-	-	-	-	-	-
CO5	3	-	1	-	-	1	-

CO-PSO Mapping

CO and PSO	PSO1	PSO2	PSO3
CO1	1	-	-
CO2	2	-	-
CO3	3	-	-
CO4	2	2	-
CO5	1	-	-

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MCA

DATA VISUALIZATION

Semester II

COURSEOVERVIEWAND OBJECTIVES:

- To understand the importance of data visualization in the business and engineering
- To understand the application and role of visualization tools in creating the advanced techniques.

COURSE OUTCOME

After completion of this course students should be able to:-

CO1: Design effective data visualizations in order to provide new insights into a research question or communicate information to the viewer.

CO 2: Know the basics of data visualization

CO 3: Understand the importance of data visualization and the design and use of many visual components

CO4: Learn to wisely use various visualization structures such as tables, spatial data, time-varying data, tree and network, etc.

CO 5: Learn the basics of colors, views, and other popular and important visualization-based issues.

OUTLINE OF THE COURSE

Unit No	Title of **Unit**	Time Required for **Unit**(Hours)
1.	Introduction to Data Visualization	9
2.	Static Graphical Techniques – 1 Management 6.0Management	9
3.	Configuring File and Share Access Permissions	9
4.	Configuring DNS Zones and Records	8
5.	Implementing Patch Management and Monitoring Server Performance	9

DETAILED SYLLABUS

Unit 1: Introduction to Data Visualization

Brief history of data visualization, scientific design choices in data visualization- choice of graphical form, grammar of graphical techniques of large amount of data, crucial need of visualization techniques, challenges in visualization techniques,

Unit 2: classification of visualization techniques for qualitative and quantitative data, power of visualization techniques, introduction to different visualization techniques..

Unit 3: Static Graphical Techniques – 1: Introduction to bar graph, basic understanding of making basic bar graph, grouping bars together, bar graphs on counts, customization of bar graphs

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by changing colour, size, title, axis units, changing width and spacing of the bar chart, adding labels to bar graph, application of bar graph in business.

Unit 4: Multivariate Graphical Techniques: Introduction to correlation matrix, application of correlation matrix in the multivariate analysis, network graph, basics of heat map, difference between heat map and tree map,

Unit 5: Introduction to higher dimensional scatter plot, axis adjustment in the higher dimensional scatter plot, addition of prediction surface of higher dimensional scatter plot.

Unit 6: Graphical Validation: Basics of multivariate statistical visual representations and its results, dendrogram, importance of dendrogram in grouping (cluster analysis),

Unit 7: Scree Plot, importance of Scree Plot, application of Scree Plot in determining number of clusters and factors,

Unit 8: QQ plot, importance of QQ plot in distribution of data for the further quantitative analysis, PP plot, applications and usage of PP Plot for distribution detection.

Unit 9: Customization: Introduction to annotations – adding : text, mathematical expression , lines, arrows, shaded shapes, highlighting the texts and items, adding error bars,

Unit 10: introduction to axis, swapping x and y axis, changing the scaling ration in the axis, positioning of axis and arranging tick marks and labels, changing the appearance of axis labels, circular graphs,

Unit 11: using themes, changing the appearance of theme elements, creating the own themes,

Unit 12: legends: removing the legends, position of legends, legend title, labels in legends.

Text Books:

1. DATA VISUALIZATION PRINCIPLES AND PRACTICE, Alexandru Telea, Latest, CRC Press
2. Hand book of Data Visualization, Chun-houh Chen, Wolfgang Härdle, Antony Unwin, Springer Publication

Reference Books:

3. R Graphics Cook Book, Winston Chang, Latest O'Reilly
4. Elegant Graphics for Data Analysis, Hadley Wickham, Latest, Springer Publication

CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7
CO1	3	2	3	3	2	–	–

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CO2	3	3	2	2	3	–	–
CO3	2	3	3	2	2	–	–
CO4	2	2	3	3	3	–	–
CO5	2	3	2	2	2	–	–

CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	3	3	1
CO-2	2	3	1
CO-3	2	3	–
CO-4	3	2	–
CO-5	3	2	1

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PROGRAM ELECTIVE I

Semester II

CLOUD ARCHITECTURAL PATTERNS

COURSE OVERVIEW AND OBJECTIVES:

- To provide students with the fundamentals and essentials of Cloud Computing.
- To provide students a sound foundation of the Cloud computing so that they are able to identify the vendors and assess the risk involved in cloud migration.

COURSE OUTCOME:

After completion of this course students should be able to:-

CO1: Analyze the Cloud computing setup with its vulnerabilities and applications.
CO2: Analyze the risks involved in migrating the existing infrastructure to cloud.
CO3: Assess various cloud service providers.
CO4: Broadly educate to know the impact of engineering on legal and societal issues.
CO5: Design and develop backup strategies for cloud data based on features.

OUTLINE OF THE COURSE

Unit No.	Title of the **Unit**	Time required for the **Unit**
1.	Introduction to cloud and their Challenges	9
2.	Assessing applications for a cloud Migration	8
3.	Cloud Migration Business Strategy	8
4.	Total Cost of Ownership (TCO)	8
5.	Migration Process	9

Detailed Syllabus

Unit 1: Introduction to cloud and their Challenges: Cloud Migration Terminology, Digital Transformation, Cloud Migration Benefits, Cloud Migration Concerns, Time Table (Gantt chart)

Unit 2: AWS CLOUD, Amazon EC2, Amazon S3, Amazon RDS, Amazon Elastic Cache, Amazon Elastic Map Reduce

Unit 3: Assessing applications for a cloud Migration: Application Design Complexity,

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Integration Complexity, The Host OS, The Application Database

Unit 4 SWOT analysis: The Usage of SWOT Analysis, Strengths, Weaknesses, Opportunities, Threats

Unit 5: Cloud Migration Business Strategy: Establishing the Migration-Architect Role, Cloud Integration Level, Single Cloud or Multi-Cloud

Unit 6: Setting the Cloud KPIs, Establishing Performance Baselines,

Unit 7: Prioritizing Migration Components, Performing any Necessary Refactoring, Creating a Data-Migration Plan

Unit 8: Switching Over Production, Reviewing the Application Resource

Unit 9: Total Cost of Ownership (TCO): Ensuring Costs Optimization on AWS

Unit 10: Cloud Performance: Supervising tuning and capacity delivery, Root cause analysis, Restoring service and SLA, Tune,

Unit 11: Increasing Resource Allocation, Producing and maintaining the capacity plan

Unit 12: Migration Process: Migrate ERP VM to AWS, VM Import/Export – VoIP Solution, Migrate Survey Solution to AWS

Text Books:

1. CLOUD ESSENTIALS: Kirk Hausman, Susan L. Cook, Telmo Sampaio, 2013 Edition,Wiley
2. Cloud Computing for Dummies: Judith Hurwitz , Robin Bloor ,Marcia Kaufman , Fern Halper, 2010 Edition, Wiley Publishing
3. Cloud Computing: Concepts, Technology & ArchitectureErl, 2014 Edition, Pearson Education

Reference Books:

1. Cloud Computing for Dummies: Judith Hurwitz , Robin Bloor ,Marcia Kaufman , Fern Halper, 2010 Edition, Wiley Publishing

CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7
CO1	1	2	–	1	3	–	–
CO2	2	–	3	2	1	–	–

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CO3	2	1	–	1	3	–	–
CO4	1	1	–	1	2	–	–
CO5	1	2	–	3	2	–	–

CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	3	1
CO-2	3	2	–
CO-3	2	2	–
CO-4	2	3	2
CO-5	3	3	–

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MCA

CYBER CRIME & IT LAW

Semester II

COURSE OVERVIEW AND OBJECTIVES: Understand Cyber Law and its impact

COURSE OUTCOME
The student would be able to:
CO 1: Students should acquire a broad perspective on the social and ethical impacts and implications of information technology.
CO 2: Students should acquire specific knowledge about major issues in several different areas of the field of Computer Ethics.
CO 3: Students should acquire in-depth knowledge of at least one significant ethical issue generated by information technology.
CO 4: Students should develop skills in clarifying and ethically analyzing realistic cases that involve information technology.
CO 5: Students should learn about intellectual property issues in cyber space

OUTLINE OF THE COURSE

Unit No	Title of **Unit**	Time Required for **Unit**(Hours)
1	Introduction	5
2	Cyber law international perspectives	6
3	Constitutional & human rights issues in cyberspace	6
4	Cyber-crimes & legal framework	7
5	Intellectual property issues in cyber space	7

Detailed Syllabus

Unit 1: Introduction- Computers and its Impact in Society, Overview of Computer and Web Technology, Statistics of digital world, Need for Cyber Law,

Unit 2: Cyber Jurisprudence at International and Indian Level

Unit 3: Indian IT act 2000, Indian IT act 2008 amendment, important amendment in IT act 2008

Unit 4: Cyber Law International Perspectives- UN & International Telecommunication Union (ITU) Initiatives

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Unit 5: Council of Europe: Budapest Convention on Cybercrimes, Asia-Pacific Economic Cooperation (APEC) ,

Unit 6: Organization for Economic Co-operation and Development (OECD),World Bank, Commonwealth of Nations

Unit 7: Constitutional & Human Rights Issues In Cyberspace- Freedom of Speech and Expression in Cyberspace, Right to Access Cyberspace: Access to Internet, Right to Privacy. Right to Data Protection

Unit 8: Cyber Crimes & Legal Framework- Definition, Cyber Crimes against Individuals, Institution and State, Hacking & cracking, Digital Forgery

Unit 9: Cyber Stalking/Harassment, Cyber Pornography, Identity Theft & Fraud, Cyber terrorism, Cyber Defamation

Unit 10: Different offences under IT Act, 2000, Cyber laws and law enforcement

Unit 11: Intellectual Property Issues In Cyber Space- Interface with Copyright Law, Interface with Patent Law

Unit 12: Trademarks & Domain Names Related issues, domain squatting

Text Books:

1. Cyber Laws, Justice Yatindra Singh, Universal Law Publishing Co, New Delhi, (2012)
2. Cyber Law, Jonthan Rosenoer, Springer, New York, (1997).

