Faculty of Science & Technology

Programme Structure & Syllabus

For

Second Year

Bachelor of Technology
Computer Engineering

Programme Code: BTECCE

Pattern 2023

< With Effect from Academic Year 2024-25>

	Authority	Date
Proposed by	Board of Studies in Computer Engineering	
Approved by	Academic Council, Vishwakarma University, Pune	

Issued by

Chairman – BoS   **Dean of Faculty**   **Director, IQAC**

Vision of the University
Emerge as a Premier University Recognized Internationally for Excellence in Education, Research and Innovation

Mission of the University	
VU-M1	To impart contemporary transformative education through research and innovation
VU-M2	To develop competent leaders-professionals for life and livelihood
VU-M3	To co-create human and socio-economic capital par excellence
VU-M4	To inculcate life skills and holistic culture appreciating morals and ethics

Values of the University	
Excellence	Transparency
Innovation	Sustainability
Diversity	Responsibility
Adaptability	Compassion

Vision of the Department of Computer Engineering
To create an intellectual and academically rich environment for careers in Computing Education and Research to fulfill global needs.

Mission of the Department of Computer Engineering	
M1	To impart modern computing education through novel methods and research.
M2	To prepare the students for life-long learning in pursuit of excellence.
M3	To create technically competent human in socio-economic domain.
M4	To promote aspiring ethically conscious engineers demonstrating sustainable entrepreneurship and professional maturity in social context.

Values of the Department of Computer Engineering	
Pursuing Excellence	Ethics & Social Responsibility
Nurturing Talent	Collaborative Approach
Career Architect	Sustainable Growth Transparency & Accountability
Innovative Outlook	Freedom of Expression

Mapping of Mission Statement of Department to University Mission Statement

Mission Statement	VU-M1	VU-M2	VU-M3	VU-M4
M1	3	3	2	2
M2	1	2	2	3
M3	2	3	2	2
M4	1	1	2	3

Affinity Level: 1- Slight, 2- Moderate, 3-Substantial

Programme Educational Objectives (PEOs)

PEO No.	Statement
PEO1	To prepare the students to evolve into a professional and committed technology workforce, by providing them with a global educational platform with innovative practices.
PEO2	To provide a sufficient mathematical and computing theory knowledge base, leading to practical and long lasting computer engineering solutions.
PEO3	To ingrain problem solving skills and sound engineering principles in students with the help of modern tools and techniques.
PEO4	To impart in the students professional and ethical practices based on standard guidelines to acquire the right attitude and aptitude for the benefit of society.
PEO5	To guide ambitious students for higher education and lead them to avenues of entrepreneurship in emerging areas of computing.

Mapping of Mission Statement of Department to PEOs

Mission Statement	PEO1	PEO2	PEO3	PEO4	PEO5
M1	3	3	3	1	2
M2	2	2	3	3	2
M3	3	3	2	2	1
M4	2	1	2	3	2

Affinity Level: 1- Slight, 2- Moderate, 3-Substantial

Programme Outcomes (POs)

PO No.	Statement
PO1	Apply the knowledge of engineering and science fundamentals to the solution of complex engineering problems.
PO2	Identify, formulate and analyze complex engineering problems to create solutions using the First principles of engineering sciences and mathematics.
PO3	Design solutions for design system components that meet the specified needs for the benefit of society.
PO4	Apply research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Create appropriate techniques and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	Apply reasoning using contextual knowledge to assess the needs of society and understand The responsibilities relevant to the professional engineering practice.
PO7	Understand the impact of professional engineering solutions as applied to the environment, And demonstrate the knowledge for sustainable development.
PO8	Adopt ethical practices as applied to the professional world to execute responsibilities and adhere to norms of the engineering profession.
PO9	Execute professional functions effectively as an individual, as well as a leader or member in Diverse multidisciplinary teams.
PO10	Communicate effectively with the engineering community and with society in solving complex problems in terms of being able to comprehend and write effective reports, make Effective presentations, as well as execute and receive clear instructions.
PO11	Demonstrate an ability to lead projects and build cost models in an interdisciplinary professional Setting
PO12	Develop learning mechanisms and inculcate the ability to prepare for lifelong learning in the context of technological change.

