B.N.M. *Institute of Technology*

An Autonomous Institution under VTU, Approved by AICTE

Department of Mathematics

Syllabus

Semester: III

Course: Fourier Transform, Fundamentals of logic and Linear Algebra
Course Code: 22MAI131 (Common to CSE, ISE, AIML)

L:T:P:J	2:1:1:0	CIA	:	50
Credits:	03	SEA	:	50
Hours:	40	SEA Duration	:	03 Hours

Course Learning Objectives: The students will be able to

1. Have an insight into Fourier series, Fourier transforms.

2. Develop knowledge of Fundamentals of logic and Relations, Vector Spaces & Linear Transformation arising in engineering

Module-1: Fourier Series & Fourier Transforms	No. of hours	Blooms cognitive Levels
Examples from Engineering field that require Fourier series and Fourier Transforms. **Fourier series**: Periodic functions, Introduction to Fourier Series, Dirichlet's condition. Problems on Fourier series over $(-l, l)$. **Fourier Transforms:** Introduction to infinite Fourier transform, Fourier sine and cosine transform and properties, problems on infinite Fourier transform, Discrete & Fast Fourier Transform. *Lab Component: Finding the Fourier series and Fourier Transform of a function*	L : 04 T : 04	**Apply**
Module-2: Fundamentals of logic and Relations		
Examples from Engineering field that require Fundamentals of logic and Relations. **Fundamentals of logic:** Basic connectives and truth tables, logic equivalence - the laws of logic, logical implication- rules of inference **Relations:** First order linear recurrence relation, second order linear homogenous recurrence relation with constant coefficients. *Lab Component: Finding the solution of recurrence relation*	L : 04 T : 04	**Apply**
Module-3: Vector Spaces		
Examples from Engineering field that require vector spaces Recap of system of linear homogenous and non-homogeneous equation and solution sets. Vector spaces, subspaces, linearly independent and dependent, Linear span of a set, basis and dimension, coordinate vectors. *Lab Component: problems on linearly independent and dependent, basis and dimension of a vector space.*	L : 04 T : 04	**Apply**
Module-4:Linear Transformation		
Examples from Engineering field that require linear transformation. Linear transformations, algebra of linear transformations, representation of transformations by matrices, Non-singular linear transformation, Inverse of a linear transformation, Range space, Null space and problems on Rank-nullity theorem. *Lab Component: problems on Inverse of a linear transformation and Rank-nullity theorem*	L : 04 T : 04	**Apply**
Module-5: Inner Product Spaces		
Examples from Engineering field that require Inner product spaces. Inner products Inner product spaces, Orthogonal set, orthogonal projections, orthonormal bases, Gram-Schmidt process, QR-factorization, Recap of Eigen values and Eigen vectors, problems on singular value decomposition. *Lab Component: Problems on QR-factorization and singular value decomposition*	L : 04 T : 04	**Apply**

Course Outcomes: After completing the course, the students will be able to

CO 1: Apply Fourier series & Transform concepts in Data visualization and Cryptography.

CO 2: Communicate the basic concepts of logic and their relevance for computer science engineering.

CO 3: Apply the knowledge of vector spaces for solving problems in arising in engineering field

CO 4: Apply the knowledge of Linear transform for solving problems in arising in image processing

CO 5: Compute orthogonal and orthonormal bases vectors and decomposition of a symmetric matrix using standard technique.

Text Books:
1. E. Kreyszig: "Advanced Engineering Mathematics", John Wiley & Sons,10th Edition(Reprint), 2016.
2. B. S. Grewal: "Higher Engineering Mathematics", Khanna Publishers, 44th Ed., 2017.
3. H. K. Dass, " Advanced Engineering Mathematics" S. Chand publication.

Reference Books:
1. C. Ray Wylie, Louis C. Barrett : "Advanced Engineering Mathematics", 6" Edition, 2. McGraw-Hill Book Co., New York, 1995.
2. James Stewart : "Calculus —Early Transcendentals", Cengage Learning India Private Ltd., 2017.
3. B.V.Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
4. Srimanta Pal & Subobh C Bhunia: "Engineering Mathematics", Oxford University Press, 3"Reprint, 2016.
5. David C. Lay, Steven R. Lay and J. J. McDonald "Linear Algebra and its applications", 3rd Edition, Pearson Education Ltd., 2017.
   Ralph P. Grimaldi, " Discrete and Combinatorial Mathematics, 5th Edition, Pearson Education 2004.

Web links and Video Lectures:
1. https://nptel.ac.in/courses/111106111
2. https://youtu.be/OynpZwylau8
3. https://archive.nptel.ac.in/courses/111/106/111106051/
4. https://www.youtube.com/watch?v=zvRdbPMEMUI
5. https://www.youtube.com/watch?v=cHNmT1-qurk
6. https://www.youtube.com/watch?v=ATqV_I8DCh0

PCC	CIA	SEA	CIA (50)			SEA **Conduction: 100 M Reduced to: 50 M**
				I	II	
Conduction	50	50	Written Test	50	50	Five questions with each of 20 marks (with internal choice). Student should answer one full question from each module
				Average of two tests – 25 Marks		
			Assignment	15		
			AAT	10		
				Total – 50 marks		**Total – 50 marks**

i) **CIA: 50%**

IA Test: 2 IA tests - Each of 50 Marks	Average of 2 tests – scaled down to 25 M
Assignment – Two assignments – one for 10 marks and another for 5 marks	15 Marks
Additional Assessment Tools (AAT) – Oral /Online Quizzes, Presentations, Group discussions, Case studies, Term Paper, Open ended experiments, Mini industrial/social/rural Projects, Two-minute video on latest topic, Short MOOC courses, Practical Orientation on Design thinking, creativity & Innovation, Participatory & Industry integrated learning, Practical activities, Problem solving exercises, Participation in seminars/academic events/symposia and any other activity	10 Marks
Total	**50 Marks**

ii) SEA : 50%

Theory Exam	5 questions to answer each of 20 Marks 2 questions from each module with internal choice Student should answer one full question from each module	20 M x 5 = **100 M** **reduced to 50 M**
	Total	**50 Marks**

B.N.M. Institute of Technology

An Autonomous Institution under VTU
Department of Information Science and Engineering

Computer Organization

SEMESTER–III

Subject Code: 22ISE132	L:T:P:J: 3:0:0:0	CIE Marks:	50
Credits:	3	SEE Marks:	50
Total Number of Lecture Hours	40	SEE Duration:	3Hours

Course objectives:

- To understand the basic sub systems of a computer, their organization, structure and operation.
- Illustrate the concept of programs as sequences of machine instructions.
- Teach the concepts of Memory system and cache memory.
- Cultivate clear thinking in performing Arithmetic, Multiplication, division and Floating-point number operations in computer.
- Describe the working of pipelining and multiprocessor computer architecture.

Module1: Introduction	Teaching Hours	Blooms cognitive Levels
Basic Structure of Computers: Basic Operational Concepts, Bus Structures, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement. Machine Instructions and Programs: Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language, Basic Input and Output Operations, Stacks and Queues, Subroutines, Additional Instructions, Encoding of Machine Instructions.	8	Understand
Module 2: Input / Output Organization		
Accessing I/O Devices, Interrupts – Interrupt Hardware, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces – PCI Bus, USB.	8	Understand
Module 3: Memory System		
Memory System: Basic Concepts, Semiconductor RAM Memories, Read Only Memories, Speed, Size, and Cost, Cache Memories – Mapping Functions, Replacement Algorithms, Performance Considerations.	8	Analyze
Module 4: MIPS Arithmetic operations		
MIPS Addressing for 32-Bit Immediates and Addresses, Parallelism and Instructions: Synchronization, Translating and Starting a Program, Addition and Subtraction (MIPS), Multiplication and Division (MIPS).	8	Apply
Module 5: Pipelining and Multiprocessors		
Pipelining: Basic concepts, Data Hazards, Instruction hazards, Basic processing unit: some fundamental concepts, execution of complete instruction, multi-bus organization, The structure of general-purposes multiprocessors, **Parallel Computer Architecture:** Processor Architecture and Technology Trends, Flynn's Taxonomy of Parallel Architectures.	8	Apply

Course outcomes: The students should be able to:

- CO 1: Ability to understand the abstraction of various components of a computer.
- CO 2: Ability to understand the functions of different sub systems, such as processor, Input/output, and memory.
- CO 3 : Analyze the concepts of Memory system and cache memory.
- CO 4 : Apply Arithmetic, Multiplication and division operations in computer.
- CO 5: Apply the working of pipelining and multiprocessor computer architecture

Reference Books:

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky, Computer Organization, 5th Edition, Tata McGraw Hill, 2002.
2. Parallel Programming for Multicore and Cluster Systems, Thomas Rauber, Gudula Runger, 2nd Edition, Springer, 2013.
3. David A. Patterson and John L. Hennessey, "Computer organization and design, The Hardware/Software interface", Morgan Kauffman / Elsevier, Fourth/Fifth edition, 2014.
4. William Stallings: Computer Organization & Architecture, 9th Edition, Pearson, 2015.

PCC	CIA	SEA	CIA (50)			SEA Conduction: 100 M Reduced to: 50 M
				I	II	
Conduction	50	50	Written Test	50	50	Five questions with each of 20 marks (with internal choice). Student should answer one full question from each module
				Average of two tests – 25 Marks		
			Assignment	15		
			AAT	10		
				Total – 50 marks		**Total – 50 marks**

i)   CIA: 50%

	Average of 2 tests – scaled down to 25 M
IA Test: 2 IA tests - Each of 50 Marks	
Assignment – Two assignments – one for 10 marks and another for 5 marks	15 Marks
Additional Assessment Tools (AAT) – Oral /Online Quizzes, Presentations, Group discussions, Case studies, Term Paper, Open ended experiments, Mini industrial/social/rural Projects, Two-minute video on latest topic, Short MOOC courses, Practical Orientation on Design thinking, creativity & Innovation, Participatory & Industry integrated learning, Practical activities, Problem solving exercises, Participation in seminars/academic events/symposia and any other activity	10 Marks
Total	**50 Marks**

ii)   SEA : 50%

Theory Exam	5 questions to answer each of 20 Marks 2 questions from each module with internal choice Student should answer one full question from each module	20 M x 5 = **100 M** **reduced to 50 M**
	Total	**50 Marks**

B.N.M. Institute of Technology

An Autonomous Institution under VTU
Department of Information Science and Engineering

Operating Systems

SEMESTER–III

Subject Code: 22ISE133	L:T:P:J: 3:0:0:0	CIA Marks:	50
Credits:	3	SEA Marks:	50
Total Number of Lecture Hours	40	SEA Duration:	3 Hours

Course Objectives:

- Introduce concepts and terminology used in OS
- Explain threading and multithreaded systems
- Illustrate process synchronization and concept of Deadlock
- Introduce to Unix File Systems

	Teaching Hours	Blooms cognitive Levels
Module1: Introduction to Operating System & Process Management		
Fundamental Concepts of Operating System: Introduction to Operating systems, Operating system functions and services, System boot. **Process Management:** Process abstraction, process address space, process management, system calls, threads. **CPU Scheduling:** Levels of scheduling, comparative study of scheduling algorithms, Multilevel Queue Scheduling, Multi-processor scheduling.	**8**	**Apply**
Module2: Process Synchronization and Deadlocks		
Concurrent Processes: Critical section problem, semaphores, Classical problems of synchronization, monitors, inter-process communication, message passing mechanisms. **Deadlocks:** Characterization, prevention and avoidance, deadlock detection and recovery.	**8**	**Apply**
Module3: Memory Management		
Memory Management: Background; Swapping; Paging; Structure of page table; Segmentation, virtual memory concept, demand paging, page replacement algorithms, thrashing, Disk Scheduling. **Solid State Drives**-SSD Architecture, Flash Controller,	**8**	**Apply**
Module4: UNIX file system		
Unix files: UNIX Architecture, Naming files. Basic file types/categories. Organization of files. Hidden files. Standard directories. Parent child relationship. The home directory and the HOME variable. Reaching required files- the PATH variable, manipulating the PATH, Relative and absolute pathnames. Directory commands – pwd, cd, mkdir, rmdir commands. The dot (.) and double dots (..) notations to represent present and parent directories and their usage in relative path names. File related commands – cat, mv, rm, cp, wc and od commands. **Practical component**: Execution of UNIX Shell Commands	**8**	**Apply**
Module5: File attributes and Shell programming		
File attributes and permissions: The ls command with options. Changing file permissions: the relative and absolute permissions changing methods. Recursively changing file permissions. Directory permissions. The shells interpretive cycle: Wild cards. Removing the special meanings of wild cards. Three standard files and redirection. **Connecting commands**: Pipe, grep, egrep. **Shell programming**: Ordinary and environment variables. Read and read-only commands. Command line arguments. exit and exit status of a command. Logical operators for conditional execution. The test command and its shortcut. The if, while, for and case control statements. The set and shift commands and handling positional parameters. The here (<<) document. Simple shell program examples. **Practical component:** Execution of Wildcards & UNIX Shell Programs	8	**Analyze**

Course Outcomes: After completing the course, the students will be able to	
CO 1	Apply the concepts of process scheduling to improve CPU utilization and identify various multi-threading models
CO 2	Identify the need of policies, protection required in managing deadlock, main and virtual memory & various techniques in managing concurrent processes
CO 3	Apply the concept of paging & segmentation for effective memory management
CO 4	Apply the concepts of Unix system and file commands to perform various tasks in files and system.
CO 5	Analyze the concepts of Wildcards and Shell Programming to write basic shell scripts and formulating regular expressions for Pattern matching

Reference Books:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles 7th edition, Wiley-India, 2006
2. Sumitabha Das., Unix Concepts and Applications., 4thEdition., Tata McGraw Hill.
3. William Stallings, Operating System: Internals and Design Principles, Prentice Hall, 9th Edition, 2018.
4. W. Richard Stevens: Advanced Programming in the UNIX Environment, 2nd Edition, Pearson Education, 2005
5. Unix System Programming Using C++ - Terrence Chan, PHI, 1999.

Web links and Video Lectures:

1. https://academicearth.org/
2. https://archive.nptel.ac.in/courses/106/105/106105214/

PCC	CIA	SEA	CIA (50)			SEA Conduction: 100 M Reduced to: 50 M
				I	II	
Conduction	50	50	Written Test	50	50	Five questions with each of 20 marks (with internal choice). Student should answer one full question from each module
				Average of two tests – 25 Marks		
			Assignment	15		
			AAT	10		
				Total – 50 marks		Total – 50 marks

i)   CIA: 50%

IA Test: 2 IA tests - Each of 50 Marks	Average of 2 tests – scaled down to 25 M
Assignment – Two assignments – one for 10 marks and another for 5 marks	15 Marks
Additional Assessment Tools (AAT) – Oral /Online Quizzes, Presentations, Group discussions, Case studies, Term Paper, Open ended experiments, Mini industrial/social/rural Projects, Two-minute video on latest topic, Short MOOC courses, Practical Orientation on Design thinking, creativity & Innovation, Participatory & Industry integrated learning, Practical activities, Problem solving exercises, Participation in seminars/academic events/symposia and any other activity	10 Marks
Total	50 Marks

ii)   SEA : 50%

Theory Exam	5 questions to answer each of 20 Marks 2 questions from each module with internal choice Student should answer one full question from each module	20 M x 5 = **100 M** **reduced to 50 M**
	Total	**50 Marks**

B.N.M. Institute of Technology

An Autonomous Institution under VTU
Department of Information Science and Engineering

Data Structures and its Applications

SEMESTER– III

Subject Code: 22ISE134	L:T:P:J: 3:0:2:0	CIE Marks:	50
Credits:	4	SEE Marks:	50
Total Number of Lecture Hours	50	SEE Duration:	3 Hours

Course objectives:

- Learn the fundamental data structures and identify data structuring strategies that are appropriate to a given contextual problem and able to design, develop, test and debug in C language considering appropriate data structure. Use and implement structures to obtain solutions.
- Illustrate and implement data types such as stack, queue and linked list and apply them for the given problem.
- Understand and distinguish the conceptual and applicative differences in trees, binary trees and binary search trees. Apply the correct tree for the given application.
- Create and use appropriate data structures in C programs for solving real life problems.

Module 1: Stacks and Queues	Teaching Hours	Blooms cognitive Levels
Concept Learning: Data Structures: Classification (Primitive & Non-primitive), Operations,Pattern Matching Algorithms (Brute force, KMP) **Stacks:** Definition, Operations, Implementation using arrays, Applications of Stacks – Infix toPostfix Conversion and Postfix Expression Evaluation. **Queues:** Definition, Operations, Implementation, Applications, Circular Queue (Message queueusing Circular queue), Doubly Ended Queue, Priority Queue. **Practical session:** Tracing Exercises, Analysis Exercises, Exercises to Modify programs **Programs not limited to:** 1. Implement KMP pattern matching algorithm for a given main string and pattern 2. Implement Boyer-Moore pattern matching algorithm for a given main string and pattern 3. Program to implement stack operations (push, pop, and display) using static array and also on dynamic array and compare the performance 4. Program to convert infix expression into postfix. 5. Program to evaluate given postfix expression 6. Program to implement queue operations using static arrays and on dynamic arrays and compare the performance. 7. Program to implement circular queue operations using arrays and on dynamic arrays and compare the performance	**10**	**Apply**
Module 2: Linked List		
Linked Lists: Definition, Create, Insert, Delete, Update, Traverse, and Position-based Operations, Concatenate, Merge, and Reverse Lists, Doubly Linked List Implementation and Operations, Circular Linked List Implementation and Operations, Applications of Lists (Polynomial addition). Implementation of stacks and queues using Linked List **Practical session:** Tracing Exercises, Analysis Exercises, Exercises to Modify programs **Programs not limited to:** 1 Program to create single linked list and implement its operations with and without header nodes I. Insert (front and rear end) ii. Delete. (Front and rear end) iii. Search. iv. Reverse. 2 Implement DLL as a stack and also as a queue	**10**	**Apply**

3	Create 2 CLL of sparse polynomials and perform addition on these 2 polynomials. Represent the resulting polynomial in a CLL		
4	Implement multiple stacks and multiple queues in a singly linked list		

Module 3: Trees

Concept Learning: Trees: General Tree Representation, Traversals, Applications. **Binary Trees**: Definition, Properties, Traversals, Applications. **Binary Search Tree**: Definition, Implementation, Search, Insert, Delete operations. Building andEvaluating Binary Expression Tree. **Concept Learning Graphs:** Adjacency Lists, and Traversal of Graphs (BFS and DFS) **Practical session:** Tracing Exercises, Analysis Exercises, Exercises to Modify programs **Programs not limited to:** 1. Implement the following operations on Binary tree: - A. Count the number of nodes in the binary tree B. Count the leaf nodes C. Check if 2 trees are equal D. Perform Tree Traversals namely in-order, pre-order, post-order and level order. 2. Create a Binary search Tree for a set of integer values, perform deletion of a key and searching for a key 3. For a given input graph check weather the nodes are connected or not using BFS and DFS method 4. Create a expression tree to evaluate the given expression using binary tree	**10** **Apply**

Module 4: Advanced Trees & Hashing

Concept Learning: Heap Tree: Definition, Implementation, Insert, Delete, Peek operations.**Hashing**: Hash Table, Hash Functions, Collision Handling by Open Addressing, Chaining. **Practical session:** Tracing Exercises, Analysis Exercises, Exercises to Modify programs. **Programs not limited to:** 1. Create a max heap and min heap of integers, display the values and perform deletion operations 2. Program to implement hashing with collision resolution	**10** **Apply**

Module 5: File Structures

File Structures: Primary Indexing, Secondary Indexing, B-Trees, Co sequential processing, K way merge. **Practical session:** Tracing Exercises, Analysis Exercises, Exercises to Modify programs. **Programs not limited to:** 1. Write a program to implement simple index on primary key for a file. Implement add (), search (), delete () using the index. 2. Write a program to read two lists of names and then match the names in the two lists using Consequential Match based on a single loop. Output the names common to both the lists. 3. Write a program to read k Lists of names and merge them using k-way merge algorithm with k = 8.	**10** **Apply**

Course outcomes: The students should be able to:
CO1: Apply fundamental data structures viz., Lists, Stacks, Queues, Linked Lists, Binary Trees from first principles CO2: Identify the use of appropriate data structures for a given problem CO3: Design and implement solutions to basic practical problems using customized data structures CO4: Apply the Advanced concepts like Heap & Hashing to solve problems. CO5: Apply the concepts to solve graphical problems.

Reference Book:

1. Fundamentals of Data Structures in C -- by Horowitz, Sahni and Anderson-Freed (Silicon Press 2007).
2. Data Structures Using C, Reema Thareja, 1st Edition, 2011, Oxford Higher Education, ISBN-13: 978-0198099307
3. "Data Structures and Program Design in C", Robert Kruse, C L Tondo, Bruce Leung and ShashiMogalla, PHI, 2nd Edition, 2015.
4. Y. Langasm, M. J. Augenstein, A. M. Tenenbaum (2001) Data Structures Using C and C++, PrenticeHall India, New Delhi, India.
5. T. H. Cormen, C. E. Leiserson and R. L. Rivest (1990) Introduction to Algorithms, Third Edition, MITPress, MA.
6. Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, 4th Revised edition; 2013,Addison-Wesley, ISBN-13: 978-8131714744

PCI	CIA	SEA	CIA (50)			SEA Conduction: 100 M Reduced to: 50 M
Conduction	50	50	Written Test	50	50	Five questions with each of 20 marks (with internal choice). Student should answer one full question from each module
				Average of two tests – 50 marks scaled down to 15 marks		
			Assignment	Average of 2 Assignments – 10M		
			Practical	Weekly Assessment – 10 Marks IA test – 15 Marks (IA test to be conducted for 50 M and scaled down to 15M)		
					Total – 50 Marks	**Total – 50 Marks**

i) CIA: 50%

Theory	**IA Test** (Theory): 2 IA tests - each of 50 Marks – Average of 2 tests scaled down to 15 Marks **Assignment** : 2 Assignments – each of 10 marks	25 Marks
	Weekly Assessment – 10 Marks **Practical test (1)** - 15 marks	25 Marks
	Total	50 Marks

ii) SEA : 50%
Question Paper:

Theory Exam	5 questions to answer, each of 20 Marks 2 questions from each module with internal choice Student should answer one full question from each module	20 M x 5 = **100 M** **Reduced to 50 M**
	Total	50 Marks

B.N.M. Institute of Technology

An Autonomous Institution under VTU

Department of Information Science and Engineering

Object Oriented Programming using Java
III Semester

Course Code: 22ISE135	L:T:P:J 3:0:2:0	CIA Marks	50
Credits	04	SEA Marks	50
Total Number of Contact Hours	50	SEA Duration	03

Course Learning Objectives: This course will enable students to:

- Show competence in the use of the Java programming language in the development of small to medium-sized application programs that demonstrate professionally acceptable coding and performance standard
- Understand the basic principles of the object-oriented programming
- Demonstrate an introductory understanding of graphical user interfaces, multithreaded programming, and event-driven programming.

Module – 1	No. of hours	Blooms cognitive Levels
Basics of Java: Features of Java, Byte Code and Java Virtual Machine, JDK, Data types, Operator, Control Statements – If , else, nested if, if-else ladders, Switch, while, do-while, for, for-each, break, continue. **Array and String:** Single and Multidimensional Array, String class, StringBuffer class, Operations on string, Command line argument, Use of Wrapper Class. **Classes, Objects and Methods:** Class, Object, Object reference, Constructor, Constructor Overloading, Method Overloading, Recursion, Passing and Returning object form Method, new operator, this and static keyword, finalize() method **Programs:** 1. Write a program to convert rupees to dollar. 60 rupees=1 dollar. 2. Write a program that calculate percentage marks of the student if marks of 6 subjects are given. 3. Write a program to enter two numbers and perform mathematical operations on them. 4. Write a program to find length of string and print second half of the string. 5. Write a program to accept a line and check how many consonants and vowels are there in line. 6. Write a program to count the number of words that start with capital letters. 7. Write a program to find that given number or string is palindrome or not. 8. Create a class which asks the user to enter a sentence, and it should display count of each vowel type in the sentence. The program	12	Apply

should continue till user enters a word "quit". Display the total count of each vowel for all sentences.
9. Write an interactive program to print a string entered in a pyramid form.
10. Write an interactive program to print a diamond shape.
11. Program to define class Box and constructors. Demonstrate constructors.
12. Program to define class Addition, methods and objects. Demonstrate method overloading to add 2 integers, 3 floating numbers and 2 strings.