Reference Books:

1. Computer Law, Chris Reed & John Angel, OUP, New York, (2007).
2. Legal Dimensions of Cyber Space, Verma S, K, Mittal Raman, Indian Law Institute, New Delhi, (2004)
3. Information Technology Act, 2000, S. R. Bhansali, University Book House Pvt. Ltd., Jaipur (2003).

CO-PO Mapping

CO and PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	-	2	-	-	-	-	-
CO2	-	-	1	-	-	-	-
CO3	-	-	-	-	2	-	1

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CO4	-	1	-	-	-	-	-
CO5	-	-	-	-	-	-	-

CO-PSO Mapping

CO and PSO	PSO1	PSO2	PSO3
CO1	-	2	-
CO2	-	3	-
CO3	-	1	-
CO4	-	1	-
CO5	-	2	2

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MCA

LINUX & SHELL PROGRAMMING

Semester II

COURSEOVERVIEWANDOBJECTIVES: Understand the shell programming principles

COURSE OUTCOME

The student would be able to:

CO 1: Understand Environment and Path setting

CO 2: Creating and editing files

CO 3: Understanding of x-window as client/ server system

CO 4: Describe types of shell

CO 5: Explain source code management- RCS and CVS. awk utility.

OUTLINE OF THE COURSE

Unit No	Title of **Unit**	Time Required for **Unit**(Hours)
1	Introduction	6
2	Vi editor	7
3	Introduction to x-window system	8
4	Shell	6
5	Shell programming	6

Detailed Syllabus

Unit 1: Introduction: Logging in, changing password (passwd command only), man, xman, info commands to access on line help. Simple commands like ls, cp, mv, grep, head, tail, sort, uniq, diff, echo, date, which, whereis, whatis, who, finger w (option and variations included),

Unit 2: Directory commands, access permissions, changing access permissions for files and directories, hard & symbolic links, Environment and path setting

Unit 3: Vi Editor: Creating and editing files, features of vi, insertion deletion, searching, substitution operations, yank, put, delete commands

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Unit 4: reading & writing files, exrc file for setting parameters, advance editing techniques. vim(improved vi).

Unit 5: Introduction To X-Window System: x-window as client/ server system, concept of window manager, remote computing & local displays, xinitrc file

Unit 6: customize X work environment and applications, customizing the fvwm window manager.

Unit 7: Shell: Meaning and purpose of shell, Introduction to types of shell. The command line, standard input and standard output,

Unit 8: redirection, pipes, filters special characters for searching files and pathnames.

Unit 9: Bourne Again Shell: shell script-writing and executing, command separation & grouping, redirection, directory stack manipulation, processes, parameters & variables, keyword variables

Unit 10: Shell Programming: Control structures, the Here document, expanding NULL or USET variables, Builtins, functions,

Unit 11: history, aliases, job control, filename substitution.

Unit 12: source code management- RCS and CVS. awk utility..

Text Books:

1. A practical Guide to Linux, Sobell, Pearson.
2. A Practical Guide to Linux Commands, Editors, and Shell Programming, Sobell, Pearson.
3. A Practical Guide to Fedora and Red Hat Enterprise Linux, Sobell, 5e, Pearson

Reference Books:

1. Harley Hahn: Guide to Unix & Linux, TMH

CO-PO Mapping

CO and PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	-	1	2	-	-	-	-
CO2	-	-	-	3	-	1	-
CO3	-	-	2	-	-	-	-
CO4	-	-	-	-	-	-	-

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CO5	3	-	1	-	-	1	-

CO-PSO Mapping

CO and PSO	PSO1	PSO2	PSO3
CO1	1	-	-
CO2	2	-	-
CO3	3	-	-
CO4	2	2	-
CO5	1	-	-

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Semester III
DESIGN & ANALYSIS OF ALGORITHMS

COURSEOVERVIEWANDOBJECTIVES: Understand the various algorithms and its applications.

COURSE OUTCOME

The student would be able to:

CO1: Understand asymptotic notations to analyze the performance of algorithms.
CO2: Identify the differences in design techniques and apply to solve optimization problems.
CO 3: Solve pattern matching problems, by choosing the appropriate algorithm design technique for their solution and justify their selection.
CO 4: Understand Randomized algorithms and network flow problem.
CO 5: Analyze deterministic and nondeterministic algorithms to solve complex problems.

OUTLINE OF THE COURSE

Unit No	Title of Unit	Time Required for Unit(Hours)
1	Background	5
2	Dynamic programming	6
3	Pattern matching algorithms	6
4	Randomized algorithms	7
5	Problem classes np, np-hard and np-complete	7

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Detailed Syllabus

Unit 1: Background: Algorithm Complexity and Order Notations and Sorting Methods.

Unit 2: Divide And Conquer Method: Binary Search, Merge Sort, Quick sort and strassen's matrix multiplication algorithms.

Unit 3: Greedy Method: Knapsack Problem, Job Sequencing, Optimal Merge Patterns and Minimal Spanning Trees.

Unit 4: Dynamic Programming: Matrix Chain Multiplication. Longest Common Subsequence and 0/1 Knapsack Problem

Unit 5: Branch and Bound: Traveling Salesman Problem and Lower Bound Theory. Backtracking Algorithms and queens problem

Unit 6: Pattern Matching Algorithms - Naïve and Rabin Karp string matching algorithms, KMP Matcher and Boyer Moore Algorithms.

Unit 7: Assignment Problems: Formulation of Assignment and Quadratic Assignment Problem.

Unit 8: Randomized Algorithms - Las Vegas algorithms, Monte Carlo algorithms, randomized algorithm for Min-Cut, randomized algorithm for 2-SAT.

Unit 9: Problem definition of Multi commodity flow, Flow shop scheduling and Network capacity assignment problems.

Unit 10: Problem Classes NP, NP-Hard and NP-Complete - Definitions of P, NP-Hard and NP-Complete Problems. Decision Problems, Cook's Theorem,

Unit 11: Proving NP-Complete Problems - Satisfiability problem and Vertex Cover Problem.

Unit 12: Approximation Algorithms for Vertex Cover and Set Cover Problem

TextBooks:

1. Coreman, Rivest, Lisserson, : “Algorithm", PHI.
2. Basse, "Computer Algorithms: Introduction to Design & Analysis", Addision Wesley.
3. Horowitz &Sahani, "Fundamental of Computer Algorithm", Galgotia.

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Reference Books:

1. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein

2. Algorithms" by Robert Sedgewick and Kevin Wayne

CO-PO Mapping

CO and PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	-	1	-	-	-	-	-
CO2	-	-	2	-	-	-	-
CO3	-	-	-	-	3	-	-
CO4	-	-	-	3	-	-	-
CO5	-	-	-	-	-	-	-

CO-PSO Mapping

CO and PSO	PSO1	PSO2	PSO3
CO1	-	2	-
CO2	-	1	-
CO3	-	1	-
CO4	-	2	-
CO5	-	2	-

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(Electives in AI)

Semester III

DEEP LEARNING

COURSE OVERVIEW AND OBJECTIVES: Students are able to:-

- To build the foundation of deep learning.
- To understand how to build the neural network.
- To enable the students to develop successful machine learning projects.

COURSE OUTCOME:

The student would be able:

CO1: Learn the fundamental principles of deep learning.

CO2: Identify the deep learning algorithms for various types of learning tasks in various domains.

CO3: Implement deep learning algorithms and solve real-world problems.

CO4: Evaluate and compare different deep learning models and techniques for specific tasks.

CO5: Demonstrate proficiency in implementing and training deep learning models using popular frameworks and libraries.

OUTLINE OF THE COURSE

Unit No	Title of Unit	Time Required for Unit(Hours)
1	Introduction	6
2	Convolutional Neural Network	6
3	Application of Deep Learning to Computer vision	5
4	Application of Deep Learning to NLP	6

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5	Opinion Mining using Recurrent Neural Networks	6

Detailed Syllabus

Unit 1: Introduction: Feed forward Neural networks, Gradient descent and the back propagation algorithm, Unit saturation, the vanishing gradient problem, and ways to mitigate it.

Unit 2: RelU Heuristics for avoiding bad local minima, Heuristics for faster training, Nestors accelerated gradient descent, Regularization, Dropout.

Unit 3: Convolutional Neural Networks: Architectures, convolution / pooling layers

Unit 4: Recurrent Neural Networks: LSTM, GRU, Encoder Decoder architectures.

Unit 5: Deep Unsupervised Learning: Autoencoders, Variational Auto-encoders, Adversarial Generative Networks, Auto-encoder and DBM Attention and memory models

Unit 6: Dynamic memory networks, Applications of Deep Learning to Computer Vision:

Unit 7: Image segmentation, object detection, automatic image captioning, Image generation with Generative adversarial networks, video to text with LSTM models, Attention models for computer vision tasks.