Mapping of PEOs to POs

PEO Number	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEO1	2	3	2	3	1	2	3	1	1	-	-	2
PEO2	3	3	2	3	1	1	2	1	-	1	1	1
PEO3	2	2	2	2	3	1	3	1	-	1	-	2
PEO4	1	1	1	1	1	1	1	3	3	2	2	-
PEO5	2	2	2	2	1	1	1	1	1	-	2	1

Affinity Level: 1- Slight, 2- Moderate, 3-Substantial

Programme Specific Outcomes (PSOs)

PSO No.	Statement
PSO1	Imbibe foundational knowledge of computing theory, algorithms and programming paradigms to create innovative, scientific solutions for complex computing challenges.
PSO2	Prepare for the latest trends in industry by adapting to various computing platforms, architectures and changing software paradigms.
PSO3	Evolve new design ideas for real world problems using appropriate mechanisms, design patterns, modeling methods and modern tools.
PSO4	Inculcate research attitude and aptitude in students using techniques and standards as applied to technology migration and evolution.

Mapping of PEOs to PSOs

PEO Number	PSO1	PSO2	PSO3	PSO4
PEO1	2	3	1	2
PEO2	3	2	1	3
PEO3	3	2	3	2
PEO4	2	2	1	1
PEO5	2	2	1	2

Affinity Level: 1- Slight, 2- Moderate, 3-Substantial

Programme Structure

Faculty	*Science and Technology*	Pattern	*2023*
Department	*Computer Engineering*	Date (w.e.f.)	*01/07/2024*
Programme	*B.Tech. Computer Engineering*		

Semester –III Pattern 2023										
Course Type	Course Code	Course Name	Teaching Scheme(Hours/Week)			Credit	Examination Scheme and Marks		
			L	T	P	C	CIE	ESE	Total
PCC	BTECCE23301	Data Structures	3	0	0	3	60	40	100
PCC	BTECCE23302	Data Structures Lab	0	0	2	1	15	10	25
PCC	BTECCE23303	Fundamentals of Data Science	3	0	0	3	60	40	100
PCC	BTECCE23304	Fundamentals of Data Science Lab	0	0	2	1	15	10	25
HSSM	BTECCE23305	Financial Literacy and Banking	2	0	0	2	50	0	50
CEP/FP	BTECCE23306	Project Based Learning -Python	0	0	4	2	30	20	50
VEC	VE23CE01	Environmental Science - I	2	0	0	2	50	0	50
MC	MT23CE01A	Discrete Mathematics	3	0	0	3	60	40	100
OE	OE23CE01	Mobile Computing	3	0	0	3	60	40	100
TOTAL			16	0	8	20	400	200	600
Instructions, if any: 1 Theory/Tutorial Hour = 1 Credit, 2 Practical hours = 1 Credit									

Faculty	*Science and Technology*	Pattern	*2023*
Department	*Computer Engineering*	**Date (w.e.f.)**	*01/07/2024*
Programme	*B.Tech. Computer Engineering*		

Semester –IV Pattern 2023									
Course Type	**Course Code**	**Course Name**	**Teaching Scheme (Hours/Week)**			**Credit**	**Examination Scheme and Marks**		
			L	**T**	**P**	**C**	**CIE**	**ESE**	**Total**
PCC	BTECCE23401	Computer Graphics and Gaming	3	0	0	3	60	40	100
PCC	BTECCE23402	Computer Graphics and Gaming Lab	0	0	2	1	15	10	25
PCC	BTECCE23403	Database Management Systems	3	0	0	3	60	40	100
PCC	BTECCE23404	Database Management Systems Lab	0	0	2	1	15	10	25
VSEC	BTECCE23405	Technical Skill development Lab - Java	1	0	2	2	30	20	50
HSSM	BTECCE23406	Project Management	2	0	0	2	50	0	50
AEC		Elective	2	0	0	2	50	0	50
VEC	VE23CE02	Environmental Science - II	2	0	0	2	50	0	50
MC	MT23CE02A	Computational Theory	3	0	0	3	60	40	100
OE	OE23CE02	Information and Application Security	3	0	0	3	60	40	100
TOTAL			**17**	**0**	**6**	**22**	**450**	**200**	**650**
				23					
Instructions, if any: 1 Theory/Tutorial Hour = 1 Credit, 2 Practical hours = 1 Credit									