Module – 2		
Class and Objects (Contd.) Access control, modifiers, Nested class, Inner class, Anonymous inner class, Abstract class. **Inheritance:** Use of Inheritance, Inheriting Data members and Methods, constructor in inheritance, Multilevel Inheritance – method overriding Handle multilevel constructors – super keyword, Stop Inheritance - Final keywords, Dynamic method dispatch, Understanding of Java Object Class, **Package and Interfaces:** Use of Package, CLASSPATH, Import statement, Static import, Access control Creation and Implementation of an interface, Interface reference, Interface inheritance, Nesting Interfaces, variables in Interfaces, Comparison between Abstract Class and Interface **Programs:** 1. Program to define inheritance and show method overriding - Program to define base class Shapes, with methods and create derived classes Square, Triangle, Rectangle and Circle. Create objects and show method overriding for calculating area of Square, Triangle, Rectangle and Circle. 2. Create an Interface Stack with methods push(), pop() and show(). Create class IntStack which implements Stack. Demonstrate the working of this class. 3. Create an Interface Queue with methods insert(), delete() and display(). Create class StringQueue which implements Queue. Demonstrate the working of this class	10	**Apply**

Module – 3		
Exception Handling: Exception and Error, Use of try, catch, throw, throws and finally, Built in Exception, Custom exception, Throwable Class. **Multithreaded Programming**: Use of Multithread programming, Thread class and Runnable interface , Thread priority, Thread synchronization, Thread communication, Deadlock **Programs:** 1. Analyze how a programmer must handle an error when an invalid mobile number is entered (lesser than 10 digits or greater than 10	**10**	**Apply**

digits; with alphabets; starting with 0) is entered while taking the details of a student. The Student class must contain the following: Name; USN; Branch and Mobile Number. Write a program using a custom exception type

2. Create an exception called Non Int Result Exception, which is generated when the result of dividing two integer values produces a result with a fractional component. Non Int Result Exception has two fields that hold integer values; a constructor; and an override of the to String() method, allowing a friendlier description of the exception to be displayed using println().

3. Write a JAVA program which creates two threads, one thread displays "JAVA" 10 times, and another thread displays "PROGRAMMING LANGUAGE" 15 times continuously?

4. Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer for every 1 second; second thread computes the square of the number and prints; third thread will print the value of cube of the number

5. Write a program that prints the Multiplication Table for numbers 2-10. At a time the tables must print completely for one number before printing for the next number

6. Create a Counter class with a private count instance variable and two methods. The first method:
   synchronized void increment() – tries to increment count by 1. If count is already at its maximum of 3, then it waits until count is less than 3 before incrementing it. The other method is
   synchronized void decrement() – attempts to decrement count by 1. If count already at a minimum of 0, then it waits until count is greater than 0 before decrementing it.
   Every time either method has to wait, it displays a statement as to why it is waiting.
   Also every time an increment or decrement occurs, the Counter displays a statement that says what occurred and shows count's new value.

7. Create a Bank class with withdrawal and deposit methods. Demonstrate the use of notify() and wait().

Module – 4		
IO Programming: Introduction to Stream, Byte Stream, Character stream, Readers and Writers, File Class, File Input Stream, File Output Stream, Input Stream Reader **Swings:** Swings: The origins of Swing; Two key Swing features; Components and Containers; The Swing Packages; A simple Swing Application; Create a Swing J Applet; J label and Image Icon; J Text Field; The Swing Buttons; J Tabbed pane; J Scroll Pane; JList; J Combo Box; JTable. **Programs:**	**10**	**Apply**

1. Create a class called Student. Write a student manager program to manipulate the student information from files by using File Input Stream and File Output Stream 2. Refine the student manager program to manipulate the student information from files by using the Buffered Reader and Buffered Writer 3. Refine the student manager program to manipulate the student information from files by using the Data Input Stream and Data Output Stream. Assume suitable data 4. Create a GUI for a business of your choice using swings. Demonstrate the use of Button, Radio Button, Combo box, List, Text field etc.		
Module – 5		
Servlet : The Life Cycle of a Servlet; Using Tomcat for Servlet Development; A simple Servlet; The Servlet API; The Javax. servlet Package; Reading Servlet Parameter; The Javax. servlet.http package; Handling HTTP Requests and Responses; Using Cookies; Session Tracking. Java Server Pages (JSP): JSP, JSP Tags, Tomcat, Request String, User Sessions, Cookies, Session Objects **Programs:** 1. Write Servlet application to print current date &time 2. Write Servlet application to demonstrate session tracking 3. Implement Program 1 using JSP 4. Implement Program 2 using JSP	**8**	**Apply**
Course Outcomes: After completing the course, the students will be able to		
CO 1**:**Understand object-oriented programming concepts and implement in java. CO 2**:**Comprehend building blocks of OOPs language, inheritance, package and interfaces. CO 3**:**Identify exception handling methods. CO 4**:**Implement multithreading in object oriented programs CO 5**:**Describe how servlets fit into Java-based web application architecture		
Reference Books : 1. The Complete Reference, Java 2 (Eleventh Edition), Herbert Schild, - TMH. 2. Java Fundamentals A comprehensive introduction By Herbert Schildt, Dale Skrien, McGraw Hill Education. 3. Programming with Java A Primer – E.Balaguruswamy,McGrawhill 4. Core Java Volume-I Fundamentals Horstmann& Cornell, - Pearson Education. - Eleventh Edition 5. Head First Java: A Brain-Friendly Guide, 3rd Edition- Kathy Sierra, Bert Bates		

PCI	CIA	SEA	CIA (50)			SEA Conduction: 100 M Reduced to: 50 M	
Conduction	50	50		I	II	PART A	PART B
			IA Test	30	30	30 Marks	70 Marks
				Average of two tests – 30 M			
			Continuous Assessment	Weekly Assessment -20 marks			
					Total – 50 Marks		Total – 50 Marks

i) CIA: 50%

IA Test: 2 IA tests - each of 30 Marks	Average of 2 tests – 30 M
Practical Lab record – 10 Marks Performance – 05 Marks Viva – 05 Marks	20 Marks
	Total 50 Marks

ii) SEA : 50%
Question Paper:

Theory part	5 questions to answer each of 6 Marks 2 questions from each module with internal choice Student should answer one full question from each module	6 M x 5 = 30 Marks
Execution part	Write up - 20 Marks Conduction - 40 Marks Viva-Voce - 10 Marks	70 Marks
	Total	**100 Marks Reduced to 50 M**

Note:
➢ No Assignment and AAT

B.N.M. Institute of Technology

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Department of Information Science and Engineering

WEB TECHNOLOGIES
SEMESTER – III

Course Code: 22ISE136	L:T:P:J 0:0:2:2	CIA: 50
Credits:	02	SEA: 50
Hours:	25	SEE Duration:03

Course Learning Objectives: This course will enable students to:
1. Learn about HTML, JavaScript
2. Learn about Scopes and Closures in java Script, develop a Server-side programming using java Script, Node.js
3. Demonstrate a connectivity with Database MySQL using ODBC and Node.js
4. Implement CRUD operations in SQL using Node.js
5. Develop a client-side Application using React Js
6. Implement MERN Stack.

Programs List: (Not restricted to the list given)

PART -A

Module – 1	Teaching Hours
Introduction to HTML, what is HTML and Where did it come from? HTML Syntax, Semantic Markup, Structure of HTML Documents, HTML Elements, HTML5 Semantic Structure Elements. HTML Tables and Forms, Introducing Tables, Styling Tables, Introducing Forms, Form Control Elements, Table and Form Accessibility. **List of Programs** 1. Design a web page that shows your class timetable using HTML table tag. 2. Design a form which should accept the student data such as, USN, Name of the Student, Date of birth, Branch, Semester. After submitting the form, It should display confirmation message.	5
Module – 2	
JavaScript: What is JavaScript and What can it do? JavaScript Design Principles, where does JavaScript Go? Syntax, JavaScript Objects, The Document Object Model (DOM), JavaScript Data types and variables, Operators, screen output and keyboard input, Control statements. **List of Programs** 1. Write a JavaScript to design a simple calculator to perform the following operations: Sum, product, difference, and quotient. 2. Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in an HTML table format.	5
Module-3	
Javascript Functions, Recursion, Arrays, Array Methods, Strings, String Methods, Regular expressions, JavaScript Events, Validating form Input, OOP concepts in Javascript.	5

List of Programs
1. . Develop and demonstrate a HTML5 file that includes JavaScript script that uses functions for the
following problems:
      a. To check whether a string is palindrome or not.
      b. Fibonacci Sequence using Recursion.
2. Create a student registration form for job application and validate the form fields using JavaScript.
3. Develop a JavaScript program to shuffle deck of cards.	

Module-4	

Introduction to node.js, node.js modules, NPM, node.js HTTP module, node.js file system, node.js email.
Introduction to MySQL, Database creation in MySQL, Insertion in MySQL, Queries to perform CRUD operations using SQL, ODBC connectivity with MySQL.
List of Programs
1. Develop a Server-side programming using java Script with the help of Node.js
   to perform following operations:
     1. Access/Write a file on server.
     2. Process User Input
2. Write a Program to implement CRUD Operation in SQL using Node.js
3. Demonstrate Open Database Connectivity (ODBC) with MySQL.
	5

Module-5	
Introduction to React.js, react render HTML, How to create a new react application, react components, react class, react events, react props, react conditionals, react lists, react forms, react router, react CSS styling. **List of Programs** 1. Create a to-do list application with add and delete functionality. 2. Create a form that takes in a name and email address and displays the entered data below the form. **Self Study:** Write a Java Script Program to implement MERN Stack.	**5**
PART - B (Mini - Project) Not restricted to the list given	

Develop a web application project using the languages and concepts learnt in exercises listed in part A with a good look and feel effects. You can use any web technologies and frameworks and databases.
Sample Projects Include :
    1. Food Ordering Website
    2. Online Purchase Store
    3. Search Engine etc.
    4. College website
    5. Banking application
    6. Blood donation application
    7. Gaming application
    8. Library management system
    9. Chat application
    10. Tourism website
	25

Course outcomes: The students will be able to:	
CO1	Create web pages with various media contents using HTML5.
CO2	Create a robust Client-side validation with java script
CO3	Create an application using node.js and react js

Text Books :

1. Programming the World Wide Web, 7th edition, Robert W. Sebesta , Pearson Education, ISBN- 9789332518827.
2. Get Programming with Node.js, Jonathan Wexler 1st Edition
3. Learning React: A Hands-On Guide to Building Web Applications Using React and Redux, Krupa Chinnathambi, (2nd Edition)

Reference Book:

1. Web Application Design and Implementation: Apache 2, PHP5, MySQL, JavaScript, and Linux/UNIX Steven A. Gabarro, December 2006, c2007, Wiley-IEEE Computer Society Press.
2. Nate Murray, Felipe Coury, Ari Lerner and Carlos Taborda, "ng-book, The Complete Book on Angular 4" September 2016 3. KrasimirTsonev, "Node.js by Example Paperback", May 2015.
3. Randy Connolly, Ricardo Hoar, "Fundamentals of Web Development", 1st Edition, Pearson Education India. (ISBN:978-9332575271).

WEB links and Video Lectures

1. https://www.w3schools.com/
2. https://nodejs.org/en/
3. https://www.mongodb.com

PBL	CIA	SEA	CIA (50)			SEA Conduction: 100 M Reduced to: 50 M
Conduction	50	50	Theory	**I IA**	**II IA**	Project Assessed for 100 marks reduced to 50 Marks
				25	25	
				Average of 2 tests – 25 M		
			Practical	Weekly Assessment (Record/Project) – 10 Marks Lab IA test – 15 Marks		
				Total – 50 Marks		**Total – 50 Marks**

i)   CIA: 50%

Theory - 2 IA tests - Each of 25 Marks	25 Marks

Practical
    Weekly Assessment - Lab record/Project – 10 Marks
     Lab IA test – 15 Marks
	25 Marks

Total	**50 Marks**

ii)   SEA : 50%

Project	Write up – 10 Marks Project report – 25 Marks Presentation & Demonstration - 50 Marks Viva-Voce – 15 Marks	100 Marks Reduced to 50 Marks

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Semester: III		
COURSE: Soft Skill-1		
Course Code: 22SFT138	L:T:P:J: 0:0:2:0	CIA Marks: 50
Credits:	1	SEA Marks: 5 0
Hours:	24 hrs	SEA Duration: 2Hrs
Course Learning Objectives: The students will be able		
1	To help students understand their strengths and weakness.	
2	To develop analytical and creative ability to solve problems individually or as a team.	
3	To make students industry ready through practice of corporate etiquettes.	
4	To enhance public speaking and presentation skills.	

Module No.	Contents of the Module	Hours	Cos
1	**Module-1 Understanding and Managing Self** Self-Awareness, Self-Management, Anger Management, Time management, Change management. Vision and goal setting - Diff between vision and goal, smart, stretched goal concept, case studies Knowledge, Skill, Attitude Personality analysis using Big 5 personality test Critical Thinking, Problem solving, Creativity and innovation Integrity, ethics, values	8	1 &2
2	**Module -2 Corporate etiquettes and Mannerism** Introduction to Etiquette and Mannerism, Personal Etiquette, Grooming etiquettes- professional styling, Body & personality styling, Video Interview Etiquettes, Personal Interview EtiquettesEffective meeting skills. Workplace behavior, Personal interview	6	3
3	**Module -3 Public Speaking and presentation skills** Introduction to public speaking, making ideas, illustrating and delivering ideas, overcoming fear of public speaking and developing great delivery. Advanced Business presentation skills, PowerPoint presentation, Group discussion	6	4
4	**Module -4 Team Work** Interpersonal skills, group work vs team work	4	5

Course Outcomes: At the end of the course the student will be able to:

CO1	Understand their strength and weaknesses.
CO2	Develop analytical and creative ability to solve problems.
CO3	Identify themselves as industry ready through the practice of corporate etiquettes.
CO4	Enhance public speaking and presentation skills.
CO5	Build team collaboration by working towards shared goals.

Mapping of Course Outcomes with Programme Outcomes:

COs	PO8	PO9	PO10	PO11
CO1	3	3		
CO2		3		3
CO3	3	3		3
CO4		3	3	
CO5			3	3

MOOC Course:

Communicate with impact - https://www.coursera.org/learn/communicate-with-impact

Leading Diverse Teams - https://www.coursera.org/learn/leading-diverse-teams

Practical component:

1. Mock GD and interview may be conducted at the end of the course to check their confidence. Students can prepare their SWOT analysis and present the same.
2. The students are to be involved in various activities and games such as Just a Minute or Pick and speak to demonstrate each topic.

Class Internal Assessment – 50 Marks

1. **Video Assignment** -30Marks
2. **Weekly Assessment** -20Marks

Rubrics for evaluation: (TOTAL - 30 Marks)

SL no.	Assessment	COs	Marks
1	Creativity	CO 2	5M
2	Approach and flow	CO 2	5M
3	Time Management (duration of video and deadline)	CO 1	5M
4	Individual presentation in the video	CO 4	5M
5	Report- Brief about the topic and Contribution of team members	CO 5	5M
6	Report- Reflections (learnings from the activity)	CO 2 & CO 5	5M

Semester End Assessment – 50 Marks

PPT - 10 Marks

Communication (Clarity and English) - 10 Marks

Body Language - 10 Marks

Viva (Q and A) - 10 Marks

Project Report - 10 Marks

Final Marks = CIA + SEA = 50+50 = 100 Marks

Department of Mathematics
Syllabus

	Semester: IV		
Course: Statistics, Probability and Graph theory			
Course Code: 22MAI141 (Common to CSE, ISE, AIML)			
L:T:P:J	2:1:1:0	CIA: 50	
Credits:	03	SEA: 50	
Hours:	40	SEA Duration: 03 Hours	

Course Learning Objectives: The students will be able to	
1	Provide an insight into applications of Graph Theory, Curve fitting & Statistical methods.
2	Develop the knowledge of probability, joint probability distribution and Queuing theory occurring in digital signal processing, design engineering and micro wave engineering.

Module-1: Curve fitting & Statistical methods	No. of hours	Blooms cognitive Levels
Examples from Engineering field that require curve fitting and statistical methods. **Curve Fitting:** Curve fitting by the method of least squares-fitting the curves of the form: $y = ax+b$, $y = ax^b$ and $y = ax^2 + bx + c$. **Statistical methods:** Introduction to Moments, Skewness, kurtosis and problems. Karl Pearson's coefficient of correlation and lines of regression. *Lab Component: Problems on curve fitting and statistical methods*	L: 04 T: 04	**Apply**
Module-2: Probability Distributions & Joint probability distribution		
Examples from Engineering field that require Probability and Joint probability distribution **Probability Distributions:** Review of basic probability theory. Discrete and continuous Random variables, probability mass/density functions (definitions only). Binomial, Poisson, exponential and normal distributions (without proof). **Joint probability distribution:** Joint Probability distribution for two discrete random variables, expectation, covariance and correlation. *Lab Component: Problems on binomial, Poisson, exponential and normal distributions*	L: 04 T: 04	**Apply**
Module-3:Markov Chain & Sampling Theory		
Examples from Engineering field that require Markov Chain and Sampling Theory **Markov Chain**: Introduction to Stochastic process, Probability vectors, Stochastic matrices, Regular stochastic matrices, Markov Chains, Higher transition probabilities, Stationary distribution of Regular Markov chains and absorbing states, Markovian processes. **Sampling Theory**: Introduction to sampling theory, Testing of hypothesis, level of significance, confidence limits, test of significance of mean and difference of means for large samples-z-test, test of significance of small Samples-Student's t- distribution, Goodness of fit-Chi-Square test. *Lab Component: Problems on Markovian processes and, Sampling Theory*	L: 04 T: 04	**Apply**
Module-4: Queuing theory		
Examples from Engineering field that require queueing theory Introduction, Symbolic representation of a queuing model, single server Poisson queuing model with infinite capacity (M/M/1: ∞/FCFS), when $\lambda_n = \lambda$ and $\mu_n = \mu(\lambda < \mu)$, Multiple server Poisson queuing model with infinite capacity (M/M/S: ∞/ FCFS), when $\lambda_n = \lambda$ for all $n, (\lambda > S\mu)$, *Lab Component: Problems on (M/M/1: ∞/FCFS) and (M/M/S: ∞/ FCFS) queuing models*	L: 04 T: 04	**Apply**
Module-5: Graph Theory		
Examples from Engineering field that require graph theory Basic concepts, types of graphs, order and size of a graph, in-degree and out-degree, bipartite-graphs, connected and disconnected graphs, Eulerian graph, Hamiltonian graphs, sub-graphs, isomorphic graphs. Matrix representation of graphs, adjacency matrix, incidence matrix. Planar graphs: definition, characterization of planar graphs, Kuratowski's theorem, Euler's formula and consequences. *Lab Component: Problems on detection of planar and non-planar graphs*	L: 04 T: 04	**Apply**

Course Outcomes: After completing the course, the students will be able to

CO 1: Make use of correlation and regression analysis to fit a suitable mathematical model for the statistical data.
CO 2: Apply discrete and continuous probability and joint probability distributions in analyzing the probability models arising in engineering field.
CO 3: Use Markov chain in prediction of future events and demonstrate the validity of testing the hypothesis.
CO 4: Acquire skills in analyzing queuing models.
CO 5: Apply the knowledge of Graph Theory in Network modeling, electrical network and computational algorithms

Reference Books:

1. E. Kreyszig: "Advanced Engineering Mathematics", John Wiley & Sons, 10th Edition(Reprint), 2016.
2. B. S. Grewal: "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2017.
3. S. D. Sharma : "Operations Research", Kedar Nath Ram Nath & Co. Meerut, 2014.
4. T. Veerarajan : Probability, Statistics and Random processes, McGraw Hill Education(India) Private Limited, Third edition, Nineteenth reprint 2017.
5. C. Ray Wylie, Louis C. Barrett : "Advanced Engineering Mathematics", 6th Edition, McGraw-Hill Book Co., New York, 1995.
6. James Stewart : Calculus-Early Transcendental, Cengage Learning India Private Ltd., 2017.
7. B. V. Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
8. Srimanta Pal & Subobh C. Bhunia: "Engineering Mathematics", Oxford University Press, 3rd Reprint, 2016.
9. Narsingh Deo, "Graph Theory with Applications to Engineering and Computer Science", Prentice Hall of India, 2000.

Web links and Video Lectures:

1. https://nptel.ac.in/courses/111104098
2. https://www.youtube.com/watch?v=1YkfeR05YXY
3. https://archive.nptel.ac.in/courses/111/104/111104079/
4. https://www.youtube.com/watch?v=xGkpXk-AnWU
5. https://archive.nptel.ac.in/courses/106/104/106104170/

PCC	CIA	SEA	CIA (50)				SEA Conduction: 100 M Reduced to: 50 M
				I	II	III	
Conduction	50	50	Written Test	30	30	30	Five questions with each of 20 marks (with internal choice). Student should answer one full question from each module
				Average of three tests – 30 Marks			
			Assignment	10			
			AAT	10			
				Total – 50 marks			**Total – 50 marks**

i) CIA: 50%

IA Test: 3 IA tests - Each of 30 Marks	Average of 3 tests – 30 M
Assignment	10 Marks
Additional Assessment Tools (AAT) – Quiz, Presentations, Term Paper, Open ended experiments, Mini Projects, Two-minute video on latest topic, Short MOOC courses	10 Marks
Total	**50 M**

ii) SEA : 50%

Theory Exam	5 questions to answer each of 20 Marks 2 questions from each module with internal choice Student should answer one full question from each module	20 M x 5 = **100 M** **reduced to 50 M**
	Total	**50 Marks**

BNM Institute of Technology
An Autonomous Institution under VTU
Department of Information Science and Engineering
SEMESTER–IV

Course: MICRO CONTROLLER AND EMBEDDED SYSTEM			
CourseCode:22ISE142			
L:T:P:J	**3:1:1:0**	**CIA:**	**50**
Credits:	**04**	**SEA:**	**50**
Hours:	**50**	**SEA Duration:**	**03Hours**

Course Learning Objectives: The students will be able to

1. Understand the fundamentals of ARM based systems, basic hardware components, selection methods and attributes of an embedded system.
2. ProgramARM7controller using the various instructions
3. Identify the applicability of the embedded system
4. Comprehend the real time operating system used for the embedded system Develop and test ProgramusingARM7TDMI/LPC2148

5.Conduct the experiments on an ARM7TDMI/LPC2148 evaluation board using evaluation version of Embedded 'C' &Keil Uvision-4 tool/compiler

Module-1	**No. of Hours**	**Blooms cognitive Levels**
Microprocessors versus Microcontrollers, ARM7 Embedded Systems: The RISC design philosophy, The CISC design philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software. ARM Processor Fundamentals: Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table, Core Extensions List of programs: 1.Write a program to add an array of 16 bit numbers & store the 32 bit result in internal RAM 2. Write a program to find the square of a number(1to10) using look-uptable.	**10**	**Apply**
Module-2		
Introduction to the ARM7 Instruction Set: Data Processing Instructions, Programme Instructions, Software Interrupt Instructions, Program Status Register Instruction, Coprocessor Instructions, Loading Constants ARM programming using Assembly language: Writing Assembly code, Profiling and cycle counting, Instruction scheduling, Register Allocation, Conditional Execution, Looping Constructs List of programs: 4. Write a program to find the largest number in an arrayof32 numbers. 5. Write a program to arrange a series of32bit numbers in ascending order. 6. Write a program to count the number of ones and zeros in two consecutive memory locations.	**10**	**Apply**

Module-3		
Embedded System Components: Embedded Vs General computing system, History of embedded systems, Classification of Embedded systems, Major applications areas of embedded systems, Core of an Embedded System including all types of processor/controller, Memory, Sensors, Actuators, LED,7segment LED display, stepper motor, Keyboard, Push button switch, Communication Interface (on board and external types), Embedded firmware, Other system components. List of programs: 7.Display "HelloWorld" message using Internal UART. 8.Interface and Control a DC Motor.	10	Apply
Module-4		
Embedded System Design Concepts: Characteristics and Quality Attributes of Embedded Systems, Operational quality attributes, non-operational quality attributes, Embedded Systems-Application and Domain specific, Hardware Software Co-Design and Program Modelling, embedded firmware design and development List of programs: 8.Interface a Stepper motor and rotate it in clock wise and anti-clock wise direction. 9.Interface a DAC and generate Triangular wave forms. Interface a DAC and generate Square wave forms.	10	Apply
Module-5		
RTOS and IDE for Embedded System Design: How to choose an RTOS, Integration and testing of Embedded hard ware and firmware, Embedded system Development Environment–Block diagram (excluding Keil), Disassembler / decompiler, simulator, emulator and debugging techniques, target hardware debugging, boundary scan. List of programs: 10. Demonstrate the use of an external interrupt to toggle an LED On/Off. 11. Display the Hex digits 0 to F on a 7-segment LED interface, with an appropriate delay in between.	10	Apply

Course Outcomes: After completing the course, the students will be able to	
CO 1	Describe the architectural features and instructions of ARM7 microcontroller
CO 2	Apply the knowledge gained for Programming ARM7 for different applications and Interface External devices and I/O with ARM7 microcontroller.
CO 3	Interpret the basic hardware components and their selection method based on the Characteristics and attributes of an embedded system.
CO 4	Develop the hardware/software co-design and firmware design approaches.
CO 5	Demonstrate the need of real time operating system for embedded system applications
CO 6	Develop and test program using ARM7 TDMI/LPC2148

Reference Books:
1. Andrew N Sloss, Dominic Symes and Chris Wright, A R M system developers guide, Elsevier, Morgan Kaufman publishers, 2008 1st Edition.
2. Shibu K V, "Introduction to Embedded Systems", Tata Mc Graw Hill Education, Private Limited, 2nd Edition.
3. Raghunandan..G.H, Microcontroller (ARM) and Embedded System, Cengage learning Publication, 20191st edition.
4. The Insider"s Guide to the ARM7 Based Microcontrollers, Hitex Ltd.,1stedition,2005.
5. Steve Furber, ARM System-on-Chip Architecture, Second Edition, Pearson,20151stedition.
6. Raj Kamal, Embedded System, Tata McGraw-Hill Publishers,2nd Edition,2008

Web links and Video Lectures:

1. https://academicearth.org/
2. https://onlinecourses.nptel.ac.in/noc20_ee98/preview

PCC	CIA	SEA	CIA (50)				SEA Conduction: 100 M Reduced to: 50 M
				I	II	III	
Conduction	50	50	Written Test	30	30	30	Five questions with each of 20 marks (with internal choice). Student should answer one full question from each module
				Average of three tests – 30 Marks			
			Assignment	10			
			AAT	10			
				Total – 50 marks			Total – 50 marks

i) CIA: 50%

IA Test: 3 IA tests - Each of 30 Marks	Average of 3 tests – 30 M
Assignment	10 Marks
Additional Assessment Tools (AAT) – Quiz, Presentations, Term Paper, Open ended experiments, Mini Projects, Two-minute video on latest topic, Short MOOC courses	10 Marks
Total	**50 M**

ii) SEA : 50%

Theory Exam	5 questions to answer each of 20 Marks 2 questions from each module with internal choice Student should answer one full question from each module	20 M x 5 = **100 M** **reduced to 50 M**
	Total	**50 Marks**

B.N.M. Institute of Technology

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Department of Information Science and Engineering

DATABASE MANAGEMENT SYSTEM
SEMESTER – IV

Subject Code: 22ISE143	Teaching Hours/Week (L: T: P: J)	3:0:1:1	CIA Marks	50
Credits		4	SEA Marks	50
Total Number of Lecture Hours		50	Exam Hours	3

Course Learning Objectives:

This course will enable students to

- Understand fundamental concepts, terminology and application of databases.
- Design concepts and creation of relational databases using relation algebra.
- Practice SQL programming through a variety of database problems.
- Demonstrate the use of Normalization, concurrency and transactions in database.