Unit 8: Applications of Deep Learning to NLP: Introduction to NLP and Vector Space Model of Semantics

Unit 9: Word Vector Representations: Continuous Skip-Gram Model, Continuous Bag-of-Words model (CBOW), Glove, Evaluations and Applications in word similarity

Unit 10: Analogy reasoning: Named Entity Recognition

Unit 11: Opinion Mining using Recurrent Neural Networks: Parsing and Sentiment Analysis using Recursive Neural Networks: Sentence Classification using Convolutional Neural Networks, Dialogue Generation with LSTMs

Unit 12: Applications of Dynamic Memory Networks in NLP, Factoid Question Answering, similar question detection, Dialogue topic tracking, Neural Summarization

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Text Books

1. Deep Learning by Ian Goodfellow, YoshuaBengio and Aaron Courville, MIT Press.

Reference Books

1. The Elements of Statistical Learning by T. Hastie, R. Tibshirani, and J. Friedman, Springer.
2. Probabilistic Graphical Models by D. Koller, and N. Friedman, MIT Press

CO-PO Mapping

COs and Pos	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7
CO1	1	2	3	-	-	-	-
CO2	-	-	2	-	-	-	-
CO3	-	2	-	-	-	-	-
CO4	2	-	-	-	-	-	-
CO5	-	1	-	-	-	-	-

CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	1	—	—
CO-2	1	—	—
CO-3	2	—	—
CO-4	2	—	—
CO-5	1	—	—

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DEEP LEARNING LAB

List of Experiments:

1. Installation and working on various tools viz. Hadoop, Python, Spark, NoSQL, ANACONDA, Tensorflow, Keras, AWS, etc.
2. Understanding key technology foundations required for Big Data.
3. Learning Hadoop systems for implementing Big Data problems.
4. Development of real-time data based applications using Hadoop.
5. Development of applications using pytorch library.
6. Knowledge extraction from given data.
7. Use of machine learning and deep learning techniques for solving image related problems.
8. Comparative evaluation of deep learning models.

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(Electives in AI)

Semester III
NATURAL LANGUAGE PROCESSING

COURSE OVERVIEW AND OBJECTIVES:

- To learn about the concepts and principles of natural language processing.
- To explore both theoretical and practical issues of natural language processing.
- To develop skills of finding solutions and building software using natural language processing techniques.

COURSE OUTCOME: The student would be able:

CO1: Understand the concept of natural language processing.
CO2: Understand various research issues in natural language processing.
CO3: Apply various tools and techniques in natural language processing.
CO4: Analyze and evaluate the performance of NLP models, including deep learning approaches, on different datasets and tasks.
CO5: Design and implement NLP systems that can understand, generate, and process human language effectively**.**

OUTLINE OF THE COURSE

Unit No	Title of Unit	Time Required for Unit(Hours)
1	Introduction	7
2	Grammar and NLP stages	7
3	Semantics	6
4	Pragmatics	7
5	NGRAMS	7

Detailed Syllabus

Unit 1: Introduction: Knowledge of Natural Language Processing, Ambiguity, Models and Algorithms

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Unit 2: Text representation in computers, encoding schemesRegular expressions, Finite State Automata, word recognition, lexicon.

Unit 3: Grammar and NLP Stages NLP grammar, POS and POS schemes, Stochastic POS tagging, HMM, Transformation based tagging (TBL)

Unit 4: Handling of unknown words, named entities, multi word expressions, lexical analyzer, Parsing, Stemming, Smoothing and Interpolation Named Entity Recognition.

Unit 5: Semantics- Meaning representation, semantic analysis, lexical semantics, WordNet, Word Sense Disambiguation- Sectional restriction

Unit 6: machine learning approaches, and dictionary-based approaches.

Unit 7: Pragmatics: Discourse, Reference Resolution, Reference Phenomena, Syntactic and Semantic Constraints on Coreference, Preferences in Pronoun Interpretation, Text Coherence and Inference Based Resolution Algorithm,

Unit 8: Corpora: elements in balanced corpus, Concordance and corpora, characteristics of Gold Standard Corpora. TreeBank, PropBank, WordNet, VerbNet etc.

Unit 9: Resource management with XML, Management of linguistic data with the help of GATE, NLTK.

Unit 10: Parallel Corpus, Comparable corpus, Inter-Annotator Agreement Tests, kappa statistics. Corpus annotation tools.

Unit 11: NGRAMS: Counting words in Corpora, N-Gram probabilities, Training and Test sets, Evaluating N-Gram Perplexity. Machine Translation and Performance Metrics Machine Translation issues, MT Evaluation, automatic evaluation BLEU, METEOR, ORANGE,

Unit 12: Information Retrieval: Vector space model, term weighting, homonymy, polysemy, synonymy, improving user queries.

Text Books

1. Speech and Language Processing by Daniel Jurafsky and James H. Martin, Prentice Hall.

Reference Books

1. Language as a Cognitive Process by T. Winograd, Addison-Wesley.
2. Natural Language Understanding by James Allen, the Benjamins/Cummings.
3. Natural language processing: a Paninian perspective by A. Bharati, R. Sangal, and V. Chaitanya, PHI.

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CO-PO Mapping

COs and Pos	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7
CO1	–	1	3	–	–	–	–
CO2	–	–	2	–	–	–	–
CO3	2	3	–	–	–	–	–
CO4	–	–	–	3	–	–	–
CO5	2	2	2	2	–	–	–

CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	1	–	–
CO-2	1	–	–
CO-3	2	–	–
CO-4	2	–	–
CO-5	1	–	–

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NATURAL LANGUAGE PROCESSING LAB

List of Experiments:

1. Tokenization and Text Preprocessing:
2. Part-of-Speech (POS) Tagging
3. Named Entity Recognition (NER)
4. Sentiment Analysis
5. Text Classification
6. Machine Translation
7. Language Modeling
8. Information Retrieval
9. Text Generation
10. Coreference Resolution
11. Language Understanding and Dialogue Systems
12. Multilingual NLP
13. Emotion Analysis
14. Text Summarization
15. Error Analysis and Bias Detection

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(Electives in AI)

Semester III MCA

ARTIFICIAL INTELLIGENCE AND INTELLIGENT AGENTS

COURSE OVERVIEW AND OBJECTIVES: Understanding of artificial intelligence and its application areas

COURSE OUTCOME

The student would be able to:

CO 1: Demonstrate knowledge of the building blocks of AI as presented in terms of intelligent agents.

CO 2: Analyze and formalize the problem as a state space, graph, design heuristics and select amongst different search or game-based techniques to solve them.

CO 3: Develop intelligent algorithms for constraint satisfaction problems and also design intelligent systems for Game Playing

CO 4: Attain the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning.

CO 5: Formulate and solve problems with uncertain information using Bayesian approaches.

OUTLINE OF THE COURSE

Unit No	Title of Unit	Time Required for Unit(Hours)
1	Introduction	6
2	Informed Search Strategies	7
3	Uncertainty	5
4	Learning	6
5	Intelligent Systems	7

`

Detailed Syllabus:

Unit 1: Introduction -What is intelligence? Foundation so far artificial intelligence (AI), History of AI;

Unit 2: Problem Solving-Formulating problems, problem types, states and operators, state space, search strategies.

Unit 3: Informed Search Strategies- Best first search, A*algorithm, heuristic functions, Iterative deepening A*(IDA), small memory A*(SMA);

Unit 4: Gameplaying-Perfect decision game, imperfect decision game, evaluation function, alpha-beta pruning

Unit 5: Uncertainty-Basic probability, Bayes rule, Belief networks, Default reasoning,

Unit 6: Fuzzy sets and fuzzy logic; Decision Making-Utility theory, utility functions, Decision-theoretic expert systems.

Unit 7 : Learning Forms of Learning, Inductive Learning: - Learning Decision Trees,

Unit 8: Statistical learning methods: - Naïve Bayes models, Bayesian network, EM algorithm, HMM,

Unit 9: Instance based learning :-nearest neighbor models.

Unit 10: Intelligent Systems- Expert System- Stages in the Development of an Expert System,

Unit 11: Difficulties in Developing Expert System, Application of Expert System

Unit 12: Introduction to Evolutionary Programming, Swarm Intelligent Systems.

Text / Reference Books:

1. Stuart Russell and Peter Norvig. Artificial Intelligence–A Modern Approach, Pearson EducationPress,2001.

2. Kevin Knight, Elaine Rich, B. Nair, Artificial Intelligence, McGrawHill,2008.

3. George F.Luger, Artificial Intelligence, Pearson Education,2001.

4. MilsJ. Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kauffman,2002.

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CO-PO Mapping

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

CO-PSO Mapping

CO and PSO	PSO1	PSO2	PSO3
CO1	-	1	-
CO2	-	2	-
CO3	-	2	-
CO4	-	1	-
CO5	-	3	-

`

Semester III

PROGRAM ELECTIVE II

BIG DATA ANALYTICS

COURSE OVERVIEW AND OBJECTIVES:

- To understand the Big Data Platform and its Use cases.
- Apply analytics on Structured and Unstructured Data.
- Acquire the knowledge and working on Big Data platforms

COURSE OUTCOME: The student would be able:

CO1: Understand the concepts and techniques of big data analytics, including data storage, processing, and analysis at scale.
CO2: Apply big data analytics tools and frameworks to process and analyze large volumes of data from various sources.
CO3: Develop skills in data preprocessing, cleansing, and transformation for effective big data analysis.
CO4: Gain proficiency in applying statistical and machine learning algorithms to extract valuable insights and patterns from big data.
CO5: Evaluate and communicate the results of big data analytics to inform data-driven decision-making and drive business value.