Module	Number of Hours	Bloom's Level
Module-1		
Databases and Databases Users: Characteristics of database Approach, Advantages of using the DBMS Approach **Database System Concepts and Architecture:** Data Models-Schemas and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces, The Database System Environment **Data Modeling Using the Entity-Relationship (ER) Model:** Entity Types-Entity sets-Attributes and Keys, Relationship types – Relationship Sets – Roles and structural Constraints, Weak Entity Types. **Laboratory component:** Draw ER Diagram for the following Databases using GitMind software. ORDER Database BANK Database LIBRARY Database	**10**	**Understand**
Module-2		
Relational Data Model - Concept of relations, schema-instance distinction, keys, referential integrity and foreign keys, relational algebra operators: selection, projection, cross product, various types of joins, division, example queries, tuple relation calculus, domain relational calculus, converting the database specification in E/R notation to the relational schema **Laboratory component:** Create Schema, insert at least 5 records in each table and add appropriate constraints for the following Library Database using ORACLE or MySQL DBMS under LINUX/Windows environment BOOK(Book_id, Title, Publisher_Name, Pub_Year) BOOK_AUTHORS(Book_id, Author_Name) PUBLISHER(Name, Address, Phone) BOOK_COPIES(Book_id, Branch_id, No-of_Copies) BOOK_LENDING(Book_id, Branch_id, Card_No, Date_Out, Due_Date) LIBRARY_BRANCH(Branch_id, Branch_Name, Address) Write SQL queries to 1. Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each branch, etc. 2. Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2017 to Jun 2017.	**10**	**Apply**

3. Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation. 4. Partition the BOOK table based on year of publication. Demonstrate its working with a simple query. Create a view of all books and its number of copies that are currently available in the Library		
Module-3		
Basic SQL: SQL Data Definition and Data Types, Specifying Constraints in SQL, Basic Retrieval Queries in SQL, INSERT – DELETE and UPDATE Statements in SQL, Additional features in SQL **More SQL: Complex Queries, Triggers, Views and Schema Modification:** More Complex SQL Retrieval Queries, Specifying Constraints as Assertions and actions as Triggers, Views (Virtual Tables) in SQL, Schema Change Statements in SQL **Laboratory component:** Create Schema, insert at least 5 records for each table and add appropriate constraints for the following Order Database using ORACLE or MySQL DBMS under LINUX/Windows environment. SALESMAN(Salesman_id, Name, City, Commission) CUSTOMER(Customer_id, Cust_Name, City, Grade, Salesman_id) ORDERS(Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id) Write SQL queries to 1. Count the customers with grades above Bangalore's average. 2. Find the name and numbers of all salesman who had more than one customer. 3. List all the salesman and indicate those who have and don't have customers in their cities (Use UNION operation.) 4. Create a view that finds the salesman who has the customer with the highest order of a day. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.	**10**	**Apply**
Module-4		
Basics of Functional Dependencies and Normalization for Relational Database: Functional Dependencies, Armstrong's axioms for FD's, Equivalent Decompositions, closure of a set of FDs, minimal covers, Normal forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Forms **Laboratory component:** Create Schema, insert at least 5 records for each table and add appropriate constraints for the following Company Database using ORACLE or MySQL DBMS under LINUX/Windows environment. EMPLOYEE (SSN, Name, Address, Sex, Salary, Super SSN, D No) DEPARTMENT (D No, D Name, Mgr. SSN, Mgr. Start Date) DLOCATION(D No,D Loc) PROJECT (P No, P Name, P Location, D No) WORKS_ON(SSN, P No, Hours) Write SQL queries to 1. Make a list of all project numbers for projects that involve an employee whose	**10**	**Analyze**

last name is 'Scott', either as a worker or as a manager of the department that controls the project. 2. Show the resulting salaries if every employee working on the 'IoT' project is given a 10 percent raise. 3. Find the sum of the salaries of all employees of the 'Accounts' department, as well as the maximum salary, the minimum salary, and the average salary in this department 4. Retrieve the name of each employee who works on all the projects controlled by department number 5 (use NOT EXISTS operator). For each department that has more than five employees, retrieve the department number and the number of its employees who are making more than Rs. 6,00,000.		
Module-5		
Introduction to Transaction Processing –Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties on Transactions **Concurrency Control Techniques:** Transactions and Schedules, Serializability and Recoverability, Precedence Graphs, Concurrency, Lock Based Protocols, 2PL, Strict 2PL Protocols, Deadlocks - Detection and Prevention **NoSQL**: SQL v/s NoSQL, The Emergence of NoSQL, BASE Properties, Data Models: Relationships, Graph Database, Schema less Database. **Laboratory component:** Implement aggregation and indexing with suitable example using MongoDB	**10**	**Analyze**

Course outcomes: The students will able to:

CO 1:	Understand the Database System Concepts along with Data Modeling Using the Entity-Relationship (ER) Model
CO 2:	Apply the concepts of relations on RDBMS, constraints, joints using relational algebra operators.
CO 3:	Apply Structured Query Language for database manipulation.
CO 4:	Analyze functional dependencies to normalize relations of relational database
CO 5:	Analyze transactions processing, schedules protocols, serializability issues, deadlocks in DBMS and concepts of NoSQL with its advantages

Text Books:
1. Ramez Elmasari, Shamkant B Navathe "Fundamentals of Database Systems", Pearson,Seventh Edition 2017.
2. "Database System Concepts", Silberschatz, H Korth, S Sudarshan, 6th Edition, McGraw-Hill, 2010
Reference Books:
1. Pramod J Sadalage, Martin Fowler, "NOSQL Distilled", Pearson, 2013

PCI	CIA	SEA	CIA (50)				SEA Conduction: 100 M Reduced to: 50 M	
Conduction	50	50			I	II	PART A	PART B
			IA Test	30	30		30 Marks	70 Marks
				Average of two tests – 30 M				
			Continuous Assessment	Weekly Assessment -20 marks				
						Total – 50 Marks	Total – 50 Marks	

i)   CIA: 50%

IA Test: 2 IA tests - each of 30 Marks	Average of 2 tests – 30 M
Practical Lab record – 10 Marks Performance – 05 Marks Viva – 05 Marks	20 Marks
	Total 50 M

ii)   SEA : 50%
Question Paper:

Theory part	5 questions to answer each of 6 Marks 2 questions from each module with internal choice Student should answer one full question from each module	6 M x 5 = 30 Marks
Execution part	Conduction - 60 Marks Viva-Voce - 10 Marks	70 Marks
	Total	**100 Marks reduced to 50 Marks**

BNM Institute of Technology

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Department of Information Science and Engineering

SEMESTER–IV

Design and Analysis of Algorithms

Subject Code: 22ISE144	L:T:P:J: 3:0:2:0	CIE Marks:	50
Credits:	4	SEE Marks:	50
Total Number of Lecture Hours	50	SEE Duration:	3 Hours

Course objectives:
- Analyze the asymptotic performance of algorithms.
- To understand the concept of designing an algorithm.
- Synthesize efficient algorithms in common engineering design situations.

Analyze the efficiency of programs based on time complexity.

Module 1	Teaching Hours	Blooms Cognitive Levels

Introduction: Notion of algorithm, Fundamentals of Algorithmic Problem Solving, Fundamentals of the Analysis of Algorithmic Efficiency: Analysis frame work, Asymptotic Notations and BasicEfficiency Classes, Mathematical Analysis of Non-recursive and Recursive Algorithms.
Practical Programs:
1. Implement Coin Changing problem method and find the time required.
2. Write a program to find maximum profit using Knapsack technique.
3. Implement Job Sequence problem using Greedy method.Apply brute force/divide and conquer technique to recursively implement the following concepts:
   a. Linear Search or Binary Search.
   b. To find the maximum and minimum from a given list of n elements using Brute Force Method.
4. There are 5 books in the shelf, find the number of ways to select 3 books from 5 books on the   shelf using the NCR with recursion.
5. Find the next three terms of the sequence 15, 23, 38, 61, … Fibonacci series of the given number using recursion.
	10	**Analyze**

Module 2		
Brute Force: Selection Sort and Bubble Sort, Sequential Search and Brute Force String Matching **Divide and Conquer**: General method, Binary search, Recurrence equation for divide and conquer, Finding the Maximum and Minimum, Merge sort, Quick sort, Strassen's matrix multiplication. Decrease and Conquer Approach: Topological Sort. **Practical Programs:** 1. Implement the Selection sort algorithm. 2. Implement Bubble sort algorithm. 3. Implement the Sequential Search algorithm. 4. Write a program to search a key in a given set of elements using Binary search method and find the time required to find the key. 5. Write a program to find Maximum and Minimum using divide and conquer technique and find the time required to find the elements. 6. Sort a given set of elements using Merge Sort method and determine the time required sort the elements. Plot a graph of number of elements versus time taken. Specify the time efficiency class of this algorithm. 7. Sort a given set of elements using Quick Sort method and determine the time	**10**	**Apply**

required sort the elements. Plot a graph of number of elements versus time taken. Specify the time efficiency class of this algorithm. 8. Implement Topological sort using source removal method find the time required to sort the elements.		
Module 3		
Greedy Method: General method, Coin Change Problem, Knapsack Problem, Job sequencing with deadlines. Minimum cost spanning trees: Prim's Algorithm, Kruskal's Algorithm. Single source shortestpaths: Dijkstra's Algorithm. Optimal Tree problem: Huffman Trees and Codes. **Practical Programs:** 1. Implement Coin Changing problem method and find the time required. 2. Write a program to find maximum profit using Knapsack technique. 3. Implement Job Sequence problem using Greedy method. 4. Implement Prim's algorithm and Find Minimum Cost Spanning Tree of a given connected undirected graph. 5. Implement Kruskal's algorithm and Find Minimum Cost Spanning Tree of a given connected undirected graph. 6. Implement Dijkstra's algorithm find shortest paths to other vertices from a given vertex in a weighted connected graph.	**10**	**Apply**
Module 4		
Dynamic Programming: General method with Examples, Multistage Graphs. Transitive Closure: Warshall's Algorithm, All Pairs Shortest Paths: Floyd's Algorithm, Optimal Binary Search Trees, Knapsack problem, Bellman-Ford Algorithm, Travelling Sales Person problem, Reliability design. **Practical Programs:** 1. Implement all-pairs shortest paths problem using Floyd's algorithm. 2. Implement all-pairs shortest paths problem using Warshal's algorithm. 3. Implement 0/1 Knapsack using Dynamic Programming. 4. Implementation of Bellman Ford Algorithm using a directed graph. 5. Implement Travelling Sales man problem using Dynamic Programming.	**10**	**Apply**
Module 5		
Backtracking: General method , N-Queens problem, Sum of subsets problem, Graph coloring, Hamiltonian cycles. Programme and Bound: Assignment Problem, Travelling Sales Person problem, 0/1 Knapsack problem: LC Programme and Bound solution, FIFO Programme and Bound solution. NP- Complete and NP-Hard problems: Basic concepts, nondeterministic algorithms, P, NP, NP-Complete and NP-Hard classes **Practical Programs:** 1. Implementation of N Queen Problem using Backtracking technique. 2. Implementation of SUM-SUBSET Problem. 3. Design and implement to find all Hamiltonian Cycles in a connected undirected Graph G of n vertices using the backtracking principle. 4. Implementation Assignment Problem using Backtracking technique. 5. Implementation of Travelling Sales Man Problem using Branch and Bound method. 6. Implementation of Knapsack problem using Branch and Bound method.	**10**	**Analyze**

	Course outcomes: The students should be able to:
CO1	Apply and Analyze the asymptotic runtime complexity of algorithms by using mathematical relations that helps to identify them in specific instances
CO2	Apply and solve problems using brute force, divide and conquer techniques
CO3	Apply various problem solving methodologies such as greedy, decrease and conquer to solve a given problem.
CO4	Apply the dynamic programming to estimate the computational complexity of different algorithms.
CO5	Apply and Analyze the efficient algorithm design approaches in a problem specific manner in terms of space and time complexity

Reference Books:
1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3 rd Edition, PHI.
2. Introduction to the design and analysis of algorithms, by Anany Levitin, 3rd Edition, Pearson Education, 2011.
3. Data Structures & Algorithms using C, R.S. Salaria, 5th Edition, Khanna Publishing.
4. Computer Algorithms, by Horowitz E., Sahani S., Rajasekharan S., 2nd Edition, UniversitiesPress, 2008

Web Links:
https://www.cs.duke.edu/courses/fall08/cps230/Book.pdf.
https://www.tutorialspoint.com/design_and_analysis_of_algorithms/design_and_analysis_of _algorithms_tutorial.pdf.

PCI	CIA	SEA	CIA (50)				SEA Conduction: 100 M Reduced to: 50 M	
					I	II	PART A	PART B
Conduction	50	50	IA Test		30	30	30 Marks	70 Marks
				Average of two tests – 30 M				
			Continuous Assessment	Weekly Assessment -20 marks				
						Total – 50 Marks	Total – 50 Marks	

i)   CIA: 50%

Test: 2 IA tests - each of 30 Marks	Average of 2 tests – 30 M

Practical
  Lab record – 10 Marks
  Performance – 05 Marks
  Viva – 05 Marks
	Marks

	Total 50 M

ii)   SEA : 50%

Question Paper:

Theory part	5 questions to answer each of 6 Marks 2 questions from each module with internal choice Student should answer one full question from each module	6 M x 5 = 30 Marks
Execution part	Conduction - 60 Marks Viva-Voce - 10 Marks	Marks
	Total	**100 Marks reduced to 50 Marks**

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SEMESTER– IV

Python Programming and its Application

Pre requisite: Python Programming

Subject Code: 22ISE145	L:T:P:J: 0:0:2:2	CIE Marks:	50
Credits:	2	SEE Marks:	50
Total Number of Lecture Hours	25	SEE Duration:	3 Hours

Course objectives:
1. Take a new computational problem and develop a plan to solve it through problem understanding and decomposition.
2. Follow a design creation process that includes specifications, algorithms, and testing.
3. Code, test, and debug a program in Python, based on your design

Module – 1	Teaching Hours
Python Basics, Entering Expressions into the Interactive Shell, The Integer, Floating-Point, and String Data Types, String Concatenation and Replication, Storing Values in Variables, **Flow control,** Boolean Values, Comparison Operators, Boolean Operators, Mixing Boolean and Comparison Operators, Elements of Flow Control, Program Execution, Flow Control Statements, Importing Modules, Ending a Program Early with sys.exit(). **List of Programs** 1. Write a python program to check whether the given string is palindrome or not. 2. Demonstrate a python code to implement abnormal termination? 3. Demonstrate a python code to print try, except and finally block statements	**5**
Module – 2	
Functions, def Statements with Parameters, Return Values and return Statements, The None Value, Keyword Arguments and print(), Local and Global Scope, The global Statement, Exception Handling, A Short Program: Guess the Number. **List of Programs** 1. Write a python program to check whether the given string is palindrome or not. 2. Write a program to create a menu with the following options 1. TO PERFORM ADDITITON 2. TO PERFORM SUBTRACTION 3. TO PERFORM MULTIPICATION 4. TO PERFORM DIVISION Accepts, users input and perform the operation accordingly. Use functions with arguments. 3. Write a python program to open a file and check what are the access permissions acquired by that file using os module?	**5**
Module – 3	
Lists, The List Data Type, working with Lists, Augmented Assignment Operators, Methods, Example Program: Magic 8 Ball with a List, List-like Types: Strings and Tuples, References, **Dictionaries and Structuring Data,** The Dictionary Data Type, Pretty Printing, Using Data Structures to Model Real-World Things. **List of Programs** 1. Create a list and perform the following methods 1) insert() 2) remove() 3) append() 4) len() 5) pop() 6) clear() 2. Create a dictionary and apply the following methods 1) Print the dictionary items 2) access items 3) use get() 4)change values 5) use len()	**5**
Module – 4	
Classes and objects, Programmer-defined types, Attributes, Rectangles, Instances as return values, Objects are mutable, Copying, **Classes and functions,** Time, Pure functions, Modifiers, Prototyping versus planning, **Classes and methods,** Object-oriented features, Printing objects, Another example, A more complicated example,The init method, The __str__ method, Operator	**5**

overloading, Type-based dispatch, Polymorphism, Interface and implementation,**Inheritance,** Card objects, Class attributes, Comparing cards, Decks, Printing the deck, Add, remove, shuffle and sort, Inheritance, Class diagrams, Data encapsulation

List of Programs
1. Write a python Program to call data member and function using classes and objects.
2. Write a python program, which accepts the radius of a circle from user and computes the area (use math module).
3. Write a python program to create a package (college), sub-package (alldept), modules (it,cse) and create admin and cabin function to module?

Module – 5	

NumPy and Pandas
Introduction, creating Array in NumPy, Accessing of Array Elements, NumPy Array Shape, Iterating Arrays, NumPy Built in Functions, NumPy ufuncs, Creating own ufunc, Arithmetic Functions, Rounding Decimals, Finding LCM and GCD.
Introduction to Pandas, Series, Key/Value as Series, Data Frames, Loading a file into Data Frame, Viewing Data, Cleaning Data, Plotting.
 	
List of Programs
1. Using a numpy module create an array and check the following:
  1. Type of array 2. Axes of array   3. Shape of array   4. Type of elements in array
2. Using a numpy module create array and check the following:
  1. List with type float 2. 3*4 array with all zeros 3. From tuple 4. Random values
3. Write a python code to read a csv file using pandas module and print the first and last five lines of a   file.
4. Using a numpy module create array and check the following:
   1. Reshape 3X4 array to 2X2X3 array
   2. Sequence of integers from 0 to 30 with steps of 5
   3. Flatten array 4. Constant value array of complex type.
	5

MINI PROJECT	

• **Sample Python Projects:** **Project 1: Dice Rolling Simulator** This is one of the interesting python projects and will generate a random number each dice the program runs, and the users can use the dice repeatedly for as long as he wants. When the user rolls the dice, the program will generate a random number between 1 and 6 (as on a standard dice).The number will then be displayed to the user. It will also ask users if they would like to roll the dice again. The program should also include a function that can randomly grab a number within 1 to 6 and print it. **Project 2: Fantasy Cricket game:** Create a Fantasy Cricket game in Python. The game should have all the features displayed in the mock-up screens in the scenario. To calculate the points for each player, you can use rules similar to the sample rules displayed below. **Project 3: Contact Book**: Everyone uses a contact book to save contact details, including name, address, phone number, and even email address. The main objective of this project is to generate a contact book using python where users can add a new contact, edit, or delete existing contacts and view the details of all their contacts. The application should also allow users to update contact information, delete contacts, and list saved contacts. **Project 4: Spin a Yarn:** The program first prompts the user to enter a series of inputs. These can be an adjective, a preposition, a proper noun, etc. Once all the inputs are in place, they are placed in a premade story	**25**

template using concatenation. In the end, the full story is printed out to read some misintended madness!

Project 5: Rock, Paper, Scissors
A 5-minute stint of rock, paper, scissors with the computer and designed by you. We again use the random function here. You make a move first and then the program makes one. To indicate the move, you can either use a single alphabet or input an entire string. A function will have to be set up to check the validity of the move.

Course Outcomes:
    21CSE145.1: Understand the basic concepts of python programming through the Mooc courses
    21CSE145.2: Create Projects using python programming for different domains.

References

1. Al Sweigart,"Automate the Boring Stuff with Python",1stEdition, No Starch Press, 2015.(Available under CC-BY-NC-SA license at https://automatetheboringstuff.com/) (Chapters 1 to 18)
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2015. (Available under CC-BY-NC license http://greenteapress.com/thinkpython2/thinkpython2.pdf) (Chapters 13, 15, 16, 17, 18) (Download pdf/html files from the above links)
3. Programming Python, Mark Lutz, O'Reilly Media, Edition 2010.
4. Gowrishankar S, Veena A, "Introduction to Python Programming", 1st Edition, CRC Press/Taylor & Francis, 2018. ISBN-13: 978-0815394372.
5. Jake VanderPlas, "Python Data Science Handbook: Essential Tools for Working with Data",1st Edition, O'Reilly Media, 2016. ISBN-13: 978-1491912058.
6. Charles Dierbach, "Introduction to Computer Science Using Python", 1st Edition, Wiley India Pvt Ltd, 2015. ISBN-13: 978-8126556014.

Semester: III / IV		
COURSE: CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS		
Course Code: 22CIP146	**L:T:P:J: 1:0:0:0**	**CIA Marks:** 50
Credits:	**1**	**SEA Marks: 5 0**
Hours:	**15 hrs**	**SEA Duration: 2Hrs**

Course Learning Objectives: The students will be able to	
1	know the fundamental political codes, structure, procedures, powers, and duties of Indian government institutions, fundamental rights, directive principles, and the duties of citizens
2	know the Indian top civil service positions and the exams conducted by UPSC and SPSC for the same
3	Understand engineering ethics and their responsibilities; identify their individual roles and ethical responsibilities towards society.

MODULE 1: Introduction to Indian Constitution	RBT	Hrs
The Necessity of the Constitution, Introduction to Indian Constitution, The Making of the Constitution, Role of Constituent Assembly, Preamble and Salient features of the Constitution of India, Fundamental Rights and its Restriction and limitations in different complex situations, Directive Principles of State Policy, Fundamental Duties.	1,2,3	3

MODULE 2: System of Government, Central Government, State Government	RBT	Hrs
System of Government-Parliamentary System, Federal System. Central Government-Basic details, Powers and Functions of Union Executive. Parliament- LS and RS (Composition, Duration, Membership and Presiding officers of Parliament and their functions). Leaders in Parliament (Leader of the House and Leader of the Opposition). Sessions of Parliament (Summoning, Adjournment, Adjournment Sine Die, Prorogation, Dissolution). Quorum of House, Language in Parliament, Joint sitting of two Houses. State Government-Basic details, Powers and Functions of State Executive. State Legislature (Composition, Duration, Membership and Presiding officers of Parliament and their functions).	1,2,3	3

MODULE 3: Judiciary, Amendments and Emergency Provisions	RBT	Hrs
Supreme Court, High Court, Judicial Review, Judicial Activism. Methods in Constitutional Amendments (How and Why). Types of Emergencies and its Consequences, Recent Amendments to the Constitution.	1,2,3	3

MODULE 4: Elections, Constitutional and Non Constitutional Bodies	RBT	Hrs
Elections- Election Commission of India, Electoral Process. Constitutional Bodies- Election Commission, Union Public Service Commission, State Public Service Commission, Goods and Service Tax Council. Non Constitutional Bodies- Central Information Commission, State Information Commission.	1,2,3	3

MODULE 5: Professional Ethics	RBT	Hrs
Scope & Aims of Engineering & Professional Ethics, Positive and Negative Faces of Engineering Ethics, Responsibilities in Engineering, the impediments to Responsibility. Trust and Reliability in Engineering, Risks, Safety and liability in Engineering, Clash of Ethics, IPRs (Intellectual Property Rights)	1,2,3	3

Course outcome: On completion of this course, students will be able to,
CO1: Have constitutional knowledge and legal literacy.
CO2: Have knowledge on All India Services and State Civil Services.
CO3: Understand Engineering and Professional Ethics and responsibilities of Engineers.

Reference Books

Suggested Learning Resources:

1.**Title of the Book - Indian Polity**
   Name of the Author - M Lakshmikanth
   Name of the Publisher-Mc Graw Hill Education
   Edition and Year- 2019
2.**Title of the Book - Engineering Ethics**
   Name of the Authors - M. Govindarajan, S.Natarajan, V.S. Senthilkumar
   Name of the Publisher- Prentice-Hall
   Edition and Year-2004

3. Durga Das Basu (DD Basu): "Introduction to the Constitution on India", (Students Edition.)

Prentice –Hall EEE, 19th / 20th Edn., (Latest Edition) or 2008.

4. Shubham Singles, Charles E. Haries, and Et al : "Constitution of India and Professional

Ethics" byCengage Learning India Private Limited, Latest Edition – 2018.

5. M.Govindarajan, S.Natarajan, V.S.Senthilkumar, "Engineering Ethics", Prentice –Hall

of IndiaPvt. Ltd. New Delhi, 2004

6. M.V.Pylee, "An Introduction to Constitution of India", Vikas Publishing, 2002.

7. Latest Publications of **NHRC - Indian Institute of Human Rights**, New Delhi.

Web Links and Video Lectures

www.unacademy.com/lesson/future-perfect-

tense/YQ9NSNQZ https://successesacademy

Question paper pattern for SEA and CIA.

•   The SEA question paper will be set for 50 marks and the pattern of the question paper will be objective type (MCQ).
•   The CIA question paper will be set for 50 marks and the pattern of the question paper will be objective type (MCQ).

                    Final Marks = CIA + SEA = 50+50 = 100 Marks

Class Internal Assessment

IA1	Objective type questions 50Marks	Average of 2 IA will be taken 50Marks
IA2	Objective type questions 50Marks	
	Total CIA	**50 Marks**

Semester End Assessment

Semester end Exam	Objective type questions 50Marks	50 Marks
	Total SEA	**50 Marks**

Final Marks = CIA + SEA = 50+50 = 100 Marks

BNM Institute of Technology

Syllabus for Softskills-2
SEMESTER – IV

Subject Name	Softskills-2 (Aptitude Quantitative & Logical)	Weekly Assessment Marks	10
Subject Code	21SFT148	Internal Assessment Marks	60
Number of Contact Hours/Week	3	Company Simulation Tests Marks	30
Total Number of Contact Hours	36	Credits	1

Module 1 (Quantitative Aptitude - 1)	**Number System** - Classification of Numbers, Multiple and factors, Divisibility Rules
	HCF & LCM, Squares and Cubes.
	Profit & Loss - Concepts of SP, CP, Profit, Loss, Gain or Loss %.
	Profit & Loss - Marked Price & Discount problems, Successive Discount.
	Percentages – Percent To Decimal Or Fraction Conversion, Inverse Case – Value From Percentage, relative Percentage
	Averages - Understanding Averages & solving problems.
Module 2 (Quantitative Aptitude - 2)	**Ratios -** Duplicate and Triplicate Ratio, Direct and Indirect variation
	Proportion - Direct Indirect proportion and relation.
	Simple Interest - Simple Interest, Basic Difference b/w both the Interests
	Compound Interest - CI with a Fractional Rate, to find Instalments.

	Speed Time & Distance - Important formulas, Relative Speed.	
	Speed Time & Distance - Understanding Units & Conversion of units	
Module 3 (Quantitative Aptitude - 3)	**Time & Work -** Introduction and Concept, Important Time and Work Formula, Work Done	
	Time & Work - Rate of Work, Time Taken, If a piece of work is done in x number of days	
	Data Interpretation - Bar Graph, Tabular Form, Line Chart, case let Form	
	Data Interpretation - Pie Chart, Radar/Web, and Missing Data Interpretation.	
	Probability – Understanding concepts and important formulas.	
	Probability – Understanding types of problems on probability	
Module 4 (Logical - 1)	Problems on Syllogisms	
	Problems on Assumptions	
	Logical Puzzles - K-level thinking	
	Logical Puzzles - Arithmetic Puzzles	
	Stick Puzzles	
	Series Completion - Basics of Next no, Missing no and Wrong no and problems on that.	
	Solving various types of Letter series and understanding different types.	
Module 5 (Logical - 2)	**Problem on Ages -** Understanding concepts and basic formula along with solving different types of problems.	
	Problem on Ages - Tips and Tricks to Solve Problems on Ages	

	Blood Relation - Generation Tree, Family Tree Problems.	
	Blood Relation - Statement Based Questions, Coded Blood Relation Question.	
	Coding & Decoding - Concept of EJOTY, Opposite Letter, Reversing the alphabets.	
	Coding & Decoding - Jumbling of Letter, Finding Codes of Derivatives.	
Module 6 (Logical - 3)	**Clocks –** Understanding concepts and basic formula along with solving different types of problems.	
	Calendar - Understanding concepts and basic formula along with solving different types of problems.	
	Image Analysis - Paper cutting & Folding, Mirror & Water Image, Cubes and Dice, Analogy, Find the odd one out, Rule Detection	
	Odd Man Out - Following certain patterns and groups.	
	Identifying the errors/odd one in the group.	
	Seating Arrangement - Linear and Circular seating Arrangements as well as problems of sitting around Square and Rectangular.	
	Distance & Direction - Distance and Displacement between any two points as well as puzzles based on that, Concept of Shadows.	

B.N.M. Institute of Technology

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Department of Information Science & Engineering
SEMESTER – V

Course Name: Software Project Management and Finance			
Course Code: 22ISE151			
L:T:P:J	2:2:0:0	CIA Marks	**50**
Credits:	3	SEA Marks	**50**
Hours:	40	Exam Hours	**03**

Course Learning Objectives:
This course will enable students to
- Identify ethical and professional issues and explain why they are of concern to software engineers.
- Recognize the importance of software maintenance and describe the intricacies involved in software evolution.
- Apply estimation techniques, schedule project activities and compute pricing.
- Identify software quality parameters and quantify software using measurements and metrics.
- Recognize the need for agile software development, describe agile methods, apply agile practices and plan for agility.

	Number of Hours	Bloom's Level
Module-1		
Introduction: Software Crisis, Need for Software Engineering. Professional Software Development, Software Engineering Ethics. Case Studies. **Software Processes:** Models: Waterfall Model, Incremental Model and Spiral Model, Process activities. **Requirements Engineering:** Requirements Engineering Processes, Functional and non-functional requirements. The software Requirements Document, Requirements Specification, Requirements validation, Requirements Management	**8**	**Apply**
Module-2		
System Models: Structural models, Behavioral models, UML modeling using StarUml tool. **Design and Implementation**: Introduction to RUP, Design Principles **Software Testing:** Development testing, Test-driven development, Release testing, User testing.	**8**	**Apply**
Module-3		
Project management: Risk management, Managing People, Teamwork. **Project Planning:** Software pricing, Plan-driven development, Project scheduling: Estimation techniques, **Quality management:** Software quality, Reviews and inspections, Software measurement and metrics, Software standards	**8**	**Apply**
Module-4		
Agile Software Development: Coping with Change, The Agile Manifesto: Values and Principles. Agile methods: SCRUM (Ref ―The SCRUM Primer, Ver 20.) and Extreme Programming. Plan-driven and agile development. Agile project management, Scaling agile methods.	**8**	**Apply**

Module-5		
How to Manage Project Finances-Cost estimating: Work Breakdown Structure, Cost budgeting: Cost Aggregation, Reserve Analysis, Parametric estimating, Infrastructure and overheads, Cost control: Change Control, Resource Management **Performance Measurement and Analysis-** Cost Variance, Earned Value, Schedule Variance, Cost Performance Index, Schedule Performance Index**.** Forecasting, Introduction of Tools to manage project Finances-TouchBase Project Financials	**8**	**Apply**

Course outcomes:
1. Understand the activities involved in software engineering and identify the role of various process models.
2. Design a software system, component, or process to meet desired needs within realistic constraints and describe various software testing methods
3. Illustrate the role of project planning and quality management in software development.
4. Describe agile project management and benefits of using agile approaches.
1. Understanding financial concepts and apply it to control Project Costs.

Reference Books:
1. Software Engineering Ian Sommerville Pearson Education 9th Edition, 2012
2. Software Engineering-A Practitioner approach Roger S. Pressman Tata McGraw Hil 7th Edition
3. An Integrated Approach to Software Engineering Pankaj Jalote Wiley India
4. A guide to the project Management body of knowledge- PMBOK guide , 7th edition

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Department of Information Science & Engineering
Semester: V

Course Name: Automata Theory and Computability
Course Code: 22ISE152

L:T:P:J	2:2:0:0	CIA	:	50
Credits:	03	SEA	:	50
Hours:	40	SEA Duration	:	03 Hours

Course Learning Objectives: The students will be able to

1	Introduce core concepts in Automata and Theory of Computation
2	Identify different Formal Language Classes and their Relationships
3	Design Grammars and Recognizers for different formal languages
4	Prove or disprove theorems in automata theory using their properties
5	Determine the decidability and intractability of Computational problems

	No. of hours	Blooms cognitive Levels
Module-1: Introduction to the Theory of Computation:		
Three Basic Concepts: Languages, Grammars and Automata, Some Applications. **Finite Automata:** Deterministic Finite Accepters, Deterministic Accepters and Transition Graphs, Languages and DFA's Regular Languages, Nondeterministic Finite Accepters: Definition of a Nondeterministic Accepter, Why Nondeterminism? Equivalence of Deterministic and Nondeterministic Finite Accepters	8	Apply
Module-2: Regular Languages and Regular Grammars		
Regular Expressions: Formal Definition of a Regular Expression, Languages Associated with Regular Expressions, Connection Between RegularExpressions and Regular Languages, Regular Expressions Denote Regular Languages, Regular Expressions for Regular Languages, Regular Expressions for Describing Simple Patterns. **Properties of Regular Languages:** Closure Properties of Regular Languages Closure under Simple Set Operations, Closure under Other Operations, Identifying Non-Regular Languages, Using the Pigeonhole Principle A Pumping Lemma.	8	Apply
Module-3: Context-Free Languages:		
Context-Free Grammars, Examples of Context-Free LanguagesLeftmost and Rightmost Derivations, Derivation Trees, Relation Between Sentential Forms and Derivation Trees, Parsing and Ambiguity, Parsing and Membership, Ambiguity in Grammars and Languages, **Simplification of Context-Free Grammars and Normal Forms:** Methods for Transforming Grammars, A Useful Substitution Rule, Removing Useless Productions, Removing λ-Productions, Removing Unit-Productions, Two Important Normal Forms, Chomsky Normal Form, Definition of Greibach Normal Form.	8	Apply
Module-4: Pushdown Automata		
Nondeterministic Pushdown Automata: Definition of a Pushdown Automaton, The Language Accepted by a Pushdown Automaton, Pushdown Automata and Context-Free Languages: Pushdown Automata for Context-Free Languages, Context-Free Grammars for Pushdown Automata, A Pumping Lemma For Context-Free Language	8	Apply

Module-5: Turing Machines and Undecidability		
Turing Machines: The Standard Turing Machine, Turing Machines as Language Accepters, Turing Machine with more complex storage: Multitape Turing Machine, Multidimensional Turing Machine, Nondeterministic Turing Machine, Universal Turing Machine, Turing Thesis, Linear Bounded Automata. Hierarchy of Formal Languages and Automata: Recursive and Recursively Enumerable Languages, the Chomsky Hierarchy. Limits of Algorithmic Computation: Some Problems that cannot be solvedby Turing, Undecidable Problem for Recursively Enumerable Languages.	**8**	**Apply**

Course Outcomes: After completing the course, the students will be able to	
CO 1:	Understand the basic properties of formal languages and grammars.
CO 2:	Differentiate regular, context-free and recursively enumerable languages.
CO 3:	Design Grammars and Automata (recognizers) for different language classes and become knowledgeable about restricted models of Computation (Regular, Context Free) .
CO 4:	Design and construct pushdown automata for the given set of Grammars.
CO 5:	Acquire concepts relating to church's hypothesis and the problem of undecidability

Reference Books:
1. Peter Linz, "An Introduction to Formal Languages and Automata", 3rd Edition, Narosa Publishers, 1998
2. John E Hopcroft, Rajeev Motwani, Jeffery D Ullman, Introduction to Automata Theory, Languages, and Computation, 3rd Edition, Pearson Education, 2013.
3. An introduction to formal languages and automata / Peter Linz.—5th ed.
4. Michael Sipser : Introduction to the Theory of Computation, 3rd edition, Cengage learning,2013
5. John C Martin, Introduction to Languages and The Theory of Computation, 3rd Edition, Tata McGraw –Hill Publishing Company Limited, 2013
6. Basavaraj S. Anami, Karibasappa K G, Formal Languages and Automata theory, Wiley India, 2012
7. C K Nagpal, Formal Languages and Automata Theory, Oxford University press, 2012.

Web links and Video Lectures:
1. https://archive.nptel.ac.in/courses/106/106/106106049/
2. https://archive.nptel.ac.in/courses/111/103/111103016/
3. https://www.csa.iisc.ac.in/~dee`pakd/atc-2021/

B.N.M. Institute of Technology

An Autonomous Institution under VTU

Department of Information Science and Engineering

Semester: V

Course Name: Introduction to Data Science using Python
Course Code: 22ISE153

L:T:P:J	2:0:2:0	CIA : 50
Credits:	03	SEA : 50
Hours:	40	SEA Duration : 03 Hours

Course Learning Objectives: The students will be able to

1	To introduce data collection and pre-processing techniques for data science
2	Explore analytical methods for solving real life problems through data exploration techniques
3	Illustrate different types of data and its visualization
4	Find different data visualization techniques and tools
5	Design and map element of visualization well to perceive information

Module-1:	No. of hours	Blooms cognitive Levels
Introduction, Toolboxes: Python, fundamental libraries for data Scientists. Integrated development environment (IDE). Data operations: Reading, selecting, filtering, manipulating, sorting, grouping, rearranging, ranking, and plotting. Program: 1,2,3	8	Understand
Module-2:		
Descriptive statistics, data preparation. Exploratory Data Analysis data summarization, data distribution, Outlier Treatment Programs: 4,5	8	Apply
Module-3:		
Supervised Learning: First step, learning curves, training-validation and test. Learning models generalities, support vector machines, random forest. Examples Programs: 6,7	8	Apply
Module-4:		
Regression analysis, Regression: linear regression simple linear regression, multiple & Polynomial regression, Logistic Regression. Unsupervised learning, clustering, similarity and distances, quality measures of clustering, case study. Programs: 8,9,10	8	Apply

Module-5:		
Recommender Systems: Introduction, How do recommender system works?, Modelling user preferences, Evaluating recommenders, Practical case. Programs: 11	8	Apply

Course Outcomes: After completing the course, the students will be able to

CO1: To introduce data collection and pre-processing techniques for data science
CO2: Apply descriptive and statistical inference
CO3: Identify different approaches in supervise learning
CO4: Apply Regression Analysis and clustering approaches
CO5: Develop Recommendation system

Reference Books:

1. Introduction to Data Science a Python approach to concepts, Techniques and Applications, Igual, L;Seghi', S. Springer, ISBN:978-3-319-50016-4
2. Doing Data Science, Cathy O'Neil and Rachel Schutt, O'Reilly Media, Inc O'Reilly Media, Inc, 2013.
3. Data Visualization workshop, Tim Grobmann and Mario Dobler, Packt Publishing, ISBN 9781800568112
4. Mining of Massive Datasets, Anand Rajaraman and Jeffrey D. Ullman, Cambridge University Press, 2010
5. Data Science from Scratch, Joel Grus, Shroff Publisher /O'Reilly Publisher Media 3. A handbookfor data driven design by Andy krik
6. Doing Data Science, Straight Talk from the Frontline, Cathy O'Neil, Rachel Schutt, O'Reilly, 1st edition, 2013
7. Mining of Massive Datasets, Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, Cambridge University Press, 2nd edition, 2014

Web links and Video Lectures:

1. https://www.knowledgehut.com/blog/data-science/eda-data-science
2. https://towardsdatascience.com/data-exploration-understanding-and-visualization-72657f5eac41
3. https://matplotlib.org/

List of Exercises

1. Download, install and explore the features of NumPy, SciPy, Jupyter, Statsmodels and Pandas packages.Write a python program to read CSV file.
2. Demonstrate Reading data from text files, Excel and the web and exploring various commands for doing descriptive analytics on the Iris data
3. Using the following data, build a model/function that can tell us the prices of the homes with 3300 sq.ft. and 5000 sq.ft using linear regression, and also plot the above data as a scatter plot.

Area	Price
2600	550000
3000	565000
3200	610000
3600	680000
4000	725000

4. Plot Mean and Standard Deviation in Pandas.
5. Suppose there are 100 students in the class and in one of the mathematics tests the average marks scored by the students in the subject is 78 and the standard deviation is 25. The marks of the student follow Normal probability distribution. Write a code to find
    a. Percentage of Students who got less than 60 marks
    b. Percentage of Students who have scored More than 70
    c. Percentage of Students who have scored More than 75 and less than 85.
6. Predict if cancer is Benign or malignant. Using historical data about patients diagnosed with cancer enables doctors to differentiate malignant cases and benign ones are given independent attributes using SVM.
7. Implement random forest classifier on iris data set to classify the type of flower.
8. A linear regression line has an equation of the form $Y = a + bX$, where X is the explanatory variable and Y is the dependent variable. The slope of the line is b, and a is the intercept (the value of y when $x = 0$). Write a Python program to describe linear regression.
9. Implement k-means algorithm.
10. Demonstrate how polynomial regression can be implemented.
11. Build a simple recommendation system.

B.N.M. Institute of Technology

An Autonomous Institution under VTU
Department of Information Science & Engineering
Semester: V

Course: COMPUTER NETWORK
Course Code: 22ISE154

L:T:P:J	2:2:2:0	CIA	:	50
Credits:	04	SEA	:	50
Hours:	50	SEA Duration	:	03 Hours

Course Learning Objectives: The students will be able to

1	Explain with the basics of data communication and various types of computer networks.
2	Demonstrate Medium Access Control protocols for reliable and noisy channels.
3	Expose wireless and wired LANs, Logical addressing.
4	Discuss transport layer services and understand UDP and TCP protocols.
5	Demonstration of application layer protocols

Module-1:	No. of hours	Blooms cognitive Levels
Introduction: Data Communications, Networks, Network Types, Networks Models: Protocol Layering, TCP/IP Protocol suite, The OSI model. **Introduction to Physical Layer**: Date Rate Limits, Performance Digital to Digital Conversion- Line coding: polar, unipolar, Block coding: 4B/5,Switching – Circuit switching, packet switching.	10	Understand
Module-2:		
Error Detection and Correction: Introduction, Block coding, Cyclic codes **Data Link Layer:** Data Link Control –DLC services: Framing, Flow and Error Control, Data link layer protocols: HDLC, Point to Point Protocol. Media Access Control – Random Access: CSMA/CD, CSMA/CA, Controlled Access, Channelization.	10	Understand
Module-3:		
Network Layer:IPV4Addresses: Address space, Classful Addressing, Classless Addressing, Dynamic Host Configuration Protocol (DHCP), Network Address Translation (NAT). IPv6 Addresses, Routing Algorithms: Link-State (LS) Routing Algorithm, The Distance-Vector (DV) Routing Algorithm.	10	Apply
Module-4:		
Transport layer: Multiplexing and Demultiplexing, Connectionless Transport UDP: UDP Segment Structure, UDP Checksum, Connection-Oriented Transport-TCP: The TCP Connection, TCP Segment Structure, Round-Trip Time Estimation and Timeout, Flow Control, TCP Connection Management, TCP congestion control.	10	Apply
Module-5:		

Application Layer: The Web and HTTP: Overview of HTTP, Non-Persistent and Persistent Connections, HTTP Message Format, User-Server Interaction Cookies, Web Caching, The Conditional GET. File Transfer- FTP: FTP Commands and Replies, Electronic Mail in the Internet: SMTP, Comparison with HTTP, Mail Access Protocols. DNS—The Internet's Directory Service: Services Provided by DNS, Overview of How DNS Works, DNS Records and Messages,	**10**	**Analyze**

Course Outcomes: After completing the course, the students will be able to

CO 1:	Understand the fundamentals of digital communication and switching.
CO 2:	Infer error detection and correction mechanisms and Compare and contrast data link layer protocols.
CO 3:	Classify wired and wireless network, IP and Routing Algorithms in network layer.
CO 4:	Recognize transport layer services and infer UDP and TCP protocols.
CO 5:	Identify principles and services of application layer protocols.

Text Books:

1. Data Communication and Networking, Behrouz A. Forouzan, McGraw Hill, 5th Edition, 2013.
2. James F. Kurose and Keith W. Ross: Computer Networking: A TopDown Approach, 8th edition, Addison-Wesley, 2021.

Reference Books:

1. Data and Computer Communication, William Stallings, 10th Edition, Pearson Education, 2013.
2. Introduction to Data Communications and Networking – Wayne Tomasi, Pearson Education, 5th Edition, 2011.
3. Larry L. Peterson and Bruce S Davie: Computer Networks: A Systems Approach, Fifth Edition, Elsevier, 2011.
4. Tanenbaum: Computer Networks, 5th Edition, Pearson Education/PHI, 2010.

Web links and Video Lectures:

1. https://archive.nptel.ac.in/courses/106/105/106105183/
2. https://www.wireshark.org/docs/wsug_html_chunked/
3. https://www.softwaretestinghelp.com/computer-networking-basics/
4. https://ns3tutorial.com/ns2-ns3/

List of Exercises

Possible list of practical programs:

Implement the following in C/C++/Java.

1. Write a program for error detecting code using CRC-CCITT (16- bits).
2. Write a program to find the shortest path between vertices using bellman-ford algorithm
3. Write a program for congestion control using leaky bucket algorithm.

Analyze the following in Wireshark.

1. TCP
2. UDP
3. HTTP
4. FTP
5. DNS Server
6. DHCP

Implement the following in NS3 or any other suitable simulator.

1. Implement three nodes point – to – point network with duplex links between them. Set the queue size, vary the bandwidth and find the number of packets dropped.
2. Implement transmission of ping messages/trace route over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.
3. Implement an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination.

B.N.M. Institute of Technology

An Autonomous Institution under VTU
Department of Information Science & Engineering
Semester: V

Course Name: Robotic Process Automation				
Course Code: 22ISE155				
L:T:P:J	0:0:2:2	**CIA**	:	50
Credits:	02	**SEA**	:	50
Hours:	24	**SEA Duration**	:	03 Hours

Course Learning Objectives: The students will be able to

1	To Understand the basic concepts and platforms of RPA.
2	To Describe the different types of variables and its Datatypes.
3	To Describe the various types of Sequence and Control flow.
4	To Apply various control techniques.
5	To Apply Screen Scraping and OCR in RPA along with Error Handling.

Descriptions (if any):

Prerequisite

- **CPU with 1.4GHz 32-bit is minimum requirement** and **recommended is Dual Core 1.8GHz 64-bit.**
- **4GB** is the **minimum requirement and 8GB** is the **recommended** RAM.
- **Windows 7 or above** is required **OS**, though recommended is **Windows 10.**
- **.NET framework 4.6.1** is **minimum** requirement.

Part A

Module-1:	**No. of hours**	**Blooms Cognitive Levels**
RPA Foundations and Platforms: What is RPA, Components of RPA, RPA Platforms- About UiPath - The future of automation, Record and PIay, Downloading and installing UiPath Studio, Learning UiPath Studio, Task recorder **DOWNLOADING AND INSTALLING UIPATH STUDIO.** On UiPath Installation, download the Community Cloud version. **REVERSING A STRING** **A Quick Guide To The Top RPA Tool:** Using Project Templates and UiPath Studio Components **"WELCOMING TO THE SESSION "** **Introduction to UiPath and its Components:** Using Types of Projects and Templates in UiPath and UiPath Components	**L: 04**	**Apply**
Module-2:		
Variables and Data Types-Variables and Scope, Collections, Data Types, Arguments, Purpose and use, File operation with step-by-step example-CSV/Excel **A) Display a Message in Message Box directly** **B) Display Message in a Message Box using Variables** **C) Assign Activity**: To assign a value to a variable. Example-Count Number of Files **D) Write CSV Activity**: To save the specified Data Table to a .csv file.	**L: 05**	**Apply**

Module-3:		
Sequence and Control Flow-Sequencing the workflow, Activities-Control flow, various types of loops and decision making-Step-by Step example using Sequence. **ACTIVITIES IN UIPATH** **If Activity:** Find whether a number is even/odd **For Each Activity:** Print Fibonacci Series **While Activity:** Print Numbers 1-10 **Do While Activity:** Print Numbers 1-10 **Switch Activity**: Sum of two numbers is even/odd	**L: 05**	**Apply**
Module-4:		
Taking Control of the Controls : Finding and attaching windows , Act on controls - mouse and keyboard activities **ACTIONS** **A) WINDOWS ACTIONS** To automate the action of getting the title of an active window. **B) MOUSE CLICKS** To automate the action of closing a notepad window. **C) KEYSTROKES** To automate the task of writing text into a notepad file.	**L: 05**	**Apply**
Module-5:		
Screen Scraping and OCR- Screen Scrapping, When to use OCR, Types of OCR available, How to use OCR, **WEB EXTRACTION-WEB SCRAPING OF GOOGLE CONTACTS-** Extract data from Google Contacts and store it in a file. **READ PDF WITH OCR ACTIVITY** Show the uses of optical character recognition to scan the images inside the PDF document and output all the text as a Variable	**L: 05**	**Apply**

PART – B (Mini projects)

The List of Possible Projects

1.MOVING FILES FROM SOURCE FOLDER TO DESTINATION FOLDER
Task: The aim is to automate the process of moving files from the source folder to the destination folder**.**

2. WEB AUTOMATION
Task: The aim is to scrape data from a website and store it in a .csv File.

3. EMAIL AUTOMATION
Task: The aim is to save the attachments of the top 30 emails which have a keyword in the subject line.
The attachments will be stored in a particular folder.