OUTLINE OF THE COURSE

Unit No	Title of Unit	Time Required for Unit(Hours)
1	Introduction to Big Data	6
2	HDFS (Hadoop Distributed File System)	5
3	Hadoop I/O	6
4	Hadoop Eco System Pig	6
5	Hbase	6

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Detailed Syllabus

Unit1: Introduction to Big Data: Types of Digital Data, Introduction to Big Data, Big Data Analytics

Unit 2: Relational Databases & SQL, Data Cleansing and Preparation, History of Hadoop, Apache Hadoop, Analyzing Data with Unix tools, Analyzing Data with Hadoop, Hadoop Streaming

Unit 3: IBM Big Data Strategy, Infosphere Big Insights and Big Sheets.

Unit 4: HDFS (Hadoop Distributed File System): The Design of HDFS, HDFS Concepts, Command Line Interface

Unit 5: Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives.

Unit6: Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.

Unit 7: Map Reduce, Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.

Unit 8: Hadoop Eco System Pig: Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators.

Unit 9: Hive: Hive Shell, Hive Services, Hive Meta store, Comparison with Traditional Databases,

Unit 10: HiveQL, Tables, Querying Data and User Defined Functions

Unit 11: Hbase: HBasics, Concepts, Clients, Example, Hbase Versus RDBMS. Big SQL, Data Analytics with R

Unit 12: Machine Learning: Introduction, Supervised Learning, Unsupervised Learning, collaborative filtering. Big Data Analytics with BigR.

Text/Reference Books

1. Data Science for Business by F. Provost and T. Fawcett, O'Reilly Media.

Text/Reference Books

2. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics by Bill Franks, John Wiley & Sons.
3. Hadoop: The Definitive Guide by Tom White, O'reily Media.
4. Big Data and Business Analytics by Jay Liebowitz, Auerbach Publications, CRC Press

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CO-PO Mapping

COs and Pos	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7
CO1	1	2	3	-	-	-	-
CO2	-	-	2	-	-	-	-
CO3	-	2	-	-	-	-	-
CO4	2	-	-	-	-	-	-
CO5	-	1	-	-	-	-	-

CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	1	–	–
CO-2	1	–	–
CO-3	2	–	–
CO-4	2	–	–
CO-5	1	–	–

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Semester III
PROGRAM ELECTIVE II

KNOWLEDGE ENGINEERING & EXPERT SYSTEMS

COURSE OBJECTIVES

- To enable the students:
- To get introduced to the basic knowledge representation, problem solving, and learning methods of Artificial Intelligence.
- To solve problems in Artificial Intelligence using Python.
- To familiarize with Fuzzy Logic and knowledge processing in expert systems.

COURSE OUTCOME

The students will

CO1: Understand the principles and methodologies of knowledge engineering for building expert systems.
CO2: Apply knowledge representation techniques to capture and organize domain-specific knowledge for expert systems.
CO3: Develop expertise in designing and building rule-based expert systems using knowledge engineering tools and methodologies.
CO4 : Evaluate and select appropriate knowledge acquisition techniques for extracting knowledge from domain experts.
CO5: Demonstrate the ability to analyze, evaluate, and enhance the performance of expert systems through knowledge engineering techniques..

OUTLINE OF THE COURSE

Unit No	Title of Unit	Time Required for Unit (Hours)
1	Problems and Search	5

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2	Search Methods	7
3	Knowledge Representation	5
4	Learning	6
5	Expert System	5

Detailed Syllabus

Unit 1: Problems and Search: What is Artificial Intelligence, The AI Problems, Defining the Problem as a State Space Search

Unit 2: Problem Characteristics Searching strategies – Generate and Test, Heuristic Search Techniques- Hill climbing– issues in hill climbing.

Unit 3: Python-Introduction to Python- Lists Dictionaries & Tuples in Python- Python implementation of Hill Climbing.

Unit 4: Search Methods - Best First Search - Implementation in Python - OR Graphs, The A * Algorithm, Problem Reduction AND-OR Graphs

Unit 5: The AO* algorithm, Constraint Satisfaction. MINIMAX search procedure, Alpha–Beta pruning.

Unit 6: Knowledge representation - Using Predicate logic - representing facts in logic, functions and predicates, Conversion to clause form, Resolution in propositional logic, Resolution in predicate logic, Unification.

Unit 7: Representing Knowledge Using Rules: Procedural Versus Declarative knowledge, Logic Programming, Forward versus Backward Reasoning.

Unit 8: Learning: What is learning, Rote learning, Learning by Taking Advice, Learning in Problem-solving, Learning from example: induction, Explanation-based learning.

Unit 9: Connectionist Models: Hopfield Networks, Learning in Neural Networks

Unit 10: Applications of Neural Networks, Recurrent Networks. Connectionist AI and Symbolic AI

Unit 11: Expert System –Representing and using Domain Knowledge – Reasoning with

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knowledge–

Unit 12: Expert System Shells –Support for explanation- examples –Knowledge acquisition-examples.

Text Books:

1. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw-Hill Publishing
2. Company Ltd., New Delhi, Third Edition, ISBN: 13:978-0-07-008770-5, 2010.
3. Stuart Russell, Peter Norvig, "Artificial Intelligence- A modern approach", Pearson Education
4. Asia, Second Edition, ISBN:81-297-0041-7

References:

1. AksharBharati, VineetChaitanya, Rajeev Sangal, "Natural Language Processing: A Paninian
2. Perspective", Prentice Hall India Ltd., New Delhi, 1996, ISBN 10: 8120309219
3. Amit Konar, Artificial Intelligence and Soft Computing, CRC Press.
4. Dan W.Patterson, "Introduction to Artificial Intelligence and Expert Systems", Prentice Hall
5. India Ltd., New Delhi, 2009, ISBN: 81-203-0777-1.

CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7
CO1	–	1	3	–	–	–	–
CO2	–	–	2	–	–	–	–
CO3	2	3	–	–	–	–	–
CO4	–	–	–	3	–	–	–
CO5	2	2	2	2	–	–	–

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CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	1	–	–
CO-2	1	–	–
CO-3	2	–	–
CO-4	2	–	–
CO-5	1	–	–

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Semester III

PROGRAM ELECTIVE II

PATTERN RECOGNITION

COURSE OVERVIEW AND OBJECTIVES: Students are able to:-

- To build the foundation of deep learning.
- To understand how to build the neural network.
- To enable the students to develop successful machine learning projects.

COURSE OUTCOME:

The student would be able:

CO1: Explain and compare a variety of pattern classification, structural pattern recognition, and pattern classifier combination techniques.

CO2: Summarize, analyze, and relate research in the pattern recognition area verbally and in writing.

CO3: Apply performance evaluation methods for pattern recognition, and critique comparisons of techniques made in the research literature.

CO4: Apply pattern recognition techniques to real-world problems such as document analysis and recognition.

CO5: Implement simple pattern classifiers, classifier combinations, and structural pattern recognizers.

OUTLINE OF THE COURSE

Unit No	Title of Unit	Time Required for Unit(Hours)
1	Introduction to Pattern Recognition	6
2	Nearest Neighbor Based	6

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	Classifiers	
3	Hidden Markov Models	5
4	Support Vector Machines	6
5	Clustering	6

Detailed Syllabus

Unit 1: **Introduction to Pattern Recognition:** Data Sets for Pattern Recognition, Different Paradigms for Pattern Recognition,

Unit 2: Pattern Representation: Data Structures for Pattern Representation, Representation of Clusters, Proximity Measures, Size of Patterns, Abstractions of the Data Set, Feature, Feature Selection, Evaluation of Classifiers, Evaluation of Clustering

Unit 3: **Nearest Neighbour Based Classifiers:** Nearest Neighbour Algorithm, Variants of the NN Algorithm, Use of the Nearest Neighbour Algorithm for Transaction Databases, Efficient Algorithms, Data Reduction, Prototype Selection,

Unit 4: Bayes Classifier: Bayes Theorem, Minimum error rate classifier, Estimation of Probabilities, Comparison with the NNC, Naive Bayes Classifier, Bayesian Belief Network.

Unit 5: **Hidden Markov Models:** Markov Models for Classification, Hidden Markov Models, Classification Using HMMs, Classification of Test Patterns.

Unit 6: Decision Trees: Introduction, Decision Trees for Pattern Classification, Construction of Decision Trees, Splitting at the Nodes, Over fitting and Pruning, Example of Decision Tree Induction.

Unit 7: **Support Vector Machines:** Introduction, Linear Discriminant Functions, Learning the Linear Discriminant Function, Neural Networks

Unit 8: SVM for Classification, Linearly Separable Case, Non-linearly Separable Case.

Unit 9: Combination of Classifiers: Introduction, Methods for Constructing Ensembles of Classifiers

Unit 10: Methods for Combining Classifiers, Evaluation of Classifiers, Evaluation of Clustering

Unit 11: **Clustering:** Clustering and its Importance, Hierarchical Algorithms, Partitional Clustering, Clustering Large Data Sets

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Unit 12: An Application to Handwritten Digit Recognition: Description of the Digit Data, Pre-processing of Data, Classification Algorithms, Selection of Representative Patterns.