4. EXCEL AUTOMATION
Task: The aim is to fill a google form from the data stored in a .csv file automatically.

5. PDF AUTOMATION
Task: The aim is to extract text and images from a PDF File and store the output in a Message Box/TextFile.

6. IMAGE & TEXT AUTOMATION
Task: Consider an application is running in a virtual environment. Now, once we enter the account number, amount, choose transaction type, a transaction ID is automatically generated.Our task is to, display the Transaction ID in a message box once the transaction is successfully completed

7. AUTOMATED CUSTOMER SUPPORT EMAILS (WITH INSTRUCTIONS)
Task: The aim is to send automated replies to emails that have particular text in their subject line. For example, If a subject line has the word 'refund,' your solution would send an automated reply to it accordingly.

8. TO FIND OUT WHETHER A NUMBER IS EVEN OR ODD.
Task: The aim is to find out whether a number is even or odd using the different components of UiPath Studio and Dashboard Of UiPath

9. EXTRACTING DATA FROM AN E-COMMERCE WEBSITE
Task: Is to design automation which reads the subject line of an email and performs a custom search. So,
For example, if my subject line says LG TV then, the designed automation must search for LG TVs' in Flipkart and extract the name, URL, and the price.

10. HOW TO AUTOMATE TASKS IN A VIRTUAL ENVIRONMENT?
Task: Automating Task on a Desktop Application:
Consider a scenario where you want to open a Notepad in the virtual environment and want to type something in it. How will you automate this task?

**Projects are not limited

Course Outcomes:
After studying these laboratory programs using UIPath, students will be able to

1. To Understand the basic concepts and platforms of RPA.
2. To Describe the different types of variables and its Datatypes.
3. To Describe the various types of Sequence and Control flow.
4. To Apply various control techniques.
5. To Apply Screen Scraping and OCR in RPA along with Error Handling.

Reference Books:
1. Tom Taulli, The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems,2020, ISBN-13 (electronic): 978-1-4842-5729-6, Publisher: A press
2. Alok Mani Tripathi, Learning Robotic Process Automation, Publisher: Packt Publishing Release Date: March 2018 ISBN: 9781788470940
3. Frank Casale, Rebecca Dilla, Heidi Jaynes, Lauren Livingston, "Introduction to Robotic Process Automation: a Primer", Institute of Robotic Process Automation.
4. Richard Murdoch, Robotic Process Automation: Guide to Building Software Robots, Automate Repetitive Tasks & Become an RPA Consultant
5. Srikanth Merianda, Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation

Web links
- https://www.uipath.com/rpa/robotic-process-automation
- https://www.uipath.com
- https://academy.uipath.in
- https://www.edureka.co/blog

BNM Institute of Technology

Syllabus for Employability Skills-1
SEMESTER – V

Subject Name	Employability Skills-1 (Technical)	Weekly Assignments (6 tests)	Max 10 Min 4
Subject Code	22XXX157	Company Simulation Tests (6 tests)	Max 15 Min 6
Number of Contact Hours/Week	2	• **Domain Specific, Programing & Coding - 90 minutes** ▪ 40 marks of MCQ's which should include Technical & Programing Questions (60 questions each of 1 mark. Students can answer any 40) ▪ 10 Marks of Coding Test *(on coding platform)* 2 programs given. Student must answer one question. Marks 50, Reduced to 25	Max 25 Min 10
Total Number of Contact Hours	24	Credits	1

Module	Topics to be covered
General Technical Training (12 hrs) (All Branches)	**Programming Languages** C, Java, Python (Platforms to be used Hacker Rank, Leet Code and Github)
Technical Training (12 hrs)	**CSE, ISE & AIML** Algorithms, Data Structures, DBMS, Computer Organisation, Computer Networks, Network Security, Operating Systems, UI/UX, Web technologies & AIML.
	ECE, EEE & ME Introduction to the following IT topics : Computer Organisation, Data Structures, Operating Systems, DBMS, Computer Networks, Network Security, AIML

Domain Specific Training to be given by Departments	**Electronics & Communication Engineering** MATLAB, SCADA, System Verilog, VLSI, & Embedded Systems,
	Electrical & Electronics & Engineering Power Electronics, Power Systems, Introduction to Robotic Process Automation (RPA) & EV Vehicles.
	Mechanical Engineering Thermodynamics, Aerodynamics, Automobile & Engines, Solidworks, Ansys, Industrial Automation, Mechatronics, & EV Vehicles

B.N.M. Institute of Technology

An Autonomous Institution under VTU
Department of Information Science & Engineering
Semester: VI

Course: Cryptography and Information Security
Course Code: 22ISE161

L:T:P:J	2:2:0:0	CIA	:	50
Credits:	**03**	**SEA**	**:**	**50**
Hours:	**40**	**SEA Duration**	**:**	**03 Hours**

Course Learning Objectives: The students will be able to

1	To understand Cryptography Theories, Algorithms and Systems.
2	To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks.
3	To study Information Security Models, threats, and attacks.
4	To know the legal, ethical and professional issues in Information Security
5	To know the technological aspects of Information Security

Module-1:	No. of hours	Blooms cognitive Levels
Introduction: Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security. **Classical Encryption Techniques:** Symmetric Cipher Model, Substitution Techniques – Caesar Cipher, Monoalphabetic Ciphers, Playfair Cipher, Hill Cipher, Polyalphabetic Ciphers, One-Time Pad, Transposition Techniques. Steganography- Foundations of modern cryptography: Perfect security – Information theory – Product cryptosystem – Cryptanalysis.	8	Understand
Module-2:		
Mathematics of Symmetric Key Cryptography: Algebraic structures - Modular arithmetic- Euclid''s algorithm- Congruence and matrices - Groups, Rings, Fields- Finite fields- Traditional Block Cipher Structure – Stream Ciphers and Block Ciphers, Motivation for the Feistel Cipher Structure, The Feistel Cipher, Block Cipher Design Principles Symmetric key Cipher: introduction to SDES, Advanced Encryption Standard - Stream Ciphers, RC4.	8	Understand

Module-3:		
Mathematics of Asymmetric Key Cryptography: Primes – Primality Testing – Factorization – Euler's totient function, Fermat's and Euler's Theorem - Chinese Remainder Theorem – Exponentiation and logarithm – Asymmetric Key Ciphers: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange, Introduction to ElGamal cryptosystem and Elliptic curve cryptography. Cryptographic Hash Functions: Secure Hash Algorithm (SHA) – SHA-512 Logic, SHA-512 Round Function. Digital Signature Standard (DSS).	**8**	**Understand**
Module-4:		
Introduction to Information Security: Introduction, The history of Information Security, what is security? Critical characteristics of Information, CNSS security model, Components of an Information System - The security systems development life cycle. The need for security: Threats and Attacks, Professional, Legal, Ethical Issues in information Security.	**8**	**Understand**
Module-5:		
Security Analysis: Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk. **Security Technologies:** Introduction, Access Control, Firewalls, Protecting Remote Connections, Intrusion Detection and Prevention Systems – Honeypots, Honeynets and Padded Cell Systems – Scanning and Analysis Tools – Bio metric Access Controls.	**8**	**Understand**

Course Outcomes: After completing the course, the students will be able to

CO 1: Understand the basic concepts of classical encryption techniques, block ciphers, stream ciphers, cryptographic functions, key management, and IP security.

CO 2: Explain the structure of various block ciphers and stream ciphers.

CO 3: Apply public key cryptosystems, hash functions and key distribution techniques in real time applications.

CO 4: Understanding the critical characteristics, approaches and need for Information Security.

CO 5: Infer the aspects of risk management and security technologies.

Reference Books:
1. Cryptography and Network Security – Principles and Practice by William Stallings, Person, 7th Edition, 2017.
2. Principles of Information Security, 6th edition, Michael E Whittman, Herbert J Mattord, CENGAGE Learning, 2018
3. Network Security Essentials Applications and Standards, William Stallings, Pearson, 4 th Edition, 2012.
4. Network Security Private Communication in a Public world, Charlie Kaufman, Radia Perlman and Mike Speciner, 2nd Edition, PHI, 2013.
5. Network Security and Management, Brijendra Singh, 3rd Edition, PHI, 2013.

Web links and Video Lectures:
1. https://dl.hiva-network.com/Library/security/Cryptography-and-network-securityprinciples-and-practice.pdf.
2. https://imcs.dvfu.ru/lib.int/docs/Networks/Security/Network%20Security%20Foundati

B.N.M. Institute of Technology
An Autonomous Institution under VTU
Department of Information Science & Engineering
Semester: VI

Course: CLOUD COMPUTING AND ITS APPLICATIONS				
Course Code: 22ISE162				
L:T:P:J	**2:0:1:2**	**CIA**	**:**	**50**
Credits:	**03**	**SEA**	**:**	**100**
Hours:	**40**	**SEA Duration :**		**03 Hours**

Course Learning Objectives: The students will be able to

1	Understand the concepts of cloud computing, virtualization and classify services of cloud computing
2	Illustrate architecture and programming in cloud.
3	Define the platforms for development of cloud applications and List the application of cloud.

Module-1: INTRODUCTION	**No. of hours**	**Blooms cognitive Levels**
Introduction to Cloud Computing – Definition of Cloud – Evolution of Cloud Computing –Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning.	**8**	**Apply**
Module-2: CLOUD-ENABLING TECHNOLOGIES		
Service Oriented Architecture – REST and Systems of Systems – Web Services – Publish? Subscribe Model – Basics of Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU –Memory – I/O Devices – Virtualization Support and Disaster Recovery. **List of programs:** • Install Virtual box/VMware Workstation with different flavors of Linux or Windows OS on top of windows7 or 8. • Install a C compiler in the virtual machine created using a virtual box and execute Simple Programs.	**8**	**Apply**
Module-3: CLOUD ARCHITECTURE, SERVICES AND STORAGE		
Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds – laaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3. **List of programs:** • Install Google App Engine. Create hello world app and other simple web applications using python/java. • Use GAE launcher to launch the web applications.	**8**	**Apply**
Module-4: RESOURCE MANAGEMENT AND SECURITY IN CLOUD		
Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources – Security	**8**	**Apply**

Overview – Cloud Security Challenges –Software-as-a-Service Security – Security Governance – Virtual Machine Security – IAM –Security Standards. **List of programs:** • Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim. • Find a procedure to transfer the files from one virtual machine to another virtual machine.		
Module-5: CLOUD TECHNOLOGIES AND ADVANCEMENTS		
CLOUD APPLICATION PROGRAMMING AND THE ANEKA PLATFORM: Framework overview, Anatomy of the Aneka container, Building Aneka clouds, Cloud programming and management INDUSTRIAL PLATFORMS AND NEW DEVELOPMENTS: Amazon web services. Google AppEngine, Microsoft Azure **Lab Component:** 7. Design and deploy a web application in a paas 8. Working with Mangra soft Aneka Software	**8**	**Apply**

Course Outcomes: After completing the course, the students will be able to	
CO 1:	Understand the concepts of cloud computing, virtualization
CO 2:	Identify different cloud delivery models and services.
CO 3:	Illustrate architecture and programming in cloud.
CO 4:	Illustrate the security in cloud and virtual machine.
CO 5:	Analyze the advantages in cloud technology.

Reference Books:
1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012. 2. Rittinghouse, John W., and James F. Ransome, Cloud Computing: Implementation, Management and Security, CRC Press, 2017. 3. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Mastering Cloud Computing, Tata Mcgraw Hill, 2013. 4. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing – A Practical Approach, Tata Mcgraw Hill, 2009. 5. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), OReilly, 2009.

Web links and Video Lectures:
1. https://archive.nptel.ac.in/courses/106/105/106105167/ 2. https://www.youtube.com/watch?v=EN4fEbcFZ_E 3. https://www.guru99.com/cloud-computing-for-beginners.html 4. https://www.simplilearn.com/tutorials/cloud-computing-tutorial https://www.mygreatlearning.com/cloud-computing/tutorials

B.N.M. Institute of Technology

An Autonomous Institution under VTU
Department of Information Science & Engineering
Semester: VI

Course: Big Data Analytics
Course Code: 22ISE163

L:T:P:J	2:2:2:0	CIA	: 50
Credits:	04	SEA	: 50
Hours:	50	SEA Duration:	03 Hours

Course Learning Objectives: The students will be able to

1	Understand the Big Data Platform and its Use cases
2	Provide an overview of Apache Hadoop, HDFS Concepts and Interfacing with HDFS
3	Apply analytics on Structured, Unstructured Data
4	Exposure to Data Analytics Apache Cassandra

Module-1:	No. of hours	Blooms cognitive Levels
Introduction to Big Data and Hadoop Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy.	10	Understand
Module-2:		
HDFS (Hadoop Distributed File System) The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures. Lab Programs: Prog 1	10	Apply
Module-3:		
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. Lab Programs: Prog 2 to 8	10	Apply
Module-4:		
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. **Hive:** Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions.	10	Apply

Lab Programs: Prog 9 and 10		
Module-5:		
Hbase: HBasics, Concepts, Clients, Example, Hbase Versus RDBMS. **Introduction to Apache Cassandra:** Introduction and its history, Key features and advantages of Cassandra, Comparison with other database systems, Understanding data modeling concepts in a NoSQL context, Designing a Cassandra data model, Primary keys and clustering keys, Data types in Cassandra.	**10**	**Apply**

Course Outcomes: After completing the course, the students will be able to	
CO 1:	Identify Big Data and its Business Implications
CO 2:	List the components of Hadoop and Hadoop Eco-System
CO 3:	Access and Process Data on Distributed File System, Manage Job Execution in Hadoop Environment
CO 4:	Apply different data processing tools like Pig, Hive and Spark
CO 5:	Apply different data processing tools like HBase and Apache Cassandra

Reference Books:

1. Tom White "Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012.
2. Seema Acharya, SubhasiniChellappan, "Big Data Analytics" Wiley 2015.
3. "Cassandra: The Definitive Guide" by Jeff Carpenter and Eben Hewitt (O'Reilly)
4. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013).
5. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
6. AnandRajaraman and Jefrey David Ulman, "Mining of Massive Datasets", Cambridge University Press, 2012.

Web links and Video Lectures:

1. https://onlinecourses.nptel.ac.in/noc20_cs92/preview
2. https://onlinecourses.nptel.ac.in/noc22_cs65/preview
3. https://www.coursera.org/specializations/business-analytics
4. https://www.classcentral.com/course/bigdata-analytics-4216
5. https://www.mygreatlearning.com/academy/learn-for-free/courses/mastering-big-data-analytics

Lab Programs

1. Installation of Apache Hadoop
2. Develop a MapReduce program to calculate the frequency of a given word in a given file.
3. Develop a MapReduce program to find the maximum temperature in each year.
4. Develop a MapReduce program to find the grades of student's.
5. Develop a MapReduce program to implement Matrix Multiplication.
6. Develop a MapReduce to find the maximum electrical consumption in each year given electrical consumption for each month in each year.
7. Develop a MapReduce to analyze weather data set and print whether the day is shinny or cool day
8. Develop a MapReduce program to find the tags associated with each movie by analyzing movie lens data
9. Write queries to sort and aggregate the data in a table using HiveQL
10. Develop a Java application to find the maximum temperature using Spark

B.N.M. Institute of Technology

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Department of Information Science and Engineering

SEMESTER - V

Virtual Reality and Augmented Reality
Scheme 2022

Course Code	22ISE164	CIA Marks	50
Teaching Hours/Week (L:T:P:J)	0:0:2:2	SEA Marks	50
Total Number of Hours	30	Exam Hours	03

Course Learning Objectives:
- Experience the fundamental Computer Vision, Computer Graphics and Human-Computer interaction Techniques related to VR/AR
- Demonstrate the Geometric Modelling Techniques Review the Virtual Environment
- Develop VR/AR Technologies Simulate and Apply Virtual/Augmented Reality to varieties of Applications.

	Number of Hours	Bloom's Level
Module 1		
Blender Introduction • Demonstrate Blender Interface, Overlay Reference, Position on Overlay, Managing Layouts, Camera Overlay • Demonstrate Scene view navigation, Scene view camera, Game View. • Project Creation, Plane creation, cube creation, Explanation of cube camera and position, Material Selection, and class file same, adding motion to the script, Run. • Understanding different 3D projectiles	**4+ 2(Project)**	**Apply**
Module 2		
Blender Programming • Show the use of blender for Creating, loading and saving the scenes. • Demonstrate the Transforms, Components, 3D objects, creating components, Saving the work. • Demonstrate the Layers, Constraints, Editor Feature 3d mode, Preferences, Build settings, Sculpting, preference add Ons • Installation of XR device, Viewing through the XR.	**4+ 2(Project)**	**Apply**
Module 3		
Graphics • Demonstrate the use of Render Pipelines, Cameras, lighting, models, mirroring objects • Demonstrate the use of Meshes, Textures, shaders, materials • Demonstrate the concept Visual effects, sky, colour for suitable example.	**4+**	**Apply**

• Demonstrate the concept of World Building, Terrain, tree Editor for suitable example. • Demonstrate XR Plug-in Management, Installation of packages. • Demonstrate Creation of left-hand, left-hand Controller and right-hand controller.	**2(Project)**	
Module 4		
Scripting, Audio Video and Animation		
• Demonstrate the Setting up scripting Environment. • Apply the concepts for Creating frames, creating .mkv files, namespaces, attributes • audio files, tracker Modules, Audio Group inspector. • Demonstrate for suitable example to create Animation, Rotation in animation, animation clips, Humanoid avatars, Animation.	**4+ 2(Project)**	**Apply**
Module 5		
Augmented reality		
• Program to show augmented reality. • Program to show The Relationship Between Augmented Reality and Other Technologies-Media, Technologies. • Program to show Spectrum Between Real and Virtual Worlds, applications of augmented reality Augmented.	**4+ 2(Project)**	**Apply**

Mini project
- Using VR exploring the human body level by level, including cell level.
- Using VR describing how medicine and body cures the illness.
- Touchless ATM Using Augmented Reality.
- Augmented Reality Controlled Hologram.
- Augmented Reality House devices.
- Augmented Reality Agriculture Field.
- Augmented Reality and Medical devices.
- VR Game Development.
- VR Application Development.
- Development of AI controlled VR Device, that accurately work to keep the clarity very good and using technology keep the eye healthy.
- Development of Cardboard VR device as activity.
- Improvising the quality of the VR Device and determining the accuracy.
- Development of Satellite with the capability of VR Camera and more features.
- Ability to view the Solar system using the VR Device using compatible camera sent through the satellite.

Course Outcomes:
The students will be able to
- Apply navigation and utilize the Blender interface effectively, create and manipulate basic 3D objects, and apply materials and textures to develop complex scenes.
- Create, load, and save scenes using Blender's scripting capabilities, apply transformations and constraints, and integrate components such as XR devices for enhanced virtual reality experiences.

- Apply the concepts of render pipelines, shaders, and visual effects to create realistic and immersive graphics, and manage environments with world-building tools, including terrain and lighting.
- Develop skills in setting up scripting environments, creating and manipulating animations, and integrating audio and video files to enhance 3D scenes, including the creation of humanoid avatars and animation clips.
- Design and implement augmented reality applications, understanding the relationship between AR and other media technologies, and apply these concepts to real-world scenarios bridging the gap between real and virtual environments.

References:

1. Virtual Reality Technology, Second Edition, Gregory C. Burdea & Philippe Coiffet, John Wiley & Sons.
2. Allan Fowler-AR Game Development‖, 1st Edition, A press Publications, 2018, ISBN 978-1484236178
3. Allan Fowler- Beginning iOS AR Game Development Developing Augmented Reality Apps with Unity and C#, 1st Edition, Apress Publications, 2018, ISBN 978-1484236178
4. Donald Hearn & Pauline Baker: Computer Graphics with OpenGL Version,3rd / 4th Edition, Pearson Education,2011
5. https://docs.unity3d.com/2023.2/Documentation/Manual/ScriptingSection.html
6. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016
7. Understanding Virtual Reality: Interface, Application and Design, William R Sherman and Alan B Craig, (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA, 2002

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An Autonomous Institution under VTU
Department of Information Science & Engineering
Semester: VI

Course: Data Mining			
Course Code: 22ISE1651			
L:T:P:J	**3:0:0:0**	**CIA**	**: 50**
Credits:	**03**	**SEA**	**: 50**
Hours:	**40**	**SEA Duration:**	**03 Hours**

Course Learning Objectives: The students will be able to	
1	Understand the principles of Data warehousing and Data Mining
2	Be familiar with the Data warehouse architecture and its Implementation
3	Classify and predict the given data for the application development

Module-1:	**No. of hours**	**Blooms cognitive Levels**
Data modelling: Basic Concepts- A multitier Architecture, Data warehouse models**:** Enterprise warehouse- Data mart and virtual warehouse, Extraction, Transformation and loading- Data Cube: A multidimensional data model- Stars, Snowflakes and Fact constellations: Schemas for multi dimensional Data models- Dimensions: The role of concept Hierarchies- Measures: Their Categorization and computation, Typical OLAP Operations.	**8**	**Understand**
Module-2:		
Data Mining: - Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation- Architecture of A Typical Data Mining Systems- Classification of Data Mining Systems. Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining	**8**	**Understand**
Module-3:		
Association Analysis :- Association Analysis: Problem Definition- Frequent Item set Generation- Rule generation- Alternative Methods for Generating Frequent Item sets- FP-Growth Algorithm- Evaluation of Association Patterns	**8**	**Apply**
Module-4:		
Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis	**8**	**Analyze**

Case Study: Customer Segmentation of E-Commerce data using Clustering Algorithms		
Module-5:		
Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web **Case Study:** Interpreting Twitter Data from ongoing technical developments in country Tweets	**8**	**Analyze**

Course Outcomes: After completing the course, the students will be able to	
CO 1:	Understand the principles of Data Modeling
CO 2:	Understand the principles of Data Mining
CO 3:	Apply the concepts of association analysis
CO 4:	Analyze the concepts of various clusters
CO 5:	Analyze the concepts of spatial and multimedia mining

Reference Books:

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar ,"Introduction to Data Mining, Pearson, First impression, 2014
2. Jiawei Han, MichelineKamber and Jian Pei"Data Mining Concepts and Techniques", Third Edition, Elsevier, 2011.
3. Alex Berson and Stephen J. Smith "Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, Tenth Reprint 2007.
4. K.P. Soman, ShyamDiwakar and V. Ajay "Insight into Data Mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2006.
5. G. K. Gupta "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.
6. Pang-Ning Tan, Michael Steinbach and Vipin Kumar "Introduction to Data Mining", Pearson Education, 2007.

Web links and Video Lectures:
1. https://www.udemy.com/topic/data-warehouse/
2. https://www.coursera.org/professional-certificates/microsoft-azure-dp-203-data-engineering
3. https://www.edx.org/learn/data-warehouse
4. https://alison.com/tag/data-mining

https://www.datacamp.com/courses/introduction-to-data-warehousing

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Department of Information Science & Engineering
Semester: VI

Course: Block Chain Technologies: Platforms and Applications				
Course Code: 22ISE1652				

L:T:P:J	3:0:0:0	CIA	:	50
Credits:	03	SEA	:	50
Hours:	36	SEA Duration	:	03 Hours

Course Learning Objectives: The students will be able to

1	Understand the basic concepts of blockchain technology.
2	Applications of Blockchain and its technologies for bitcoin and cryptocurrencies.
3	Demonstrate the functioning of smart contracts with the help of Ethereum 101.
4	Apply the concept of hyperledger for creation of distributed and personalized blockchains.
5	Build and Implement blockchain technology for real world applications.