Text Books:

1. Pattern Recognition an Introduction, V. Susheela Devi M. Narasimha Murty, University Press.

2. Pattern Recognition, Segrios Theodoridis, Konstantinos Koutroumbas, Fourth Edition, Elsevier

Reference Books:

1. Pattern Recognition and Image Analysis, Earl Gose, Richard John Baugh, Steve Jost, PHI 2004.

2. C. M. Bishop, 'Neural Networks for Pattern Recognition', Oxford University Press,Indian Edition, 2003.

3. Pattern Classification, R.O.Duda, P.E.Hart and D.G.Stork, Johy Wiley,2002

CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7
CO1	1	2	3	-	-	-	-
CO2	-	-	2	-	-	-	-
CO3	-	2	-	-	-	-	-
CO4	2	-	-	-	-	-	-
CO5	-	1	-	-	-	-	-

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CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	1	–	–
CO-2	1	–	–
CO-3	2	–	–
CO-4	2	–	–
CO-5	1	–	–

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Semester III

PROGRAM ELECTIVE II

BLOCKCHAIN

COURSE OVERVIEWAND OBJECTIVES: Understand the building blocks of crypto currency

COURSE OUTCOME

The student would be able to:

CO 1: Describe Cryptography

CO 2: Describe Encryption

CO 3: Describe Crypto currency basics

CO 4: Describe SHA Algorithms

CO 5: Explain Hyper-Ledger

OUTLINE OF THE COURSE

Unit No	Title of Unit	Time Required for Unit(Hours)
1	Introduction to Cryptography	6
2	Conventional Encryption	7
3	Key management	6
4	Introduction to Block chain and Crypto-currency Basics	7
5	Working of Block chain and Hyper Ledger	8

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Detailed Syllabus:

Unit1: Introduction to Cryptography: Introduction to Advanced Cryptography and Cryptanalysis, Classical Encryption Techniques – Substitution Techniques, Transposition Techniques, And Permutation Method.

Unit 2: Advanced Encryption Techniques and Security Issues – RC4, One-time Pad, RSA, DES,

Unit 3: Triple DES, AES and Diffie Hellman, Case study

Unit 4: Conventional Encryption : Confidentiality using conventional encryption – Placement of Encryption, Traffic Confidentiality, Key Distribution and Random NumberGeneration.

Unit5: Key management – Generating Keys, Nonlinear Keyspaces, Transferring Keys, Verifying Keys, Using Keys, Updating Keys, Storing keys, Backup keys, Compromised Keys

Unit 6: Lifetime of Keys, Destroying Keys and Public-Key Management, Case study.

Unit7: Introduction to Blockchain and Crypto-currency Basics : What is Blockchain, Blockchain Technology and Mechanisms, Challenges

Unit 8: Centralized Servers and Trusted Third Party, Shift from gold standard to flat currency to Hash cash/Digital, Trust less System, Transactions and Blocks,

Unit 9: Digital Signatures, Discussion on Bitcoin and Ethereum, Significance, Security

Unit 10: The Bitcoin Mining Network, Mining Developments, Decentralization and Hard Forks, Ethereum Eco-System

Unit 11: Working of Blockchain and Hyper Ledger,cTechnology behind Blockchain-Consensus Building, Proof of Work, Byzantine Generals, Distributed Consensus,

Unit 12: Cryptography, Hashing, Data Integrity, Public vs. Private Key Cryptography, Merkle Trees. Crypto-currency and Mining, Proof of Work vs. Stake, Business Model, What is Hyper Ledger, Distributed Ledger Technology, Hyper Ledger Fabric and Composer, Assets, Chaincode and Ledger/Transactions, Permission Network, Member Services,

Text Books:

1. Imran Bashir. (2018). Mastering Blockchain : Distributed edger Technology, Decentralization and Smart Contracts explained,Import.

2. Chris Dannen. (2017). Introducing Ethereum and Solidity: Foundations of Crypto currency and Blockchain Programming for Beginners.Apress.

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Reference Books:

1. Imran Bashir. (2018). Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts explained, Import.Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder. (2016).

2. Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction. Princeton University Press.

3. Alex Tapscott and Don Tapscott. (2016). Blockchain Revolution: How the Technology behind Bitcoin Is Changing Money, Business, and the World, Portfolio.

4. Dr. Gavin Wood. (2014) Ethereum: A Secure Decentralized Transaction Ledger. Yellow Paper.

CO-PO Mapping

CO and PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	-	1	2	-	-	-	-
CO2	-	-	-	-	-	1	-
CO3	-	-	2	-	-	-	-
CO4	-	1	-	-	-	-	-
CO5	-	-	-	-	-	1	-

CO-PSO Mapping

CO and PSO	PSO1	PSO2	PSO3
CO1	-	-	2
CO2	-	-	3
CO3	-	-	1
CO4	2	-	-
CO5	1	-	-

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Semester III
(Electives in CTIS)

STORAGE AND DATA CENTER

COURSE OVERVIEW AND OBJECTIVES:

- To impart the basic concepts of Storage systems and Datacenter environment.
- To understand concepts about RAID techniques.
- To understanding about taking backup and restoring the data with the help of Business Continuity and Disaster Recovery concepts and tools.
- To understand about Data Center Consolidation and Clustering.

COURSE OUTCOME: At the end of the course, students will be able to:

- Analyze Storage devices and technologies.
- Summarize the advantages and functionality of NAS and SAN.
- Appreciate knowledge on Backups and Disaster Recovery.
- Describe Data Center Consolidation and its phases.
- Appreciate knowledge on design and analysis of Cluster Architecture.

OUTLINE OF THE COURSE

Unit No	Title of Unit	Time Required for Unit(Hours)
1	Introduction to Storage System	6
2	Storage Networking Technologies	7
3	Backup and Disaster Recovery	7
4	Data Center Consolidation	6
5	Data Center Clusters	7

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Detailed Syllabus

Unit 1: Introduction to Storage System

Introduction to Information Storage: Information Storage, Evolution of Storage Architecture, Data Center Infrastructure, Virtualization and Cloud Computing

Unit 2: Data Center Environment: Application, Database Management System (DBMS), Host (Compute), Connectivity, Storage, Host Access to Data, Direct-Attached Storage, Storage Design Based on Application

Unit 3: Data Protection (RAID): RAID Implementation Methods, RAID Array Components, RAID Techniques, RAID Levels, RAID Impact on Disk Performance, RAID Comparison

Unit 4: Storage Networking Technologies

Network-Attached Storage: General-Purpose Servers versus NAS Devices, Benefits of NAS, File Systems and Network File Sharing, Components of NAS, NAS I/O Operation, NAS Implementations, NAS File-Sharing Protocols, Factors Affecting NAS Performance , File-Level Virtualization.

Unit 5: Fibre Channel Storage Area Networks: Fibre Channel Overview, The SAN and Its Evolution, Components of FC SAN, FC Connectivity, Switched Fabric Ports, Fibre Channel Architecture, Fabric Services, Switched Fabric Login Types, Zoning, FC SAN Topologies, Virtualization in SAN.

Unit 6: IP SAN and FCoE: iSCSI, FCIP, FCoE

Unit 7: Backup and Disaster Recovery: Introduction to Business Continuity, Information Availability, BC Terminology, BC Planning Life Cycle, Failure Analysis, Business Impact Analysis, BC Technology Solutions.

Unit 8: Backup and Archive: Backup Purpose, Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup Architecture, Backup and Restore Operations, Backup Topologies, Backup in NAS Environments, Backup Targets, Data Deduplication for Backup, Backup in Virtualized Environments, Data Archive, Archiving Solution Architecture.

Unit 9: Data Center Consolidation: Reasons for Data Center Consolidation, Consolidation Opportunities, .**Data Center Consolidation Phases:** Phase 1: Study and Document the Current Environment, Phase 2: Architect the Target Consolidated Environment, Phase 3: Implement the New Architecture, Phase 4: Control and Administer the Consolidated.

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Unit 10: Best Practices in IT: Defining Best Practices, Deploying Best Practices, Benefits of Best Practices, Systems Management Best Practices, Server Cluster Best Practices, Data Storage Best Practices, Network Management Best Practices, Documentation Best Practices, Network Diagram Documentation, Documentation Formats.

Unit 11: Data Center Clusters: Cluster Architecture: Asymmetric Two-Node Clusters, Symmetric Two-Node Clusters, Complex Cluster Configurations, Failover Policies, Best Practices.

Cluster Requirements: Required Hardware Cluster Components, Cluster Software Requirements, What Happens During Service Failover, Cluster Installation Checklist.

Unit 12: Designing Cluster-Friendly Applications: Automating Operations, Controlling Application Failover Time, Reducing Data Loss During Failover, Minimizing Application Failures, Designing Node-Independent Applications, Minimizing Planned Downtime, Restoring Client Connections.

Text/Reference Books:

1. Storage Networks Explained: Basics and Application of Fibre Channel SAN, NAS, ISCSI, INFINIB and FOCE by Ulf Troppens.
2. Storage Management in Data Centers: Understanding, Exploiting, Tuning, and Troubleshooting Veritas Storage Foundation by Volker Herminghaus and Albrecht Scriba.
3. Blade Servers and Virtualization: Transforming Enterprise Computing While Cutting Costs by Barb Goldworm and Anne Skamarock.

CO-PO Mapping

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

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CO-PSO Mapping

CO and PSO	PSO1	PSO2	PSO3
CO1	1	-	-
CO2	2	-	-
CO3	3	-	-
CO4	2	-	-
CO5	1	-	-

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Semester III

(Electives in CTIS)

Cloud Web Services

Course Objective

This course aims at providing the students an insight into the operations of cloud and introduces them to different cloud providers available.