Module-1:	No. of hours	Blooms cognitive Levels
Blockchain: Distributed systems, History of blockchain, Introduction to blockchain, Types of blockchain, CAP theorem and blockchain, Benefits and limitations of blockchain. **Decentralization and Cryptography:** Decentralization using blockchain, Cryptography and Technical and Technical Foundations: Cryptographic primitives, Asymmetric cryptography, Public and private keys	L :08	Understand
Module-2:		
Bitcoin and Alternative Coins A: Bitcoin, Transactions, Blockchain, Bitcoin payment B: Alternative Coins, Theoretical foundations, Bitcoin limitations, Namecoin, Litecoin, Primecoin, Zcash.	L : 07	Apply
Module-3:		
Smart Contracts and Ethereum 101: Smart Contracts: Definition: Ricardi contracts. Ethereum 101: Introduction, Ethereum blockchain, Elements of the Ethereum of the Ethereum blockchain, Precompiled contracts.	L : 07	Apply
Module-4:		
Introduction to Hyperledger: What is Hyperledger? Distributed Ledger Technology & its Challenges, Hyperledger & Distributed Ledger Technology, Hyperledger Fabric, Hyperledger Composer.	L : 07	Apply
Module-5:		
Applications of Blockchains: Alternative block chain**:** Blockchain-Outside-of Currencies, Internet of Things, Government, Finance, Media,Medical Record Management System, Domain Name Service and Future of Blockchain.	L : 07	Apply

Course Outcomes: After completing the course, the students will be able to

CO1	Understand the fundamental concepts of block chain technology
CO2	Apply the concepts of blockchain for bitcoin and crytocurrencies.
CO3	Apply the working of Smart Contracts through Etherereum 101
CO4	Apply the Concepts of Hyperledger for development of personalized and distributed blockchains
CO5	Create and Develop real world block chain based solutions using varieties of Block chain technology.

Reference Books:

1. Mastering Blockchain- Distributed ledgers, decentralization and smart contracts explained, Author Imran Bashir, Packet Publishing Ltd, 2nd edition, ISBN 978-1-7812-544-5, 2017

2. Bitcoin and Cryptocurrency Technologies, Author-Arvind Narayanan, Joseph Bonneau, Edward Felten, Andre Miller, Steven Goldfeder, Princeton Univercity, 2016.
3. Blockchain Basics: A Non-Technical Introduction in 25 Steps, Author-Daniel Drescher, Apress, 1st Edition, 2017
4. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, Andreas M. Antonopoulos, O'Reilly Media, 1st Edition, 2014.
5. Blockchain with Hyperledger Fabric , Nitin Gaur, Anthony O'Dowd, Petr Novotny, Luc Desrosiers, Venkatraman Ramakrishna, Salman A. Baset,November 2020, Packt Publishing, Second Edition,ISBN: 9781839218750

Web links and Video Lectures:
1. NPTEL online course : https://nptel.ac.in/courses/106/104/106104220/

2. Udemy: https://www.udemy.com/course/build-your-blockchain-az/

https://eduxlabs.com/courses/blockchain-technology- training/?tab=tab-curriculum

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Department of Information Science & Engineering
SEMESTER – VI

Course: Cyber Security			
Course Code: 22ISE1653			
L:T:P:J	**3:0:0:0**	**CIA**	**50**
Credits:	**03**	**SEA**	**50**
Hours:	**40**	**SEA Duration:**	**03 Hours**

Course Learning Objectives: The students will be able to	
1	Explain the importance of cyber security
2	Explain the security issues in programming, web and OS.
3	Understand the various threats to network communications, and attacks such as denial of service (DoS) and distributed denial of serives.(DDoS)
4	Explore various aspects of Digital Forensics technology
5	By implementing, learners will have idea about computer crime.

Module-1:	**No. of hours**	**Blooms cognitive Levels**
Introduction: What Is Computer Security? Threats, Harm, Vulnerabilities, Controls, Conclusion, What's Next? **Toolbox:** Authentication, Access Control, and Cryptography: Authentication, Access Control.	**8**	**Understand**
Module-2:		
The Web—User Side: Browser Attacks, Web Attacks Targeting Users, Obtaining User or Website Data, Email Attacks. **Operating Systems:** Security in Operating Systems, Security in the Design of Operating Systems, Rootkit.	**8**	**Apply**
Module-3:		
Networks: Network concepts, War on Networks: Threats to Network Communications, Wireless Network Security, Denial of Service, Distributed Denial-of-Service.	**8**	**Apply**
Module-4:		
Introduction to Digital Forensics, Forensic Software and Hardware, Analysis and Advanced Tools, Forensic Technology and Practices, Forensic Ballistics and Photography, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Network Forensics.	**8**	**Understand**

Module-5:		
Introduction to Cyber Crime Investigation, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands on Case Studies, Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.	**8**	**Apply**

Course Outcomes: After completing the course, the students will be able to	
CO 1:	Understand fundamental aspects of cyber security
CO 2:	Identify the security issues in web, network, Operating system
CO 3:	Identify common network security threats and methods used to mitigate these ricks
CO 4:	Illustrate computer forensic techniques to identify the digital forensics associated with criminal activities.
CO 5:	Apply forensic analysis tools to recover important evidence for identifying computer crime.

Reference Books:

1. Charles P. Pfleeger, Shari Lawrence Pfleeger, Jonathan Margulies, Security in Computing, 5th Ed,Pearson Education, 2015
2. Understanding Forensics in IT-NIIT,2005
3. Nelson Phillips and EnfingerSteuart, Computer Forensics and Investigations, Cengage Learning Publisher, 2009

4. Sammons, John, and Michael Cross. The basics of cyber safety: computer and mobile device safety made easy. Elsevier, 2016.
5. Brooks, Charles J., Christopher Grow, Philip Craig, and Donald Short. Cybersecurity essentials. John Wiley & Sons,2018
6. Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, Decentralization, and Smart Contracts Explained", Second Edition, Packt Publishing, 2018.
7. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction" Princeton University Press, 2016

Web links and Video Lectures:

1. https://onlinecourses.nptel.ac.in/noc23_cs127/preview
2. https://www.slideshare.net/Siblu28/cyber-security-36922359
3. https://www.geeksforgeeks.org/cyber-security-types-and-importance/
4. NPTEL online course : https://nptel.ac.in/courses/106/104/106104220/#
Udemy: https://www.udemy.com/course/build-your-blockchain-az/

B.N.M. Institute of Technology

An Autonomous Institution under VTU
Department of Information Science & Engineering
Semester: VI

Course: Data Visualization	
Course Code: 22ISE1654	

L:T:P:J	**3:0:0:0**	**CIA**	**: 50**
Credits:	**03**	**SEA**	**: 50**
Hours:	**40**	**SEA Duration:**	**03 Hours**

Course Learning Objectives: The students will be able to

1	Understand and describe the main concepts of data visualization, chart types and their recommended usage.
2	Create data visualizations and dashboards using Tableau Desktop
3	Identify the latest dashboard and reporting features of Microsoft Power BI
4	Make Use of data from multiple sources, create stunning visualizations
5	Identify the capabilities of Power BI mobile applications

Descriptions (if any):

Prerequisite

- Working knowledge of Programming Language.
- Windows or Apple O.S.
- CPUs must support SSE4.2 and POPCNT instruction sets
- Citrix environments, Microsoft Hyper-V, Parallels, and VMware.

Module-1:	**No. of hours**	**Blooms Cognitive Levels**
Introduction: Introduction to data visualization, Getting started with Tableau Desktop, Connecting to the tutorial dataset, Creating the charts. **Common charts**: Creating common visualizations (bar charts, line charts etc.), Filtering and sorting data, Adding Titles, Labels, and descriptions, Publish your work to Tableau Cloud.	**8**	**Understand**
Module-2:		
Interactions: Interactivity with text and visual tooltips, Interactivity with actions (filter, highlight, URL), Assembling dashboards from multiple charts. **Transform the data:** Creating simple calculations in Tableau**,** Using table calculations**,** Introduction to Tableau Preparation.	**8**	**Apply**
Module-3:	**No. of hours**	**Blooms Cognitive Levels**
Preparing Data Sources: Query folding, Query design per dataset mode, Import mode dataset queries, Direct Query dataset queries, Direct Query report execution, Composite datasets, and Table storage modes. **Data Sources:** Authentication, Data Source settings, Privacy levels, Power BIas a data source, Power BI Desktop options, Global options, Current FILE options.	**8**	**Apply**
Module-4:		

SQL views: SQL views versus M queries, SQL view examples, Date dimension view, Mark as date table, Product dimension view, Slowly changing dimensions. **Designing Dashboards:** Dashboard design, Visual selection, Layout, Navigation pane, Full screen mode, supporting tiles	**8**	**Apply**
Module-5:		
Dashboard Architecture Single dashboard Architecture, Multiple dashboard Architecture, Organizational Dashboard Architecture, Multiple datasets. **Dashboard Tiles:** Tile details and custom links, Real time data tiles, Dashboard themes**,** Mobile optimized dashboards	**8**	**Apply**

Course Outcomes: After completing the course, the students will be able to
CO1: Understand and describe the main concepts of data visualization, chart types and their recommended usage.
CO2:Create data visualizations and dashboards using Tableau Desktop
CO3:Identify the latest dashboard and reporting features of Microsoft Power BI
CO4:Make use of data from multiple sources, create stunning visualizations
CO5:Identify the capabilities of Power BI mobile applications

Reference Books:
1. Steve Wexler, Jeffrey Shaffer, Andy Cotgreave: The Big Book of Dashboards
2. Mastering Microsoft Power BI - Second Edition By Greg Deckler , Brett Powell
3. Ryan Sleeper: Practical Tableau
4. Ben Fry, "Visualizing data: Exploring and explaining data with the processing environment", O'Reilly, 2008.
5. A Julie Steele and Noah Iliinsky, Designing Data Visualizations: Representing Informational Relationships, O'Relly

Web links:
- https://powerbi.microsoft.com
- https://www.tableau.com
- https://www.udemy.com/course/data-visualization-dashboard-design
- https://www.insightplatforms.com/10-free-tools-dashboards-data-visualization-infographics

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An Autonomous Institution under VTU
Department of Information Science & Engineering
Semester: VI

Course: UI Frameworks
Course Code: 22ISE1655

L:T:P:J	3:0:0:0	CIA	:	50
Credits:	03	SEA	: 50	
Hours:	40	SEA Duration:	03 Hours	

Course Learning Objectives: The students will be able to

1	To understand the Front-end Web UI Framework.
2	To understand the essence of Bootstrap grid system and responsive design.
3	To understand the various Bootstrap CSS components
4	To understand the various Bootstrap Java script components
5	To understand the concept of Bootstrap and JQuery Web Tools

Module-1:	**No. of hours**	**Blooms cognitive Levels**
Front-end Web UI Frameworks Overview: Front-End Web UI Frameworks and Tools: Bootstrap 4, How to Use the Learning Resources, What is Full-Stack Web Development? Setting up Git, Basic Git Commands, Online Git Repositories, Front-end Web UI Frameworks.	**8**	**Understand**
Module-2:		
Introduction to Bootstrap: Getting Started with Bootstrap, Responsive Design, Bootstrap Grid System, Responsive Design and Bootstrap Grid System.	**8**	**Understand**
Module-3:		
Bootstrap CSS Components: Navigation and Navigation Bar, Navbar and Breadcrumbs, Icon Fonts, Icon Fonts, User Input, Buttons, Forms, Bootstrap Tables and Cards, Displaying Content: Tables and Cards, Images and Media, Alerting Users.	**8**	**Apply**
Module-4:		
Bootstrap Javascript Components: Bootstrap JavaScript Components, Tabs, Pills and Tabbed Navigation, Tabs, Collapse and Accordion, Accordion, Tooltips, Popovers and Modals, Tooltips and Modals, Carousel.	**8**	**Apply**

Module-5:		

Web Tools: Bootstrap and JQuery, More Bootstrap and JQuery, CSS Preprocessors: Less and Sass, Less, Scss, Building and Deployment, Task Runners, Grunt, Web UI Frameworks.	**8**	**Apply**

Course Outcomes: After completing the course, the students will be able to

    CO 1:Understand the Front-end Web UI Framework and basic Git commands

    CO 2:Understand the Bootstrap grid system and responsive design

    CO 3:Develop an application using bootstrap CSS components

    CO4:Develop an application using bootstrap Javascript Components

    CO5:Building and Deployment of applications

Reference Books:

1. Mastering Front-End Web Development (HTML, Bootstrap, CSS, SEO, Cordova, SVG, JavaScript, An Advanced Guide, Chong Lip Phang, November 2020
2. Mastering Bootstrap 4, Benjamin Jakobus , Jason Marah, September 2016
3. Learning Bootstrap 4, Matt Lambert, Second Edition
4. Step By Step Bootstrap 3: A Quick Guide to Responsive Web Development Using Bootstrap 3 – May 22, 2014
5. Bootstrap in 24 Hours, Sams Teach Yourself, Jennifer Kyrnin , 1st Edition

Web links and Video Lectures:

1. https://coursesity.com/course-detail/front-end-web-ui-frameworks-and-tools-bootstrap-4
2. https://medium.com/swlh/front-end-web-ui-frameworks-and-tools-bootstrap-4-fb3906d885ff
3. https://getbootstrap.com/docs/5.3/getting-started/introduction/
4. https://www.youtube.com/watch?v=-qfEOE4vtxE
https://www.youtube.com/watch?v=eow125xV5-c

B.N.M. Institute of Technology

An Autonomous Institution under VTU
Department of Information Science & Engineering

Semester: VI

Course: Strategic Management
Course Code: 22ISE1656

L:T:P:J	3:0:0:0	CIA	:	50
Credits: 03	03	SEA	:	50
Hours: 36	40	SEA Duration	:	03 Hours

Course Learning Objectives: The students will be able to

1	To provide a framework for students to understand strategic management concepts and conduct external analysis for competitive advantage.
2	To help students develop a thorough understanding of principles and models related to an organization's internal analysis.
3	To help students understand the different strategy options available for organizations in a complex and dynamic environment.

Module-1: Introduction to Strategic Management and External Analysis	**No. of hours**	**Blooms cognitive Levels**
Meaning and Characteristics of Strategic Management; The Strategic Management Process. **External Analysis**– PESTLE analysis, Environment Threat and Opportunity Profile (ETOP); Industry Analysis –Porter's Dominant Economic Features, Porter's Five Forces Model, Strategic Group Mapping; Industry Key Success Factors, Key Performance Indicators and Key Result Areas.	**8**	**Apply**
Module-2: Internal Analysis		
Strategic Vision, Mission, Goals, Long-Term and Short-Term Objectives and their Value to the Strategic Management Process; Organizational Capability Profile – Resource Based View of the firm (RBV) and VRIN; Business Portfolio Analysis – BCG / Growth Share Matrix, GE 9 Cell Model; Balanced Score Card, SWOC Analysis, Value Chain Analysis, Benchmarking.	**8**	**Apply**
Module-3: Strategy Formulation		
Corporate Strategies: Growth Strategies – Internal Growth, External Growth (Integration, Diversification, Mergers, Joint Ventures, Strategic Alliances), Product/Market Expansion grid / Ansoff's Matrix; Stability Strategies – NoChange, Profit and Proceed with Caution.	**8**	**Apply**
Module-4:Strategy Implementation		
Facilitators for implementation of strategy: Organisational Structures – matching structure to strategy, McKinsey's 7S, Changing structure and processes (Business Process Reengineering, Six Sigma); Strategic Leadership; Organisational Culture – Learning organisations, MBO, TQM.	**8**	**Apply**

Module-5: Strategic Control		
Focus of Strategic Control, Establishing Strategic Controls (Premise Control, Strategic Surveillance, Special Alert Control, Implementation Control), Exerting Strategic Control (through Competitive Benchmarking, Performance and Formal and Informal Organisations).	**8**	**Apply**

Course Outcomes: After completing the course, the students will be able to	
CO 1:	Understand strategic management concepts and how to conduct external analysis for competitive advantage.
CO 2:	Apply selected models of internal analysis to evaluate an organization.
CO 3:	Understand and analyse the different strategy options available for organizations in a complex and dynamic environment.
CO 4:	Appreciate the essential factors in strategy implementation.
CO 5:	Understand how to establish and exert strategic control.

Reference Books:

1. Strategy: Theory & Practice , Stewart Clegg Chris Carter Marting Kornberger Jochen Schweitze: Sage Publications 3 rd Ed, 2020
2. Strategy Management: Theory & Practice John Parnell Biztantra 2004
3. Crafting and Executing Strategy: The Quest for Competitive Advantage – Concepts and Cases ,Arthur A. Thompson Jr. Margaret A. Peteraf John E. Gamble A. J. Strickland III Arun K. Jain McGraw Hill Education 19th Ed, 2017

Web links and Video Lectures:

1.https://www.edx.org/learn/strategic-management
2.https://www.youtube.com/watch?v=ZmRK9wc3hjI
3. https://ipbusinessacademy.org/wp-content/uploads/2021/02/Lecture-NotesPart1.pdf

B.N.M. Institute of Technology

An Autonomous Institution under VTU
Department of Information Science & Engineering
Semester: VI

Course: Natural Language Processing			
Course Code: 22ISE1661			
L:T:P:J	**3:0:0:0**	CIA :	**50**
Credits:	**03**	SEA :	**50**
Hours:	**40**	SEA Duration :	**03 Hours**

Course Learning Objectives: The students will be able to	
1	To learn the fundamentals of natural language processing
2	To understand the use of CFG and PCFG in NLP
3	To understand the role of semantics of sentences and pragmatics
4	To apply the NLP techniques to IR applications
5	Compare and contrast the use of different statistical approaches for different types of NLP applications

Module-1: Introduction	**No. of hours**	**Blooms cognitive Levels**
Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM - Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance	**8**	**Understand**
Module-2: Word Level Analysis		
Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.	**8**	**Apply**
Module-3: Syntactic Analysis		
Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs - Feature structures, Unification of feature structures.	**8**	**Apply**
Module-4: Semantics and Pragmatics		
Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised,Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.	**8**	**Apply**
Module-5: Discourse Analysis and Lexical Resources		
Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).	**8**	**Apply**

Course Outcomes: After completing the course, the students will be able to	
CO 1:	To tag a given text with basic Language features
CO 2:	To design an innovative application using NLP components
CO 3:	To implement a rule based system to tackle morphology/syntax of a language
CO 4:	To design a tag set to be used for statistical processing for real-time applications
CO 5:	To compare and contrast the use of different statistical approaches for different types of NLP applications.

Reference Books:
1. Daniel Jurafsky, James H. Martin―Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, ―Natural Language Processing with Python‖, First Edition, O_Reilly Media, 2009..
3. Breck Baldwin, ―Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
4. Richard M Reese, ―Natural Language Processing with Java‖, O_Reilly Media, 2015.
5. Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
   Tanveer Siddiqui, U.S. Tiwary, ―Natural Language Processing and InformationRetrieval‖, Oxford University Press, 2008.

B.N.M. Institute of Technology

An Autonomous Institution under VTU
Department of Information Science & Engineering
Semester: VI

Course: NoSQL
Course Code: 22ISE1662

L:T:P:J	3:0:0:0	CIA	:	50
Credits:	**03**	**SEA**	**:**	**50**
Hours:	**40**	**SEA Duration:**		**03 Hours**

Course Learning Objectives: The students will be able to

1	Compare different types of NoSQL Databases
2	Compare and contrast RDBMS with different NoSQL databases.
3	Demonstrate the detailed architecture Document-oriented NoSQL databases.
4	Explain performance tune of Key-Value Pair NoSQL databases.
5	Apply Nosql development tools on different types of NoSQL Databases.

	No. of hours	Blooms cognitive Levels
Module-1: Why NoSQL		
Overview and History of NoSQL Databases. Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Key Points	8	Understand
Module-2: Aggregate and Distributed Data model		
Aggregate, Key-Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases. Replication and sharding, MapReduce on databases. Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication.	8	Apply
Module-3: Document Databases		
Document oriented Database Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure.	8	Apply
Module-4: Column-Family Store and Key-Value Databases		
Column-Family Data Store Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage. Key-Value Database: Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases.	8	Apply

Module-5: Graph Databases		
Graph Databases, Graph Database. Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases. Graph NoSQL databases using Neo4, NoSQL database development tools and programming languages. NoSQL Key/Value databases using MongoDB.	**8**	**Apply**

Course Outcomes: After completing the course, the students will be able to	
CO 1:	Understand different types of NoSQL Databases.
CO 2:	Compare Relational Database to NoSql stores and explain Sharding and Replication
CO 3:	Illustrate the Document-oriented NoSQL databases
CO 4:	Understand column oriented NoSql Database.
CO 5:	Understand detailed architecture of Graph NoSQL databases and apply Nosql Development tools with suitable usecase.

Text Books:

1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications,1st Edition ,2019.

Web Reference:

1. https://www.ibm.com/cloud/learn/nosql-databases
2. https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp
3. https://www.geeksforgeeks.org/introduction-to-nosql/

https://www.javatpoint.com/nosql-database

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Department of Information Science & Engineering
SEMESTER – VI

	Course: Operation Research				
	Course Code: 22ISE1663				
L:T:P:J		**3:0:0:0**	**CIA**	**:**	**50**
Credits:		**03**	**SEA**	**:**	**50**
Hours:		**40**	**SEA Duration**	**:**	**03Hours**

Course Learning Objectives: The students will be able to

1	To understand the methodology of OR problem solving and formulate linear programming problem.
2	Describe numerous problem-solving approaches for optimization.
3	Solve linear programming problems using simplex method, Big M method 2- phase method.
4	Identify the problems of transportation and assignment problem, and then solve it.
5	Use game theory as a case study in a decision support system.

Module-1:	No. of hours	Blooms cognitive Levels
Introduction, Linear Programming: Introduction: The origin, nature and impact of OR; Defining the problem and gathering data; Formulating a mathematical model; Deriving solutions from the model; Testing the model; Preparing to apply the model; Implementation . Introduction to Linear Programming Problem (LPP): Prototype Example Assumption of LPP, Formulation of LPP and Graphical Method Various Examples.	**8**	**Understand**
Module-2:		
Simplex Method–1: The essence of the simplex method; Setting up the simplex method; Types of variables, Algebra of the simplex method; the simplex method in tabular form; Tiebreaking in the simplex method, BigM method, Two phase method.	**8**	**Apply**
Module-3:		
Simplex Method–2: Duality Theory-The essence of duality theory, Primal dual relationship, conversion of primal to dual problem and viceversa. The dual simplex method.	**8**	**Apply**
Module-4:		
Transportation and Assignment Problems: The transportation problem, Initial Basic Feasible Solution (IBFS) by North West Corner Rule method, Matrix Minima Method, Vogel's Approximation Method. Optimal solution by Modified Distribution Method (MODI).The Assignment problem; A Hungarian algorithm for the assignment problem. Minimization and Maximization varieties in Transportation and assignment problems.	**8**	**Apply**

Module-5:		
Game Theory: Game Theory: The formulation of two persons, zero sum games; saddle point, maximin and minimax principle, Solving simple games- a prototype example; Games with mixed strategies; Graphical solution procedure.	**8**	**Apply**

Course Outcomes: After completing the course, the students will be able to	
CO 1:	Solve linear programming problems using appropriate techniques and optimization solvers, interpret the results obtained.
CO 2:	Determine optimal strategy for products using various methods
CO 3:	Solve linear programming problems using duality theory and post optimality analysis
CO 4:	Understand the given problem as transportation and assignment problem and solve.
CO5:	Illustrate game theory for decision support system.

Reference Books:
1. D.S. Hira and P.K. Gupta, Operations Research, (Revised Edition), Published by S. Chand & Company Ltd, 2014 2. S Kalavathy, Operation Research, Vikas Publishing House Pvt Limited, 01-Aug-2002 3. S D Sharma, Operation Research,KedarNath Ram Nath Publishers. 4. Kantiswaroop, P.K.Guptha and Man Mohan: Operation Research. Sultan Chand. 5. Introduction to Operations Research - Hiller and Liberman, MGH, 7th Edition, 2002.

Web links and Video Lectures:
1. https://archive.nptel.ac.in/courses/112/106/112106134/# 2. http://www.universalteacherpublications.com/univ/ebooks/or/Ch1/techniq.htm 3. https://indiafreenotes.com/operations-research-techniques/ 4.https://nptel.ac.in/courses/110106062 5. https://onlinecourses.nptel.ac.in/noc22_ma48/preview

B.N.M. Institute of Technology

An Autonomous Institution under VTU
Department of Information Science & Engineering
Semester: VI

Course: Deep Learning				
Course Code: 22ISE1664				
L:T:P:J	3:0:0:0	**CIA** :	50	
Credits:	03	**SEA** :	50	
Hours:	40	**SEA Duration :**	03 Hours	

Course Learning Objectives: The students will be able to			
1	Introduce students to deep learning algorithms and their applications in order to solve real problems.		
2	Understand the concepts of deep learning, including neural networks, activation functions, and the learning process.		
3	Gain experience in deploying deep learning models to solve practical problems.		
4	Course Learning Outcomes		

Module-1: Introduction	**No. of hours**	**Blooms cognitive Levels**
Historical context and motivation for deep learning; basic supervised classification task, optimizing logistic classifier using gradient descent, stochastic gradient descent, momentum, and adaptive sub-gradient method.	8	Understand
Module-2: Neural Networks		
Feedforward neural networks, deep networks, regularizing a deep network, model exploration, and hyper parameter tuning.	8	Understand
Module-3: Convolution Neural Networks		
Introduction to convolution neural networks: stacking, striding and pooling, applications like image, and text classification.	8	Apply
Module-4: Sequence Modeling		
Recurrent Nets: Unfolding computational graphs, recurrent neural networks (RNNs), bidirectional RNNs, encoder-decoder sequence to sequence architecture deep recurrent networks, LSTM networks.	8	Apply
Module-5: Autoencoders		
Undercomplete autoencoders, regularized autoencoders, sparse autoencoders, denoising autoencoders, representational power, layer, size, and depth of autoencoders, stochastic encoders and decoders..	8	Apply

Course Outcomes:	After completing the course, the students will be able to
CO 1:	Describe the feed-forward and deep networks
CO 2:	Design single and multi-layer feed-forward deep networks and tune various hyper-parameters
CO 3:	Implement deep neural networks to solve a problem
CO 4:	Analyze performance of deep networks.