Course Content:

UNIT-1: Introduction to Cloud Computing and Amazon Web ServicesIntroduction to Cloud Computing, Cloud Service Delivery Models (IAAS, PAAS,SAAS), Cloud Deployment Models (Private, Public, Hybrid and Community)

Unit 2: Cloud Threats and Importance of Cloud Security, Case StudyIntroduction to Amazon Web Services, Other leading cloud service providers in themarket, Why Amazon? Use Cases, AWS Storage Options, AWS Compute Options,AWS Database Options, AWS Workflow Automation and Orchestration Options, AWSSystems Management and Monitoring Options

Unit 3: AWS Virtual Private CloudIntroduction, Explore various Digital Transformational Services by AWS in ArtificialIntelligence, Analytics and IoT with some related use cases, AWS Pricing Concept.

UNIT 4: AWS Compute

Introduction to Elastic Cloud Compute (EC2), Amazon Machine Images (AMIS),Instance Lifecycle, Instance Types And Uses, Modifying Existing Images, Creating NewImages of Running Instances, Converting an Instance Store AMI to an EBS AMI, EBSVolume Types, Elastic IPs, Associating and releasing Elastic IP addresses to and froman EC2 Instance, Elastic Load Balancing, Auto scaling EC2 Instances,

Unit 5: Introduction toAWS Lambda, Automating EC2 instances using code in AWS Lambda.

UNIT 6: Web Applications and Security: Introduction to Elastic Beanstalk, Deploying Scalable Application On AWS, SelectingAnd Launching An Application Environment, Provisioning Application Resources withCloud formation, Introduction to CloudWatch, Describe Amazon Cloud Watch metricsand alarms, AWS Messaging Services(SNS,SQS,SES).

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Unit 7: Introduction to AWS Security, Describe Amazon Identity and Access Management(IAM), AWS Directory Service, AWS Key Management Service, Securing Data at Restand In Motion. UNIT IVAWS Storage

Unit 8: Amazon Storage, S3 Storage Basics, Buckets and Objects, S3 Versioning, Hosting astatic website on Amazon S3 using S3 website endpoints,

Unit 9: Managing VoluminousInformation with Elastic Block Storage (EBS) , EBS Features, Glacier Storage Service ,Describe Amazon Dynamo DB and its benefits, Applications and use cases of DynamoDB, Understand key aspects of Amazon RDS, Launch an Amazon RDS instance.

UNIT 10: AWS Networking: Introduction to AWS Networking , Access Control Lists (ACLs), Network ACL Basics and Rules, Default and Custom Network ACL, Managing Access with ACLs, Setting Upa Security Group, Setting up Virtual Private Cloud (VPC) and Internet Gateway, Settingup Virtual Private Network(VPN), Two services of VPN: AWS Site-to-Site VPN and AWS Client VPN

Unit 11: Understanding Customer Gateway,Virtual Private Gateway, TransitGateway, Setting Up Dedicated Hardware For VPC, Scenario 1:VPC with a SinglePublic Subnet (Standalone Web), Scenario 2: VPC with Public and Private Subnetsusing NAT (multi-tier website), Scenario 3:VPC with Public and Private Subnets AndAWS Site-to-Site VPN Access (Extension of your Corporate Network into the cloud andalso directly access the Internet from your VPC)

Unit 12: Scenario 4: VPC with a Private SubnetOnly and AWS Site-to-Site VPN Access. (Extension of your Corporate Network into thecloud using Amazon's infrastructure without exposing your network to the Internet),Route53 for DNS System, Cloud Front.DML trigger for auditing data modification, Using DDL triggers for auditing structuremodification, configuring SQL server auditing.

List of Experiments

1. AWS root user account creation using AWS management console.
2. Understanding AWS Billing Dashboard and Setting up billing alerts using CloudWatch.
3. Launching an EC2 instance and accessing it through SSH using putty.
2. Creating web server on EC2, with and without bash script.
3. (i) Creating Amazon machine Image(AMI) from an existing instance (ii) Creating and customizing a new AMI.
4. Demonstrating Elastic Load Balancer with the help of 3 EC2 instances.

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5. (i) Creating roles and attaching policies for EC2 service(automating START and STOP of instance) using Identity

6. and Access Management(IAM)

7. (ii) Demonstrating the use of Amazon Lambda and suitable code for automating START and STOP of EC2 instance

8. by integrating Lambda service with the respective roles created for the same.

9. Demonstrating S3-bucket creation, object upload, setting access permissions and S3 versioning.

10. Demonstrating version control in S3. Notice the difference with and without versioning after uploading object with

11. same name but different size.

12. Creating and hosting static web site using S3 bucket.

13. Demonstrating Amazon SNS service.

14. Configuration of Database engine using Amazon RDS.

15. Creating DNS using Route 53.

16. Creating your own VPC, subnets, route tables and security groups.

17. Demonstrating the configuration of NAT gateway.

Course Outcome:

1. Understand Cloud Web Services such as AWS with the help of case studies
2. Create a web server using a service like EC2 and familiarize themselves with various options and configurations in Cloud watch.

Text Book:

1. Cloud Computing: Principles and Paradigms, Editors: RajkumarBuyya, James Broberg, Andrzej M. Goscinski, Wiley, 2011

2. https://awsdocs.s3.amazonaws.com/gettingstarted/latest/awsgsg-intro.pdf

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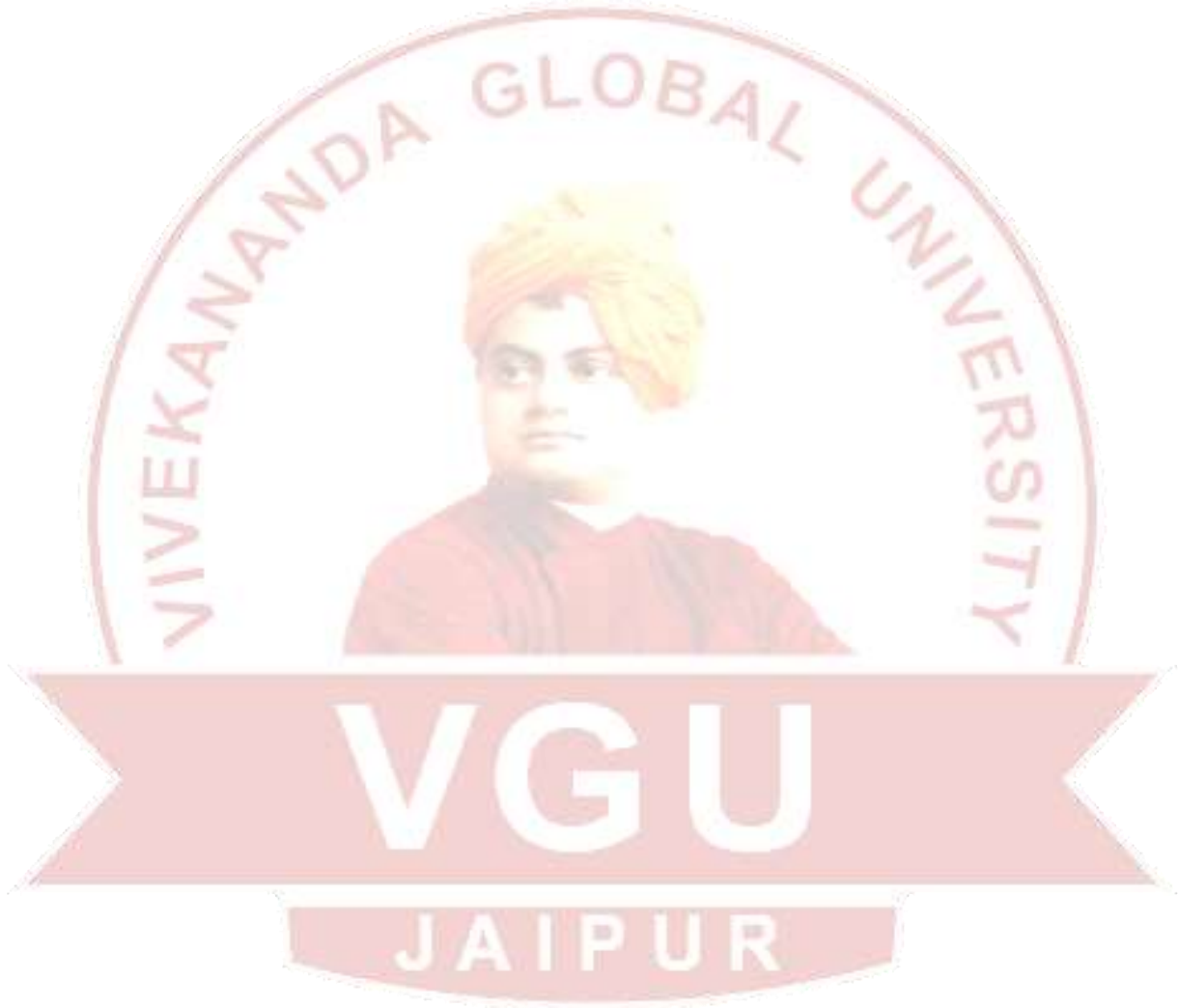
Reference Books:

1. YohanWadia , “AWS Certified Solutions Architect Official Study Guide: Associate Exam, John Packt Publishing, 2016.
2. Bernald Golden, “Amazon Web Services for Dummies”, John Wiley & Sons, 2013.
3. Cloud Computing Explained: Implementation Handbook for Enterprises, John Roton,Recursive Press (November 2, 2009).



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Semester III

(Electives in CTIS)

Cryptography and Network Security

Course objectives:

- To understand the fundamentals of Cryptography
- To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity
- To understand the various key distribution and management schemes
- To understand how to deploy encryption techniques to secure data in transit across data networks
- To design security applications in the field of Information technology

Syllabus

Unit-1: Introduction to security attacks, services and mechanism, introduction to cryptography. Conventional Encryption: Conventional encryption model, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stereography, stream and block ciphers.