Reference Books:

1. Bunduma, N. (2017). Fundamentals of Deep Learning. O'reilly Books.

2. Heaton, J.(2015). Deep Learning and Neural Networks, Heaton Research Inc.

3. Goodfellow, I. (2016). Deep Learning. MIT Press.

4. Deng, L., & Yu, D. (2009). Deep Learning: Methods and Applications (Foundations and Trends in Signal Processing). Publishers Inc.

5. Hall, M.L, (2011). Deep Learning. VDM Verlag

B.N.M. Institute of Technology

An Autonomous Institution under VTU
Department of Information Science & Engineering
SEMESTER – VI

**Course: Agile Software Development**					
**Course Code: 22ISE1665**					
L:T:P:J	3:0:0:0	**CIA**	:	50	
Credits:	03	**SEA**	:	50	
Hours:	36	**SEA Duration**	:	03 Hours	

Course Learning Objectives: The students will be able to

1	To understand how an iterative, incremental development process leads to faster delivery of more useful software
2	To understand the essence of agile development methods
3	To understand the principles and practices of extreme programming
4	To understand the roles of prototyping in the software process
5	To understand the concept of Mastering Agility

Module-1:	No. of hours	Blooms cognitive Levels
Agile: Understanding Success, Beyond Deadlines, The Importance of Organizational Success, Enter Agility, **How to Be Agile?:** Agile Methods, Don't Make Your Own Method, The Road to Mastery, Find a Mentor	**06**	**Understand**
Module-2:		
Understanding XP: The XP Lifecycle, The XP Team, XP Concepts, **Adopting XP:** Is XP Right for Us?, Go!, Assess Your Agility.	**06**	**Understand**
Module-3:		
Practicing XP: Thinking: Pair Programming, Energized Work, Informative Workspace, Root-Cause Analysis, Retrospectives, **Collaborating:** Trust, Sit Together, Real Customer Involvement, Ubiquitous Language, Stand- Up Meetings, Coding Standards, Iteration Demo, Reporting, **Releasing:** "Done Done", No Bugs, Version Control, Ten-Minute Build, Continuous Integration, Collective Code Ownership, Documentation, **Planning:** Vision, Release Planning, The Planning Game, Iteration Planning, Slack, Stories, Estimating, **Developing:** Incremental Requirements, Customer Tests, Test-Driven Development, Refactoring, Simple Design, Incremental Design and Architecture, Spike Solutions.	**08**	**Analyze**

Module-4:		
Mastering Agility: Values and Principles: Commonalities, About Values, Principles, and Practices, Further Reading, **Improve the Process:** Understand Your Project, Tune and Adapt, Break the Rules, **Rely on People:** Build Effective Relationships, Let the Right People Do the Right Things, Build the Process for the People, **Eliminate Waste:** Work in Small, Reversible Steps, Fail Fast, Maximize Work Not Done, Pursue Throughput.	**08**	**Analyze**
Module-5:		
Deliver Value: Exploit Your Agility, Only Releasable Code Has Value, Deliver Business Results, Deliver Frequently, **Seek Technical Excellence:** Software Doesn't Exist, Design Is for Understanding, Design Tradeoffs, Quality with a Name, Great Design, Universal Design Principles, Principles in Practice, Pursue Mastery.	**08**	**Analyze**

Course Outcomes: After completing the course, the students will be able to

CO 1: Understand the essence of agile development methods

CO 2: Understand The XP Lifecycle, XP Concepts, Adopting XP

CO 3: Analyze the Work on Pair Programming, Root-Cause Analysis, Retrospectives, Planning, Incremental Requirements, Customer Tests

CO 4: Analyze the concept of Mastering Agility

CO 5: Analyze the principles and practices of extreme programming

Reference Books:
1. **The Art of Agile Development** (Pragmatic guide to agile software development),James shore, Chromatic, O'Reilly Media, Shroff Publishers & Distributors, 2007.
2. Agile Software Development, Principles, Patterns, and Practices, Robert C. Martin, Prentice Hall; 1st edition, 2002
3. "Agile and Iterative Development A Manger's Guide", Craig Larman Pearson Education, First Edition, India, 2004.
4. Essential Scrum: A Practical Guide to the Most Popular Agile Process (Addison-Wesley   Signature Series (Cohn)) 1st Edition by Kenneth Rubin
5. Scrum: The Art of Doing Twice the Work in Half the Time Hardcover – September 30, 2014 by Jeff Sutherland (Author), J.J. Sutherland

Web links and Video Lectures:

1. https://www.techtarget.com/searchsoftwarequality/definition/agile-software-development
2. https://www.atlassian.com/agile/kanban
3. https://www.atlassian.com/agile/scrum
4. https://www.simplilearn.com/tutorials/agile-scrum-tutorial/what-is-agile
https://www.youtube.com/watch?v=WjwEh15M5Rw

B.N.M. Institute of Technology

An Autonomous Institution under VTU
Department of Information Science & Engineering
Semester: VI

Course: Knowledge Management			
Course Code: 22ISE1666			
L:T:P:J	3:0:0:0	CIA	: 50
Credits:	03	SEA	: 50
Hours:	40	SEA Duration: 03Hours	

Course Learning Objectives: The students will be able to

1	Understand the basics of knowledge creation and knowledge capture
2	Understand the mechanics of knowledge management
3	Understand the use of knowledge management strategy and application of KM tools

Module-1: Introduction	No of hours	Blooms cognitive Levels
Introduction: An Introduction to Knowledge Management - The foundations of knowledge management- including cultural issues- technology applications organizational concepts and processes- management aspects- and decision support systems. The Evolution of Knowledge management: From Information Management to Knowledge Management - Key Challenges Facing the Evolution of Knowledge Management - Ethics for Knowledge Management.	8	Apply
Module-2: Creating The Culture Of Learning And Knowledge Sharing		
Organization and Knowledge Management - Building the Learning Organization. Knowledge Markets: Cooperation among Distributed Technical Specialists – Tacit Knowledge and Quality Assurance.	8	Apply
Module-3: Knowledge Management-The Tools		
Telecommunications and Networks in Knowledge Management - Internet Search Engines and Knowledge Management - Information Technology in Support of Knowledge Management - Knowledge Management and Vocabulary Control - Information Mapping in Information Retrieval - Information Coding in the Internet Environment - Repackaging Information	8	Apply
Module-4: Knowledge Management-Application		
Components of a Knowledge Strategy - Case Studies (From Library to Knowledge Center, Knowledge Management in the Health Sciences, Knowledge Management in Developing Countries).	8	Apply

Module-5: Future Trends and Case Studies		
Advanced topics and case studies in knowledge management - Development of a knowledge management map/plan that is integrated with an organization's strategicand business plan - A case study on Corporate Memories for supporting various aspects in the process life -cycles of an organization.	**8**	**Apply**

Course Outcomes: After completing the course, the students will be able to	
CO 1:	Understand the basics of knowledge management
CO 2:	Understand and apply knowledge management models
CO 3:	Understand the mechanics of knowledge management
CO 4:	Understand and implement knowledge management strategy and knowledge management tools
CO 5:	Understand and apply ICT tools for effective knowledge management

Reference Books:
1. Srikantaiah, T.K., Koenig, M., "Knowledge Management for the Information Professional" Information Today, Inc., 2000.
2. Nonaka, I., Takeuchi, H., "The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation", Oxford University Press, 1995.
3. Frances Horibe, MANAGING KNOWLEDGE WORKERS, John Wiley & Sons
4. Fernandez & Leidner, KNOWLEDGE MANAGEMENT, PHI Learning, New Delhi,2008
5. Ganesh Natarajan and Sandhya Shekhar, KNOWLEDGE MANAGEMENT - ENABLING BUSINESS GROWTH, Tata McGrawHill, New Delhi
6. Elias.M. Award & Hassan M. Ghaziri,KNOWLEDGE MANAGEMENT, PearsonEducation

Web links and Video Lectures:
1.What is Knowledge Management? https://www.youtube.com/watch?v=3_eI5r55XhU 2.Knowledge Management and Innovationhttps://www.youtube.com/watch?v=DNUwZctwwhw

B.N.M. Institute of Technology

An Autonomous Institution under VTU
Department of Information Science and Engineering
SEMESTER – VII

Course Name: Big Data Analytics
Course Code: 22ISE171

L:T:P: J	2:2:2:0	CIA:	50
Credits:	4	**SEA:**	50
Hours:	50	**SEE Duration:**	3 Hours

Course Learning Objectives: This course will enable students to:

1. Understand the fundamentals and evolution of Big Data along with its structure, types, and significance in modern data-driven industries.
2. Explore real-world applications of Big Data in business sectors like social networking, fraud detection, and retail to gain insights into its practical relevance
3. Introduce and explain technologies and frameworks for handling Big Data such as Hadoop, Spark, Pig, Hive, and Cassandra.
4. Enable learners to develop and execute data processing jobs using MapReduce and optimize their performance.
5. Familiarize learners with Big Data storage and retrieval concepts using tools like HDFS, Hive, and Cassandra with an emphasis on distributed and NoSQL systems.

Module 1	Teaching Hours	Blooms cognitive Levels
Getting an Overview of Big Data: What is Big Data? History of Data, Management – Evolution of Big Data, Structuring Big Data, Types of Data, Elements of Big Data, Big Data Analytics, Careers in Big data, Advantages of Big Data Analytics, Future of Big Data. **Exploring the Use of Big Data in Business Context**: Use of Big Data in Social Networking, **Use of Big Data in Preventing Fraudulent Activities, Use of Big Data in Retail Industry, Introducing Technologies for Handling Big Data**: Distributed and Parallel Computing for Big Data, Introducing Hadoop, Cloud Computing and Big Data, In-Memory Computing Technology for Big Data.	10	Understand

Module 2		
Understanding Hadoop Ecosystem: Hadoop Ecosystem, Hadoop Distributed File System: Concepts of Blocks in HDFS Architecture, NameNodes and DataNodes, The command line interface, Using HDFS Files, Hadoop specific File System Files, HDFS commands, The org.apache.hadoop.io.package, HDFS High Availability , Features of HDFS. **Understanding MapReduce Fundamentals**: The MapReduce Framework. Exploring the Features of MapReduce. Working of	10	Understand

MapReduce. Exploring Map and Reduce Functions. Techniques to Optimize MapReduce Jobs. Hardware/Network Topology, Synchronization, File System, **Uses of MapReduce.** **Practical Component:** Installation of Apache Hadoop (Not limited to this program)		

Module 3

Processing Your Data with MapReduce: Recollecting the Concept of MapReduce Framework, Developing Simple MapReduce Application, Building the Application, Executing the Application, **Points to Consider while Designing MapReduce**. **Customizing MapReduce Execution**: Controlling MapReduce Execution with InputFormat, Reading Data with Custom Record Reader, Organizing Output Data with OutputFormats, Customizing Data with Record Writer, Optimizing MapReduce Execution with Combiner, **Controlling Reducer Execution with Partitioners.** **Practical Component:** Develop a MapReduce program to calculate the frequency of a given word in each file. Develop a MapReduce program to find the maximum temperature in each year. Develop a MapReduce program to implement Matrix Multiplication	**10**	**Apply**

Module-4

Pig: Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. **Hive**: Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and **User Defined Functions**. **Practical Component:** • Develop a MapReduce to analyze weather data set and print whether the day is shinny or cool day • Write queries to sort and aggregate the data in a table using HiveQL • Demonstrate Hive UDF to convert table data into uppercase letter. • Compute the average of a given numeric values using pig.	**10**	**Apply**

Module 5

Spark: Introduction, Spark Applications, Jobs, Stages, and Tasks, Resilient Distributed Datasets, Creation, Transformations and Actions, Persistence, Serialization, Shared Variables, Broadcast Variables, Accumulators, Anatomy of a Spark Job Run, Job Submission, DAG Construction, Task Scheduling, Task Execution,	**10**	**Analyze**

Executors and Cluster Managers, Spark on YARN.

Introduction to Apache Cassandra: Introduction and its history, Key features and advantages of Cassandra, Comparison with other database systems, understanding data modeling concepts in a NoSQL context, **Designing a Cassandra data model, Primary keys and clustering keys, Data types in Cassandra**.

Practical Component:

- Create a spark data frame and perform the following operations.
  - o Add a column to a Spark DataFrame
  - o Filter a Spark DataFrame
  - o Group by aggregation on Spark DataFrame
  - o Query the DataFrame with SQL
- Develop an application to find the maximum temperature using Spark

Course outcomes: The students will be able to	
CO1	Understand the core concepts, architecture, and technologies involved in Big Data processing and storage.
CO2	Apply Big Data tools and frameworks such as Hadoop, MapReduce, Pig, Hive, Spark, and Cassandra to process and analyze large datasets.
CO3	Apply Big Data tools and techniques to build end-to-end data pipelines for efficient data processing, storage, and analysis.
CO4	Analyze the suitability and efficiency of Big Data technologies for different application scenarios.

Reference Books

1. **Big Data Black Book**, DT Editorial Services, 2016 Edition, Dreamtech Press, ISBN-13: 978-9351199311.
2. **Hadoop: The Definitive Guide**, Tom White, 4th Edition, O'Reilly Media, 2015, ISBN-13: 978-1491901632.
3. **Big Data Glossary**, Pete Warden, 1st Edition, O'Reilly Media, 2011, ISBN-13: 978-1449314590.
4. **Big Data and Analytics**, Seema Acharya, Subhashini Chellappan, 2nd Edition, Wiley India Publications, 2019, ISBN-13: 978-8126579518.
5. **Big Data: Principles and Best Practices of Scalable Real-Time Data Systems**, Nathan Marz, James Warren, 1st Edition, Manning Publications, 2015, ISBN-13: 978-1617290343.
6. **Hadoop For Dummies**, Dirk deRoos, Paul C. Zikopoulos, Roman B. Melnyk, Bruce Brown, Rafael Coss, 1st Edition, John Wiley & Sons, 2014, ISBN-13: 978-1118607558.
7. **Cassandra: The Definitive Guide**, Jeff Carpenter, Eben Hewitt, 3rd Edition, O'Reilly Media, 2022, ISBN-13: 978-1098115166.

| 8. | **Spark: The Definitive Guide**, Bill Chambers, Matei Zaharia, 1st Edition, O'Reilly Media, 2018, ISBN-13: 978-1491912219. |

WEB links and Video Lectures

1. https://onlinecourses.nptel.ac.in/noc20_cs92/preview
2. https://onlinecourses.nptel.ac.in/noc22_cs65/preview
3. https://www.coursera.org/specializations/business-analytics
4. https://www.classcentral.com/course/bigdata-analytics-4216
5. https://www.mygreatlearning.com/academy/learn-for-free/courses/mastering-big-data   analytics

B.N.M. Institute of Technology

An Autonomous Institution under VTU
Department of Information Science and
Engineering
SEMESTER-VII

Course Name: Salesforce Developer
Course Code: 22ISE1725

S L: T: P: J:	3:0:0:0	CIA Marks:	50
Credits:	3	**SEA Marks:**	50
Total Number of Lecture Hours	40	**SEA Duration:**	3 Hours

Course Objectives:

- To equip students with the skills and experience in developing and deploying basic business logic and user interfaces.
- To train students to advance their knowledge and skills in building custom applications on the Salesforce Lightning Platform.
- To teach the fundamental programmatic capabilities of the Lightning Platform, including Apex, Visualforce, and basic Lightning Components.
- To provide practical experience in using the programmatic capabilities of the Lightning Platform to develop custom business logic and interfaces.
- To prepare students to extend Salesforce capabilities through advanced programmatic techniques and tools.

Module 1	Teaching Hours	Blooms cognitive Levels
Platform Developer I Exam Overview; Apex & .NET Basics: Map .NET Concepts to the Lightning Platform, Understand Execution Context, Use Asynchronous Apex, Debug and Run Diagnostics **Formulas and Validations :** Use Formula Fields, Implement Roll-Up Summary Fields, Create Validation Rules **Data Modeling :** Understand Custom & Standard Objects, Create Object Relationships, Work with Schema Builder **Data Management :** Import Data, Export Data **Approve Records with Approval Processes :** Customize How Records Get Approved, Build an Approval Process **Record-Triggered Flows :** Triggered Flows, Build a Record-Triggered Flow, Add a Scheduled Task to Your Flow, Meet Flow Trigger Explorer **Search Solution Basics :** Choose the Right Search Solution, Build Search for Common Use Cases, Optimize Search Results	**8**	**Apply**
Module 2		
Apex Basics & Database : Get Started with Apex, Uses Objects, Manipulate Records with DML, Write SOQL Queries, Write SOSL Queries **Apex Triggers** : Get Started with Apex Triggers, Bulk Apex Triggers **Triggers and Order of Execution:** Performing a sequence of events in a order when a record is saved with an insert, update, or upsert statement **Asynchronous Apex**: Asynchronous Processing Basics, Use Future Methods,	**8**	**Apply**

Use Batch Apex, Control Processes with Queueable Apex, Schedule Jobs Using the Apex Scheduler, Monitor Asynchronous Apex		
Module 3		
Visualforce & Lightning Experience: Use Visualforce in Lightning Experience, Develop Visualforce Pages for Lightning Experience, Explore the Visualforce App Container, Share Visualforce Pages Between Classic and Lightning Experience, Manage Navigation, Understand Important Visual Design Considerations, Know Which Features to Avoid in Lightning Experience. **Visualforce Basics:** Get Started with Visualforce, Create & Edit Visualforce Pages, Use Simple Variables and Formulas, Use Standard Controllers, Display Records, Fields, and Tables, Input Data Using Forms, Use Standard List Controllers, Use Static Resources, Create & Use Custom Controllers	**8**	**Apply**
Module 4		
Lightning Web Components Basics: Discover Lightning Web Components, Create Lightning Web Components, Deploy Lightning Web Component Files, Handle Events in Lightning Web Components, Add Styles and Data to a Lightning Web Component Secure Server-Side Development: Write Secure Apex Controllers, Mitigate SOQL Injection, Mitigate Cross-Site Request Forgery **Developer Console Basics:** Get Started with the Developer Console, Navigate and Edit Source Code, Generate and Analyze Logs, Inspect Objects at Checkpoints, Execute SOQL and SOSL Queries **Command-Line Interface:** Learn About the Command-Line Interface, Explore Command Structure and Navigation, Set Up Command-Line Tools. **Org Development Model:** Plan for Changes to Your Org, Develop and Test Changes Locally, Test and Deploy Changes	**8**	**Apply**
Module 5		
Apex Testing: Get Started with Apex Unit Tests, Test Apex Triggers, Create Test Data for Apex Tests **Find and Fix Bugs with Apex Replay Debugger:** Launch Your Trailhead Playground, Set Up Visual Studio Code, Set Up Apex Replay Debugger, Debug Your Code **Debug Logs:** Debug Log Details, Debug Log Order of Precedence, Debug Log Levels, Searching a Debug Log, Delete Debug Logs, Debug Log Filtering for Apex **Project with Case Study :** Apex Specialist: Concepts Tested in This Superbadge, Apex Triggers, Asynchronous Apex, Apex Integration, Apex Testing	**8**	**Analyze**

	Course Outcomes: After completing the course, the students will be able to	
CO 1	Explain the core components of Salesforce development platform architecture, data modeling, Apex programming, user interface design using Visualforce and Lightning Web Components, automation tools, testing, debugging, and deployment practices	
CO 2	Apply Apex programming, SOQL/SOSL queries, and data modeling techniques to develop and automate business logic, manage workflows, and manipulate data in the Salesforce platform.	

CO 3	Develop interactive user interfaces and secure, scalable components using Visualforce and Lightning Web Components, and deploy cloud-based applications using Salesforce development tools.
CO 4	Analyze Salesforce applications for performance, security, and functionality by integrating Apex logic, database operations, automation flows, user interface components, and DevOps practices to ensure scalable and maintainable cloud-based solutions.

Reference Books:

1. Michael Wicherski, "Beginning Salesforce Developer", 2018, Wiley Apress Publisher
2. Paul Battisson, "Learning Salesforce Development with Apex", 2022, BPB Publishers
3. Dan Appleman, "Advanced Apex Programming in Salesforce", 2020, PACKT Publisher
4. Paul Battisson, "Mastering Apex Programming", 2023, PACKT Publisher.
5. Mohith Shrivastava, "Learning Salesforce Lightning Application Development: Build and test Lightning Components for Salesforce Lightning Experience using Salesforce DX", 2018, PACKT
6. Brian Cline, "Lightning Web Components (LWC) Development on the Salesforce Platform: A Salesforce developer's guide to building, testing, and deploying Lightning Web Components", 2023,
7. PACKT Publisher Saifullah Saifi and Ashwini Kumar Raj, "Cloud Computing Using Salesforce", 2021 BPB

Web links and Video Lectures:

- Use the Trailhead Platform: https://www.salesforce.com/blog/what-istrailhead/The Salesforce Developer Trailmix :
- https://trailhead.salesforce.com/users/trjha3/trailmixes/salesforce-developer-catalyst-v-3-0

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Semester: VII

Course: Ethical Hacking

Course Code: 22ISE1734

L:T:P:J	3:0:0:0	CIA	:	50
Credits:	3	**SEA**	:	50
Hours:	40	**SEA Duration**	:	3 Hours

Course Learning Objectives: The students will be able to

1	To understand ethical hacking fundamentals, networking concepts, IP addressing, routing, and basic network setup.
2	To understand the vulnerability assessment using tools like NMAP, Nessus, and Metasploit for system exploitation and social engineering.
3	To study the cryptographic techniques including key management, hash functions, digital signatures, and explore steganography and biometrics.
4	To know the network-based attacks
5	To know the web application vulnerabilities using tools

Module-1:	No. of hours	Blooms cognitive Levels
Introduction to Ethical Hacking: Basic Concepts of Networking, TCP/IP Protocol Stack, IP addressing and routing, TCP and UDP, IP subnetting, Routing protocols, IP version 6, Routing examples, **Software Installation and Network Setup.**	8	**Understand**
Module-2:		
Information Gathering: **Nessus Installation,** Port Scanning Using NMAP, Other Features of NMAP, Metasploit Exploiting System Software, Metasploit Exploiting System Software and Privilege, Metasploit Social Eng Attack, MITM (Man in The middle) Attack.	8	**Understand**
Module-3:		
Basic concepts of cryptography: Private-key cryptography, Public-key cryptography, hash functions, Digital signature and certificate, Applications, **Steganography,** Biometrics.	8	**Understand**
Module-4:		
Network Based Attacks: DNS and Email Security, Password cracking, Phishing attack, Malware, Wifi hacking, **Dos and DDos attack**, Elements of Hardware Security, Side Channel Attacks, Physical Unclonable Function, Hardware Trojan.	8	**Apply**

Module-5:		
Web Application Vulnerability Scanning, SQL Injection Authentication Bypass, SQL Injection Error Based, SQL Injection Error Based from Web Application, SQLMAP, Cross Site Scripting, File Upload Vulnerability, **The NMAP Tool: A Relook,** Network Analysis using Wireshark.	**8**	**Analyze**

Course Outcomes: After completing the course, the students will be able to	
CO 1:	Understand the fundamental principles of ethical hacking, cryptography, network-based attacks, and web vulnerabilities, and demonstrate foundational skills in using tools such as NMAP, Nessus, Metasploit, SQLMAP, and Wireshark.
CO 2:	Design and implement a secure test environment to simulate network and application attacks, assess vulnerabilities, and develop strategic countermeasures in line with ethical hacking practices.
CO 3:	Analyze the different types of cyber threats, including cryptographic attacks, social engineering, and web application vulnerabilities, and apply appropriate mitigation techniques using ethical hacking tools.

Reference Books:

1. Data and Computer Communications – William Stallings, 10th Edition, 2021
2. TCP/IP Protocol Suite – Behrouz A. Forouzan 5th Edition, McGraw-Hill Education, 2012
3. UNIX Network Programming – W. Richard Stevens et al. Volume 1 (Sockets API), 3rd Edition, 2004
4. Introduction to Computer Networks and Cybersecurity – C-H. Wu & J. D. Irwin CRC Press, 2013
5. Cryptography and Network Security: Principles and Practice – William Stallings, 8th Edition (Global), Print ISBN 978-1292437484, released June 2022

Web links and Video Lectures:

1. https://onlinecourses.nptel.ac.in/noc25_cs142/unit?unit=1&lesson=2

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SEMESTER – VII

Course Name: Research Methodology & Intellectual Property Rights			
Course Code: 22ISE174			
L:T:P:J	1:2:0:0	**CIA:**	50
Credits:	02	**SEA:**	50
Hours:	25	**SEA Duration:**	3 hours

Course Learning Objectives: The students will be able to

1. To equip learners with a strong foundation in engineering research methods, ethical practices, and problem-solving techniques, including literature review and technical reading.
2. To develop learners' ability to analyze, synthesize, and manage knowledge through bibliographic tools and proper citation practices in scholarly work.
3. To provide comprehensive knowledge of Intellectual Property (IP) rights—including patents, copyrights, trademarks, industrial designs, and geographical indications—with a focus on their legal frameworks, registration processes, and real-world applications.