Unit 2: Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, fiestal structure, data encryption standard(DES), strength of DES, differential and linear crypt analysis of DES, block cipher modes of operations, triple DES

Unit 3: IDEA encryption and decryption, strength of IDEA, confidentiality using conventional encryption, traffic confidentiality, key distribution, random number generation.

Unit 4: Introduction to graph, ring and field, prime and relative prime numbers, modular arithmetic, Fermat's and Euler's theorem, primality testing, Euclid's Algorithm, Chinese Remainder theorem, discrete logarithms.

Unit 5: Principals of public key crypto systems, RSA algorithm, security of RSA, key management, Diffle-Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, Elganel encryption.

Unit 6: Message Authentication and Hash Function: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MACS, MD5 message digest algorithm, Secure hash algorithm (SHA).

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Unit 7: Digital Signatures: Digital Signatures, authentication protocols, digital signature standards (DSS), proof of digital signature algorithm.

Unit 8: Authentication Applications: Kerberos and X.509, directory authentication service

Unit 9: electronic mail security-pretty good privacy (PGP), S/MIME.

Unit: 10: IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.

Unit 11: Web Security: Secure socket layer and transport layer security, secure electronic transaction (SET).

Unit 12: System Security: Intruders, Viruses and related threads, firewall design principals, trusted systems.

Text Books:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Prentice Hall, New Jersy.
2. Johannes A. Buchmann, "Introduction to Cryptography", Springer-Verlag. 3. Bruce Schiener, "Applied Cryptography".

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PROGRAM ELECTIVE II

Semester III

CYBER FORENSICS

COURSE OVERVIEW AND OBJECTIVES: Understand and document the process of cyber forensics.

COURSE OUTCOME:

Students will be able to:

- Understand tradeoffs and differences between various forensic tools.
- To describe the representation and organization of data and metadata within modern computer systems.
- Fighting against Macro Threats
- Create disk images, recover deleted files and extract hidden information.
- Understand the research in computer forensics.

OUTLINE OF THE COURSE

Unit No	Title of Unit	Time Required for Unit(Hours)
1	Computer forensic	5
2	Data Recovery	6
3	Electronic Evidence	7
4	Threats	6
5	Surviellance	7

Detailed Syllabus

Unit 1: COMPUTER FORENSICS: Definition, requirement of cyber forensics in today's IT era,

Unit 2: Computer Forensics Fundamentals – Types of Computer Forensics Technology – Types of Vendor and Computer Forensics Services

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Unit 3: Cyber Crimes & Cyber Forensics

Unit 4: DATA RECOVERY: Data Recovery – Evidence Collection and Data Seizure – Duplication and Preservation of Digital Evidence – Computer Image Verification and Authentication

Unit 5: Important software tools for Data Recovery, Network Forensics, Email Header investigation

Unit 6: ELECTRONIC EVIDENCE: Discover of Electronic Evidence, Identification of Data Reconstructing Past Events Networks

Unit 7: Electronic evidence and cyber laws, collecting evidence

Unit 8: THREATS: Fighting against Macro Threats – Information Warfare Arsenal

Unit 9: Tactics of the Military – Tactics of Terrorist and Rogues – Tactics of Private Companies.

Unit 10: SURVEILLANCE: The Future Arsenal Surveillance Tools, Victims and Refugees

Unit 11: Advanced Computer Forensics

Unit 12: Case Studies

Text Books:

1. John R. Vacca, "Computer Forensics", Firewall Media, 2004.
2. Chad Steel, "Windows Forensics", Wiley India, 2006.
3. Majid Yar, "Cybercrime and Society", Sage Publications, 2006.

Reference Books

1. Robert M Slade, "Software Forensics", Tata McGraw Hill, 2004

CO-PO Mapping

CO and PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	-	1	2	-	-	-	-
CO2	-	-	-	-	-	1	-
CO3	-	-	2	-	-	-	-

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CO4	-	1	-	-	-	-	-
CO5	-	-	-	-	-	1	-

CO-PSO Mapping

CO and PSO	PSO1	PSO2	PSO3
CO1	1	-	-
CO2	2	-	-
CO3	3	-	-
CO4	2	-	-
CO5	1	-	-

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Semester II
ETHICAL HACKING

COURSE OVERVIEW AND OBJECTIVES:

- To help students understand how ethical hacking is used as a method to prevent hacking.

COURSE OUTCOME: After completion of this course students should be able to:

CO1: Explain the importance of ethical hacking in achieving the goals of information security.

CO2: Differentiate the processes of vulnerability assessment from penetration testing.

CO3: Comprehend the importance of countermeasures for managing vulnerabilities.

CO4: Justify the need for documentationof both technical and management audiences.

CO5: Articulate the rationale for having an adequate legal framework for dealing with hacking

OUTLINE OF THE COURSE

Unit	Title of the unit	Time required for the Unit (Hours)
1.	Introduction to Ethical Hacking	9
2.	Hacking Methodology 6.0Management	8
3.	Web and Network Hacking	9
4.	Report writing & Mitigation	8
5.	Ethical Hacking and Legal System	8

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Detailed Syllabus

Unit 1: Introduction to Ethical Hacking

Hacking Methodology, Process of Malicious Hacking, and Foot printing and scanning: Foot printing, scanning. Enumeration: Enumeration.

Unit 2: System Hacking and Trojans: System Hacking, Trojans and Black Box Vs. White Box Techniques.

Unit 3: Hacking Methodology

Denial of Service, Sniffers, Session Hijacking and Hacking Web Servers: Session Hijacking, Hacking Web Servers.

Unit 4: Web Application Vulnerabilities and Web Techniques Based Password Cracking: Web Application Vulnerabilities, Web Based Password Cracking Technique

Unit 5: Web and Network Hacking

SQL Injection, Hacking Wireless Networking, Viruses, Worms and Physical Security: Viruses and Worms, Physical Security.

Unit 6: Linux Hacking: Linux Hacking. Evading IDS and Firewalls: Evading IDS and Firewalls.

Unit 7: Report writing & Mitigation

Introduction to Report Writing & Mitigation, requirements for low level reporting & high level reporting of Penetration testing results

Unit 8: Demonstration of vulnerabilities and Mitigation of issues

Unit 9: Ethical Hacking and Legal System

Overview of India's Information Technology Amendment Act 2008 (IT Act 2008) ,

Unit 10: cyber theft and IPC sec 378,

Unit 11: IT Act 2008 – sections 43, 65 and 66

Unit 12: Case Studies.

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Textbooks:

1.Gray Hat Hacking, The Ethical Hackers Handbook,Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle,3rd Edition, McGraw Hill Education

Reference Books:

1. CEH v9: Certified Ethical Hacker,Version 9,Study GuideSean-Philip Oriyano,Sybex

2. Hacking for Beginners: Ultimate 7 Hour Hacking Course for BeginnerS

CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7
CO1	1	2	3	2	1	3	–
CO2	2	1	2	2	1	3	–
CO3	3	1	2	2	1	1	–
CO4	–	–	–	–	–	–	–
CO5	–	–	–	–	–	–	–

CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	3	–	–
CO-2	3	–	–
CO-3	3	–	–
CO-4	–	2	2
CO-5	–	2	2

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Semester III

SECURITY ARCHITECTURE

COURSE OVERVIEW AND OBJECTIVES:

To help students relate concepts of information security architecture

COURSE OUTCOME: After completion of this course students should be able to:-

CO1: Relate concepts of system security

CO2: Justify the need for securing internet in mitigating important vulnerabilities.

CO3: Get the basic knowledge of mobile platforms

CO4: Acquire the knowledge about thesupply chain security

CO5: Acquire the knowledge about critical infrastructure

OUTLINE OF THE COURSE

1.	Software and System Security	8
3.	Security in Mobile Platforms	8
4.	Introduction to Hardware Security, Supply Chain	9
5.	Issues in Critical Infrastructure and SCADA Security	8

Detailed Syllabus

Unit 1: Software and System Security: Control hijacking attacks – buffer overflow, integer overflow, bypassing browser memory protection, Sandboxing and Isolation

Unit 2: Tools and techniques for writing robust application software, Security vulnerability detection tools, and techniques – program analysis (static,concolic and dynamic analysis), Privilege, access control

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Unit 3: Operating System Security, Exploitation techniques, and Fuzzing

Unit 4: Network Security & Web Security

Security Issues in TCP/IP – TCP, DNS, Routing (Topics such as basic problems of security in TCP/IP, IPsec, BGP Security, DNS Cache poisoning etc)

Unit 5: Network Defense tools – Firewalls, Intrusion Detection, Filtering, DNSSec, NSec3, Distributed Firewalls, Intrusion Detection tools, Threat Models, Denial of Service Attacks, DOS-proof network architecture

Unit 6: Security architecture of World Wide Web, Security Architecture of Web Servers, and Web Clients, Web Application Security – Cross Site Scripting Attacks, Cross Site Request Forgery, SQL Injection Attacks, Content Security Policies (CSP) in web

Unit 7: Session Management and User Authentication, Session Integrity, Https, SSL/TLS, Threat Modeling, Attack Surfaces, and other comprehensive approaches to network design for security

Unit 8: Security in Mobile Platforms

Android vs. ioS security model, threat models, information tracking, rootkits, Threats in mobile applications, analyzer for mobile apps to discover security vulnerabilities,