Module 1	Teaching Hours	Blooms cognitive Levels
Introduction: Meaning of Research, Objectives of Engineering Research, and Motivation in Engineering Research, Types of Engineering Research, Finding and Solving a Worthwhile Problem. Ethics in Engineering Research, Ethics in Engineering Research Practice, **Types of Research Misconduct, Ethical Issues Related to Authorship.**	5	**Understand**
Module 2		
Literature Review and Technical Reading: New and Existing Knowledge, Analysis and Synthesis of Prior Art Bibliographic Databases, Web of Science, Google and Google Scholar, Effective Search: The Way Forward Introduction to Technical Reading Conceptualizing Research, Critical and Creative Reading, **Taking Notes While Reading, Reading Mathematics and Algorithms, Reading a Datasheet.** Attributions and Citations: Giving Credit Wherever Due, Citations: Functions and Attributes, Impact of Title and Keywords on Citations, Knowledge Flow through Citation, Citing Datasets, Styles for Citations, Acknowledgments and Attributions, What Should Be Acknowledged, Acknowledgments in, Books Dissertations, Dedication or Acknowledgments.	5	**Understand**
Module 3		
Introduction To Intellectual Property: Role of IP in the Economic and Cultural Development of the Society, IP Governance, IP as a Global Indicator of Innovation, Origin of IP History of IP in India. Major Amendments in IP Laws and Acts in India.	5	**Understand**

Patents: Conditions for Obtaining a Patent Protection, To Patent or Not to Patent an Invention. Rights Associated with Patents. Enforcement of Patent Rights. Inventions Eligible for Patenting. Non-Patentable Matters. Patent Infringements. Avoid Public Disclosure of an Invention before Patenting. Process of Patenting. Prior Art Search. Choice of Application to be Filed. Patent Application Forms. Jurisdiction of Filing Patent Application. Publication. Pre- grant Opposition. Examination. Grant of a Patent. Validity of Patent Protection. Post-grant Opposition. Commercialization of a Patent. Need for a Patent Attorney/Agent. Can a Worldwide Patent be Obtained. Do I Need First to File a Patent in India. Patent Related Forms. Fee Structure. Types of Patent Applications. Commonly Used Terms in Patenting. **National Bodies Dealing with Patent Affairs. Utility Models.**		

Module 4

Copyrights and Related Rights: Classes of Copyrights. Criteria for Copyright. Ownership of Copyright. Copyrights of the Author. Copyright Infringements. Copyright Infringement is a Criminal Offence. Copyright Infringement is a Cognizable Offence. Fair Use Doctrine. Copyrights and Internet. Non- Copyright Work. Copyright Registration. Judicial Powers of the Registrar of Copyrights. Fee Structure. Copyright Symbol. Validity of Copyright. Copyright Profile of India. Copyright and the word 'Publish'. Transfer of Copyrights to a Publisher. Copyrights and the Word 'Adaptation'. Copyrights and the Word 'Indian Work'. Joint Authorship. Copyright Society. Copyright Board. Copyright Enforcement Advisory Council (CEAC). International Copyright Agreements, Conventions and Treaties. **Interesting Copyrights Cases.** Trademarks: Eligibility Criteria. Who Can Apply for a Trademark. Acts and Laws. Designation of Trademark Symbols. Classification of Trademarks. Registration of a Trademark is Not Compulsory. Validity of Trademark. Types of Trademark Registered in India. Trademark Registry. Process for Trademarks Registration. Prior Art Search. **Famous Case Law: Coca-Cola Company vs. Bisleri International Pvt. Ltd.**	**5**	**Understand**

Module 5

Industrial Designs: Eligibility Criteria. Acts and Laws to Govern Industrial Designs. Design Rights. Enforcement of Design Rights. Non-Protectable Industrial Designs India. Protection Term. Procedure for Registration of Industrial Designs. Prior Art Search. Application for Registration. Duration of the Registration of a Design. Importance of Design Registration. Cancellation of the Registered Design. Application Forms. Classification of Industrial Designs. Designs Registration Trend	**5**	**Understand**

in India. International Treaties. **Famous Case Law: Apple Inc. vs. Samsung Electronics Co.**

Geographical Indications: Acts, Laws and Rules Pertaining to GI. Ownership of GI. Rights Granted to the Holders. Registered GI in India. Identification of Registered GI. Classes of GI. Non-Registerable GI. Protection of GI. Collective or Certification Marks. Enforcement of GI Rights. Procedure for GI Registration Documents Required for GI Registration. GI Ecosystem in India.

Case Studies on Patents. Case study of Curcuma (Turmeric) Patent, Case study of Neem Patent, Case study of Basmati patent. IP Organizations In India. Schemes and Programmes

Course Outcomes : After completing the course, the students will be able to	
1	To identify research problems, apply ethical standards in research, and effectively utilize teaching-learning and technical reading methods.
2	To navigate intellectual property systems, including patents, copyrights, trademarks, industrial designs, and geographical indications, understanding their legal frameworks, registration processes, and enforcement mechanisms.
3	To critically analyze scholarly work, apply proper citation and attribution practices, and evaluate real-world case studies to understand the practical application of intellectual property laws.

Reference Books

1. **Engineering Research Methodology: A Practical Insight for Researchers**, Dipankar Deb, Rajeeb Dey, Valentina E. Balas, 1st Edition, Springer, 2019, ISBN-13: 978-9811329463.

2. **Intellectual Property: A Primer for Academia**, Prof. Rupinder Tewari, Ms. Mamta Bhardwaj, 1st Edition, Publication Bureau, Panjab University, 2021, ISBN: 81-85322-92-0.

3. **Textbook of Intellectual Property Rights**, N.K. Acharya, 9th Edition, Asia Law House, April 2025, ISBN-13: 978-9390912209.

WEB links and Video Lectures

1. https://onlinecourses.nptel.ac.in/noc25_ge66/preview
2. https://online.vtu.ac.in/course-details/Research-Methodology

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Department of Information Science and Engineering

Advanced Distributed Systems
Scheme: 2022

SEMESTER–VII			
Subject Code: 22ISE1731	L:T:P:J: 3:0:0:0	CIA Marks:	50
Credits:	3	SEA Marks:	50
Total Number of Lecture Hours	40	SEA Duration:	3 Hours

Course Objectives:
- To develop a foundational understanding of gossip-based algorithms, peer-to-peer systems, and distributed hash table architectures.
- To enable learners to apply theoretical principles of distributed coordination, clock synchronization, and consensus mechanisms in practical settings.
- To analyze consistency, fault tolerance, and the trade-offs in distributed architectures using real-world technologies and blockchain models.

	Teaching Hours	Blooms cognitive Levels
Module I : Foundations of Distributed Communication and Peer-to-Peer Systems		
Epidemic and gossip-based algorithms, Early peer-to-peer systems: Napster Early peer-to-peer systems : Gnutella Structured P2P and DHTs: Chord, Pastry, BitTorrent	8	**Understand**
Module II : Time, Coordination, and Fundamental Theoretical Results		
Logical clocks Algorithms, Mutual Exclusion Algorithms, Distributed Leader Election Distributed Minimum Spanning Tree algorithms, FLP Impossibility Result	8	**Apply**
Module III : Consistency, Availability, and Theoretical Guarantees		
Consistency models and the CAP theorem, Consensus protocols: Paxos, Consensus protocols: RAFT	8	**Analyze**
Module IV : Fault Tolerance and Secure Agreement		
Byzantine Generals Problem, Virtual Synchrony, Blockchain fundamentals Bitcoin	8	**Apply**
Module V : Real-World Distributed Systems and Programming Platforms		
Case Studies: Amazon Dynamo, Facebook Cassandra, Google Percolator Platforms: Voldemort (LinkedIn), Condor, Microsoft DryadLINQ	8	**Analyze**

Course Outcomes: After completing the course, the students will be able to

CO 1	Understand gossip-based and epidemic algorithms for data dissemination for unstructured (Napster, Gnutella) and structured (DHT-based like Chord, BitTorrent) peer-to-peer architectures.
CO 2	Apply and simulate key distributed algorithms including logical clocks, mutual exclusion, leader election, FLP, and spanning trees, while incorporating Byzantine fault tolerance, virtual synchrony, and secure blockchain-based consensus for reliable decentralized services.
CO 3	Analyze CAP theorem trade-offs and compare consensus protocols like Paxos and RAFT, used in systems like Dynamo, Cassandra, Voldemort, and DryadLINQ manage replication, consistency, fault tolerance, and performance.

Reference Books:

1. Advanced Distributed Systems, Prof. Smruti R. Sarangi, Computer Science and Engineering IIT Delhi
2. Distributed Systems: Concepts and Design, Coulouris, Dollimore, Kindberg & Blair, 5th Edition, 2021, Pearson
3. Designing Data-Intensive Applications, Martin Kleppmann, 2025, Pearson, Addison-Wesley
4. Understanding Distributed Systems, Roberto Vitillo, 2022, Roberto Vitillo
5. Introduction to Reliable & Secure Distributed Programming, Cachin, Guerraoui & Rodrigues, 2011, Springer-Verlag

Web links and Video Lectures:

https://www.youtube.com/watch?v=7u_mrZ7w45U&list=PLp6ek2hDcoNAOfn2X55uHBAvxicuCwF6T

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Semester: VII

Course Name: Multicore Computer Architecture				
Course Code: 22ISE17331				
L:T:P:J	3:0:0:0	**CIA**	:	50
Credits:	3	**SEA**	:	50
Hours:	40	**SEA Duration**	:	3 Hours

Course Learning Objectives: The students will be able to

1	To introduce students to the fundamentals of computing systems, evolution of computer architecture, and various number systems used in digital computing.
2	To develop a solid understanding of binary arithmetic operations, including complements, floating-point representation, and error analysis.
3	To equip students with the ability to write, debug, and optimize assembly language programs using standard instruction sets and addressing modes.
4	To enable students to understand and implement algorithms for binary addition, multiplication, and division, and recognize performance implications in hardware design.
5	To provide students with knowledge of processor datapath design, pipelining concepts, and memory hierarchy, including caches and virtual memory, to evaluate and improve computer system performance.

Module-1:	No. of hours	Blooms cognitive Levels
Introduction to Computing and Number Systems: Overview of Computing Systems; Evolution of Computers; Number Systems: Binary, Octal, Decimal, Hexadecimal conversions; Complements and Binary Arithmetic; Floating Point Number Representation (IEEE 754), normalization, rounding errors, precision and range considerations.	**8**	Understand
Module-2:		
Assembly Language Programming: Assembly Language Syntax and Structure; Registers and Data Movement; Addressing Modes; Arithmetic and Logical Instructions; Control Flow Instructions (branches, loops, subroutines); Writing and Debugging Assembly Programs; Stack Operations; Parameter Passing in Assembly.	**8**	Apply
Module-3:		
Algorithms for Arithmetic Operations: Binary Addition algorithms with carry-lookahead; Binary Multiplication algorithms – array multiplier, Booth's algorithm; Binary Division – restoring and non-restoring methods; Signed and Unsigned Arithmetic; Overflow and Underflow conditions; Performance considerations for arithmetic algorithms.	**8**	Analyze
Module-4:		

Processor Design and Pipelining: Processor Datapath Design; Control Unit design (Hardwired vs. Microprogrammed); Pipeline Architecture: instruction fetch, decode, execute, memory access, write-back stages; Data Hazards and Solutions (stalling, forwarding); Control Hazards; Branch Prediction techniques; Pipeline Performance Metrics (CPI, throughput, speedup).	**10**	Apply
Module-5:		
Memory Systems: Memory Hierarchy Design; Cache Organization and Mapping Techniques (direct, associative, set-associative); Cache Coherence protocols; Cache Performance Metrics (hit/miss ratio, access time); Virtual Memory Management – paging, segmentation; Translation Lookaside Buffers (TLB); Page Replacement Algorithms (LRU, FIFO, Optimal); Address Translation.	**8**	Analyze

Course Outcomes: After completing the course, the students will be able to	
CO 1:	Explain fundamental computing concepts, number systems, floating-point representations, and their roles in computer systems.
CO 2:	Apply assembly language programs and implement arithmetic algorithms for binary addition, multiplication, and division operations in digital systems.
CO 3:	Analyze processor datapaths, pipelining techniques, and memory hierarchy designs to evaluate system performance, identify hazards, and propose optimization strategies.

Reference Books:

1. **Smruti R. Sarangi**, *Computer Organisation and Architecture*, McGraw-Hill Education, 2015.
2. **Carl Hamacher, Zvonko Vranesic, Safwat Zaky**, *Computer Organization and Embedded Systems*, 6th Edition, McGraw-Hill, 2012.
3. **David A. Patterson and John L. Hennessy**, *Computer Organization and Design: The Hardware/Software Interface*, 5th Edition (ARM Edition), Morgan Kaufmann, 2016.
4. **William Stallings**, *Computer Organization and Architecture: Designing for Performance*, 11th Edition, Pearson, 2019.
5. **Andrew S. Tanenbaum and Todd Austin**, *Structured Computer Organization*, 6th Edition, Pearson, 2012.

Web links and Video Lectures:

2. https://www.mheducation.co.in/computer-organization-and-architecture-9781259058915-india
3. https://www.pearson.com/en-us/subject-catalog/p/structured-computer-organization/P200000006065/9780132916523
4. https://nptel.ac.in/courses/106102062
5. https://ocw.mit.edu/courses/6-823-computer-system-architecture-fall-2005/pages/video-lectures/
6. https://www.udacity.com/course/computer-architecture--ud007

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Semester: VII

Course Name: Reinforcement Learning

Course Code: 22ISE1735

L:T:P:J	3:0:0:0	**CIA**	:	50
Credits:	3	**SEA**	:	50
Hours:	40	**SEA Duration**	:	3 Hours

Course Learning Objectives: The students will be able to

1	Describe the foundational concepts of reinforcement learning, including agent-environment interaction, exploration vs. exploitation, and bandit algorithms.
2	Illustrate the mathematical formulation of Markov Decision Processes (MDPs) and the derivation of Bellman Optimality Equations.
3	Develop solutions using dynamic programming and temporal difference learning methods, implementing them in simulated environments.
4	Construct and experiment with advanced reinforcement learning algorithms, such as Fitted Q Iteration and Deep Q-Networks, for function approximation in high-dimensional spaces.
5	Evaluate hierarchical reinforcement learning strategies and POMDP techniques, analyzing their effectiveness in planning under uncertainty.

Module-1:	**No. of hours**	**Blooms cognitive Levels**
Introduction to RL and Bandit Algorithms Introduction to Reinforcement Learning concepts; Agent and Environment; Rewards; Bandit Algorithms including UCB, PAC, Median Elimination; Introduction to Policy Gradient methods	**8**	Understand
Module-2:		
Markov Decision Processes and Bellman Equations Topics: Full Reinforcement Learning using Markov Decision Processes (MDPs); State Transitions; Rewards; Policies; Bellman Optimality Equations for state-value and action-value functions	**8**	Apply
Module-3:		
Dynamic Programming and Temporal Difference Methods Full Reinforcement Learning using Markov Decision Processes (MDPs); State Transitions; Rewards; Policies; Bellman Optimality Equations for state-value and action-value functions	**10**	Analyze
Module-4:		

Function Approximation and Advanced RL Algorithms Function Approximation methods (linear and nonlinear); Least SquaresMethods; Fitted Q Iteration; Deep Q-Networks (DQN); Policy Gradient methods applied to full RL problems	**10**	Apply
Module-5:		
Hierarchical RL and POMDPs Hierarchical Reinforcement Learning; Options Framework for temporally extended actions; Partially Observable Markov Decision Processes (POMDPs) for planning under uncertainty	**8**	Analyze

Course Outcomes: After completing the course, the students will be able to	
CO 1:	Understand key concepts in reinforcement learning, including agents, environments, rewards, bandit algorithms (UCB, PAC, Median Elimination), and policy gradients.
CO 2:	Apply Markov Decision Processes, Bellman equations, dynamic programming, and temporal difference methods to solve reinforcement learning problems.
CO 3:	Analyze advanced RL algorithms, including function approximation, DQN, hierarchical RL, and POMDPs, to evaluate performance and design RL systems for complex environments.

Reference Books:

1. **Richard S. Sutton and Andrew G. Barto**, *Reinforcement Learning: An Introduction*, 2nd Edition, MIT Press, 2018.
2. **Marco Wiering and Martijn van Otterlo (Eds.)**, *Reinforcement Learning: State-of-the-Art*, Springer, 2012.
3. **Csaba Szepesvári**, *Algorithms for Reinforcement Learning*, Morgan & Claypool, 2010.
4. **Praveen Palanisamy**, *Hands-On Intelligent Agents with OpenAI Gym: Your Guide to Developing AI Agents Using Deep Reinforcement Learning Techniques*, Packt Publishing, 2018.
5. **Lilian Weng**, *Deep Reinforcement Learning: Theory and Practice*, Self-published tutorial series, latest online edition 2023

Web links and Video Lectures:

1. https://www.youtube.com/playlist?list=PLqYmG7hTraZDVH599EItlEWsUOsJbAodm
2. https://www.coursera.org/specializations/reinforcement-learning
3. https://www.youtube.com/playlist?list=PLoROMvodv4rOABXSygHTsbvUz4G_YQhOb
4. https://www.youtube.com/playlist?list=PLqYmG7hTraZBKeNJ-JE_eyJ2z1S9tT0hs
5. https://www.youtube.com/watch?v=aUrX-rP_ss4

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Semester: VII

Course Name: Software Testing

Course Code: 22ISE1736

L:T:P:J	3:0:0:0	CIA	:	50
Credits:	3	**SEA**	**:**	50
Hours:	40	**SEA Duration**	**:**	3 Hours

	Course Learning Objectives: The students will be able to
1	Describe software testing fundamentals, including software quality concepts, STLC, and the V-model, to understand the purpose and scope of testing in software development.
2	Develop comprehensive test cases, apply functional and non-functional testing techniques, and prepare appropriate test data based on requirements.
3	Plan and execute tests effectively, establish exit criteria, monitor progress using metrics, and manage traceability of requirements.
4	Generate detailed bug reports, manage bug life cycles, assess severity and priority, and use tools like JIRA or Bugzilla for defect tracking.
5	Evaluate the need for test automation, write and execute automated scripts, and integrate QA best practices like code reviews, configuration management, and version control into the testing process.

Module-1:	**No. of hours**	**Blooms cognitive Levels**
Fundamentals of Software Testing and Quality Assurance Introduction: Software Quality, Importance of QA, Verification vs. Validation, Testing Terminology, Software Testing Life Cycle (STLC), V-Model of Software Development, Types of Software Tests, Cost of Poor Quality and QA Process.	**8**	Understand
Module-2:		
Testing Approaches and Test Design Techniques Writing Test Cases, Functional Testing, Non-functional Testing (Performance, Load, Stress), UI and Usability Testing, Exploratory vs. Scripted Testing, Manual vs. Automated Testing, Preparing Test Data, Creating Test Scenarios from Requirements, Test Design Techniques (Boundary Value Analysis, Equivalence Partitioning).	**10**	Apply
Module-3:		
Test Execution, Planning, and Metrics Test Execution Concepts, Introduction to Test Oracles, Developing Test Strategy, Planning and Exit Criteria, Traceability Matrix, Test Coverage, Test Metrics and Progress Monitoring.	**8**	Analyze

Module-4:		
Bug Management and Reporting Introduction to Bug Reporting, Bug Life Cycle, Severity and Priority Levels, Bug Tracking Tools (JIRA, Bugzilla), Writing Defect Reports, Test Data Mining Basics, Generating and Reading Test Reports.	**8**	Apply
Module-5:		
Automation, QA Best Practices, and Project Work Test Automation Basics, When Not to Automate, Introduction to Selenium IDE, Writing and Running Automated Tests, QA vs. QC, Defect Prevention Strategies, Code Reviews, Static Analysis, Change and Configuration Management, Introduction to Version Control (Git Basics), Course Recap, Final Mini Project, Writing Final Test Cases, Bug Reporting with Screenshots.	**10**	Analyze

Course Outcomes: After completing the course, the students will be able to	
CO 1:	Understand fundamental concepts of software quality, testing life cycles, verification, validation, and test design techniques.
CO 2:	Apply functional and non-functional testing approaches, create effective test cases, execute tests, and report defects using industry-standard tools.
CO 3:	Analyze test results, bug reports, and metrics to evaluate software quality, recommend improvements, and implement automation and QA best practices.

Reference Books:

1. **Roger S. Pressman**, *Software Engineering – A Practitioner's Approach*, 7th Edition, McGraw-Hill, 2010.
2. **Cem Kaner, Jack Falk, and Hung Quoc Nguyen**, *Testing Computer Software*, 2nd Edition, Wiley, 1999.
3. **Rex Black**, *Foundations of Software Testing: ISTQB Certification*, 4th Edition, Cengage, 2012.
4. **Paul Ammann and Jeff Offutt**, *Introduction to Software Testing*, 2nd Edition, Cambridge University Press, 2016.
5. **Lisa Crispin and Janet Gregory**, *Agile Testing: A Practical Guide for Testers and Agile Teams*, Addison-Wesley, 2008.

Web links and Video Lectures:

1. https://www.youtube.com/watch?v=2moSRifW2xY
2. https://www.bugzilla.org/
3. https://www.youtube.com/watch?v=MF8xBS_GQTI
4. https://www.atlassian.com/software/jira
5. https://www.youtube.com/watch?v=1w3y1LL0Xlw

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BUSINESS INTELLIGENCE & ANALYTICS SEMESTER – VIII			
Course Code: 22ISE1811	**L: T:P: J 3:0:0:0**	CIA	: 50
Credits:	**03**	SEA	: 50
Hours:	**40**	**SEE Duration: 03**	

Course Learning Objectives: This course will enable students to:

1. Understand the fundamentals of Business Intelligence and Analytics (BIA)
2. Apply data management principles and relational database concepts.
3. Develop descriptive and predictive analytics solutions using statistical learning, data mining techniques, and visualization to extract insights from structured data.
4. Analyze customer and business problems using classification, clustering, regression, decision trees, ensemble methods, and customer analytics models such as CLV and RFM.
5. Implement advanced analytics techniques using programming tools (Python/R) for real-world business applications including targeted marketing, segmentation, time-series forecasting, and text mining.

Module-1	**Teaching Hours**	**Blooms cognitive Levels**
Introduction to Business Intelligence & Analytics (BIA), drivers of BIA, types of analytics: descriptive to prescriptive, vocabulary of business analytics, course plan and resources, Technical architecture of BIA, case analysis of AT&T Long distance, fundamentals of data management, OnLine Transaction Processing (OLTP), design process of databases.	**8**	**Understand**
Module-2		
Relational databases, normalisation, SQL queries, ShopSense case of management questions, data warehousing, OnLine Analytical Processing (OLAP), data cube, Descriptive analytics, and visualization, customer analytics, survival analysis, customer lifetime value, case study.	**8**	**Apply**
Module-3		
Data mining process, introduction to statistical learning, data pre-processing, data quality, overview of data mining techniques, case study using regression analysis, Introduction to classification, classification techniques, scoring models, classifier performance, ROC and PR curves, Introduction to decision trees, tree induction, measures of purity, tree algorithms, pruning, ensemble methods, Tree implementation in Python: problem of targeted mailing.	**8**	**Apply**

Module-4		
Cluster analysis, measures of distance, clustering algorithms, K-means and other techniques, cluster quality, A store segmentation case study using clustering, implementation in Python, profiling clusters, cluster interpretation and actionable insights, RFM sub- segmentation for customer loyalty	**8**	**Apply**
Module-5		
Machine learning, Artificial Neural Networks (ANN), topology and training algorithms, back propagation, financial time series modelling using ANN, implementation in Python, Text mining, process, key concepts, sentiment scoring, text mining using R-the case of a movie discussion forum.	**8**	**Apply**

Course outcomes: The students will be able to:

CO1: Explain Business Intelligence and Analytics concepts, types of analytics, BIA architecture, and data-driven decision-making using real-world case studies.

CO2: Design and manage relational databases and data warehouses by applying normalization, SQL queries, OLTP/OLAP concepts, and data cube operations for analytical processing.

CO3: Perform data pre-processing, assess data quality, and apply regression and classification techniques to build predictive models and evaluate their performance using metrics such as ROC and PR curves.

CO4: Apply clustering and customer analytics techniques (K-means, RFM analysis, segmentation) to identify customer groups, profile clusters, and derive actionable business insights.

CO5: Implement machine learning, neural networks, time-series forecasting, and text mining techniques using Python/R to solve real-world business analytics problems.

Reference Books:

1. Data Mining Techniques: For Marketing, Sales, and Customer Relationship Management, Third Edition, Gordon S. Linoff, Michael J. A. Berry
2. Designing a neural network for forecasting financial and economic time series, Neurocomputing 10 (1996) 215-236, ELSEVIER
3. Text Mining with R: A Tidy Approach 1st Edition, by Julia Silge, David Robinson,2017

WEB links and Video Lectures
https://onlinecourses.nptel.ac.in/noc24_cs65/preview