Unit 9: Viruses, spywares, and keyloggers and malware detection

Unit 10: Introduction to Hardware Security, Supply Chain Security: Threats of Hardware Trojans and Supply Chain Security, Side Channel Analysis based Threats, and attacks

Unit 11: Issues in Critical Infrastructure and SCADA Security: Security issues in SCADA, IP Convergence Cyber Physical System Security threats, Threat models in SCADA and various protection approaches

Unit 12: Machine learning and SCADA Security

Text books:

1. Cryptography security architecture: design and verification by Peter Gutmann
2. Security, Design, and Architecture for Broadband and Wireless Network Technologies" by Chilamkurti

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Reference books:

1. Security Architecture: Design, Deployment and Applications (RSA Press)" by Christopher King and Curtis Dalton
2. Android Security Internals – An In–Depth Guide to Android′s Security Architecture" by NikolayElenkov
3. Security Architecture Design Process for Health Information Exchanges (HIEs)" by nis

CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7
CO1	1	2	–	1	3	–	–
CO2	2	–	3	2	1	–	–
CO3	2	1	–	1	3	–	–
CO4	1	1	–	1	2	–	–
CO5	1	2	–	3	2	–	–

CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	3	1
CO-2	3	2	–
CO-3	2	2	–
CO-4	2	3	2
CO-5	3	3	–

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Semester III
PRINCIPLES OF VIRTUALIZATION

COURSE OVERVIEW AND OBJECTIVES:

- To understand the virtualization and Cloud Technology

COURSE OUTCOME: After completion of this course students should be able to:-

- Understand basic concepts of Virtualization.
- Understand Virtualization technologies: Hypervisor, emulation, and application VM; Platform virtualization, storage virtualization, and network virtualization etc.
- Create, manage, migrate and troubleshoot virtual machines, templates, clones, alarms, configure virtual switches, configure virtual storages, examine the features and functions of different storage protocols, such as FC, FCoE, iSCSI, NFS.
- Understand the VMware vSphere features such as load balancing, migration
- Understand CPU scheduling, CPU Optimization, network optimization, storage optimization, configuration of distributed switch in virtualized Environment.

OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit
1.	Introduction	9
2.	Components of vSphere 6.0Management	9
3.	Features of vSphere and NSX	8
4.	VSphere Solutions to Data Center Challenges and vSphere Security	8
5.	Resource optimization and resource management	8

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Detailed Syllabus

Unit 1: Introduction: Introduction to Virtualization - Types of virtualization - Difference between cloud and virtualization - Physical infrastructure and virtual infrastructure -

Unit 2: Virtualization approaches - Partitioning - Hosting - Isolation - Hardware independence - Virtual machine - Hypervisor - Types of hypervisor - Virtual machine manager - Types of hypervisor

Unit 3: Introduction to datacenter virtualization Esxi - Difference between Esxi and Esx - Versions of Esxi - Installation and configuration of Esxi 6.0 - vSphere 6.0

Unit 4: Components of vSphere 6.0

Components of VMware vSphere - vSphere 6.0: Overview and Architecture - Topology of vSphere 6.0 Data Center - vSphere 6.0 Configuration MaximumsvCenter Server

Unit 5: vCenter Server Features - Certificate Management - Alarms and Alerts - Monitoring Features - Template Management - Linked Mode Deployment

Unit 6: Storage Features in vSphere - Shared Storage - Storage Protocols - Datastores - Virtual SAN - Virtual Volumes.

Unit 7: Features of vSphere and NSX: vSphere Resource Management Features - vMotion - Distributed Resource Scheduler (DRS) - - Distributed Power Management (DPM) - Storage vMotion - Storage DRS - Storage I/O Control

Unit 8: Network I/O Control - vSphere Availability Features - vSphere Data Protection - High Availability - Fault Tolerance - vSphere Replication - Introduction to NSX

Unit 9: V Sphere Solutions to Data Center Challenges and vSphere Security: Challenges - Availability Challenges - Scalability Challenges - Management Challenges - Optimization Challenges - Application Upgrade Challenges - Cloud Challenges

Unit 10: Security - Describe the features and benefits of VMware Platform Services Controller - Configure ESXi host access and authorization - Secure ESXi - vCenter Server - and virtual machines - Upgrade ESXi and vCenter Server instances

Unit 11: Resource optimization and resource management

Network Optimization - Configure and manage vSphere distributed switches - Migrate virtual machines from standard switches to distributed switches - Explain distributed switch features such as port mirroring - LACP - QoS tagging - and NetFlow -

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Unit 12: CPU Optimization - Storage Optimization - Diagnose storage access problems.

Text / References Book:

1. Virtualization Essentials Paperback, Matthew Portnoy, Wiley
2. VMware Cookbook, Troy - Shroff/O'Reilly, Wiley
3. Mastering VMware vSphere 5.5 (SYBEX), Scott Lowe, Nick Marshall, Forbes Guthrie, Matt Liebowitz , Josh Atwell, 2014, Wiley

CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO1	1	2	–	1	3	–	–	–	–	–	–	–
CO2	2	–	3	2	1	–	–	–	–	–	–	–
CO3	2	1	–	1	3	–	–	–	–	–	–	–
CO4	1	1	–	1	2	–	–	–	–	–	–	–
CO5	1	2	–	3	2	–	–	–	–	–	–	–

CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	3	1
CO-2	3	2	–
CO-3	2	2	–
CO-4	2	3	2
CO-5	3	3	–

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Semester III
SEMINAR

COURSE OBJECTIVE: This will enable them to gain confidence in facing the placement interviews

COURSE OUTCOME:

The student should be able to:
CO 1: Select one technical topic
CO 2: Prepare synopsis
CO 3: Present the seminar progress
CO 4: Give a final presentation
CO 5: Use various teaching aids such as overhead projectors, power point presentation and demonstrative models

Procedure:

The students are to select one technical topic related its branch for Seminar. The student is to submit the synopsis for assessment and approval. Progress for preparation of the seminar topic would be continuously assessed from time to time. Two periods per week are to be allotted and students are expected to present the seminar Progress. A faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain the attendance.Students have to give a final presentation for 15 minutes on his topic. Students are encouraged to use various teaching aids such as overhead projectors, power point presentation and demonstrative models.

CO-PO Mapping

CO and PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	-	1	2	-	-	-	-
CO2	-	-	-	-	-	1	-
CO3	-	-	2	-	-	-	-
CO4	-	1	-	-	-	-	-
CO5	-	-	-	-	-	1	-

`

CO-PSO Mapping

CO and PSO	PSO1	PSO2	PSO3
CO1	-	-	2
CO2	-	-	3
CO3	-	-	1
CO4	2	-	-
CO5	1	3	-

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Semester III
MCA
SUMMER INTERNSHIP

COURSE OVERVIEW AND OBJECTIVES: The objective of Summer Internship is to enable the student to take up investigative study in the broadfield of Computer Science & Engineering, either fully theoretical/practical or involving both theoretical and practical work.

COURSE OUTCOME:

The student should be able to:

CO 1: Marketing Strategy Development
CO 2: Content Creation and Marketing
CO 3: Data Analytics and Reporting
CO 4: Client Communication and Relationship Building
CO 5: Team Collaboration and Project Management

Details:

- The purpose of practical training is not only to get acquainted with the culture of companies, but also to realize something of importance for the company visited. By working in a group within the company, it is expected that the trainee gets a better insight in the practical aspects of the industry. This is intended to facilitate the transition from the thorough theoretical education, dispensed at our University, into an industrial professional career. .

CO-PO Mapping

CO and PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	-	1	2	-	-	-	-
CO2	-	-	-	-	-	1	-
CO3	-	-	2	-	-	-	-
CO4	-	1	-	-	-	-	-
CO5	-	-	-	-	-	1	-

`

CO-PSO Mapping

CO and PSO	PSO1	PSO2	PSO3
CO1	-	-	2
CO2	-	-	3
CO3	-	-	1
CO4	2	-	-
CO5	1	-	-

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Semester IV
MCA

PROJECTRESEARCH PROJECT/INDUSTRIAL PROJECT / INDUSTRY INTERNSHIP/PROJECT IN AN ACADEMIC INSTITUTE / LAB OF NATIONAL IMPORTANCE (RESEARCH PUBLICATIONS)

COURSE OVERVIEW AND OBEJCTIVES: To improve the professional competency and research aptitude by touching the areas which otherwise not covered by theory or laboratory classes. The practical training aims to develop the work practice in students to apply theoretical and practical tools/techniques to solve real life problems related to industry and current research.

COURSE OUTCOME:

The student will be able to:

CO 1: Develop the work practice
CO 2: Solve real life problems related to industry
CO 3: Better insight in the practical aspects of the industry
CO 4: Facilitate the transition from the thorough theoretical education
CO 5: Acquaintance with the culture of companies

Details:

The purpose of practical training is not only to get acquainted with the culture of companies, but also to realize something of importance for the company visited. By working in a group within the company, it is expected that the trainee gets a better insight in the practical aspects of the industry. This is intended to facilitate the transition from the thorough theoretical education, dispensed at our University, into an industrial professional career.

CO-PO Mapping

CO and PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	-	1	2	-	-	-	-
CO2	-	-	-	-	-	1	-

`

CO3	-	-	2	-	-	-	-
CO4	-	1	-	-	-	-	-
CO5	-	-	-	-	-	1	-

CO-PSO Mapping

CO and PSO	PSO1	PSO2	PSO3
CO1	-	-	2
CO2	-	-	3
CO3	-	-	1
CO4	2	-	-
CO5	1	-	-