* Elective	
BTECCE23407	Leadership and Personality Development
BTECCE23408	From Campus to Corporate - 1

Name of Head of Department   Name of Dean
Sign: Sign:
Date: Date:

SEM III

BTECCE23301: Data Structures

Course Type		PCC	Semester		III

Teaching Scheme		Credits		Examination Scheme	
Lecture	3 Hr./Week	Lecture	3	CIE Marks	60
Tutorial	0 Hr./Week	Tutorial	0	ESE Marks	40
Practical/Studio	0Hr./Week	Practical/Studio	0	Total Marks	100
Total	3 Hr./Week	Total	3		

Course Description

This course helps the student to study the representation and applications of Stack and Queue data structures, tree data structure and its traversals. It also focuses on graph data structure and usage of hashing techniques.

Course Outcomes

CO No.	Statement
1	To understand the representation and applications of stack and Queue data structure.
2	To perform various operations on linked lists.
3	To demonstrate the use of binary tree traversals and perform operations on them.
4	To Use advanced trees and its applications for various purposes.
5	To Apply the Graph data structure to solve the applications of it and use hashing techniques.

Mapping of COs to POs and PSOs

CO No						POs							PSOs				BTL
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	3																UN
CO2		3															AP
CO3							2										AP
CO4												3					AP
CO5														3			AN

Affinity Level: 1- Slight, 2- Moderate, 3-Substantial, BTL: Bloom's Taxonomy Level

Course Content

Unit No-1	Stacks and Queues	Hours -9	CO	BTL
Stacks: Fundamentals of stack, Representation and Implementation of stack using arrays, Applications of tack: Decimal to Binary Conversion, reversing a string, Parsing: Well-form parenthesis, Different expression conversions and evaluation. Queues: Fundamentals of queue, Representation and Implementation of queue using arrays, Circular queue: representation and implementation, Applications of queue: Josephus Problem, Job Scheduling, Queue Simulation, Categorizing Data, Doubly Ended Queue, Priority queue. Multiple Stacks and Multiple Queues.			1	UN

Unit No-2	Linked Lists	Hours -9	2	AP
Dynamic Memory allocation, Concept of linked organization, singly linked list, doubly linked list, circular linked list, Insertion, Deletion, and traversal on above data structures. Representation and manipulations of polynomials using linked lists. Implementation of linked Lists for Stacks and Queues, Generalized Linked List, operations on GLL like copy, Equality.				
Unit No-3	Trees	Hours -9	3	AP
Trees: Basic Terminologies, Binary trees, Types of binary trees, Binary tree representation using array and linked list, Creation of a binary tree, Binary Search Trees, creation of binary Search tree, tree traversals (recursive and non-recursive), finding height and counting leaf nodes of a binary search tree (with and without recursion), Deletion of a node from a binary search tree. Finding mirror image of the binary search tree with and without recursion, Printing a tree level wise.				
Unit No-4	Advanced Trees	Hours -9	4	AP
Threaded binary trees, Creation and traversal of in-order, pre-order and post-order threaded binary tree, Insertion and deletion of nodes in threaded binary tree, AVL Trees, Creation of Heap Tree and Heap sorting, Huffman tree.				
Unit No-5	Graphs	Hours -9	5	AP
Review of basic terminology, Types of graphs: directed, undirected, weighted graph, Representation of graphs using adjacency matrix, adjacency list, Traversals: Depth First and Breadth First, connected components and spanning trees, Kruskal's and Prim's algorithms for minimum spanning tree, Algorithm for shortest path- Dijkstra's algorithm.				

Textbooks

1	"Fundamentals of Data Structures in C", E. Horwitz, S. Sahani, Anderson-Freed, Second Edition, Universities Press.
2	Data structures using C and C++", Y. Langsam, M.J. Augenstein, A.M.Tanenbaum, Pearson Education, Second Edition
3	"Data structures using C and C++", YedidyahLangsam, Moshe Jugenstein, Aaron M. Tanenbaum, Second Edition, Pearson Publications

Reference Books / Journal Articles / Weblink

1	"An Introduction to data Structures with applications", J. Tremblay, P. Sorenson, TMH Publication, 2nd Edition.2.
2	"C and Data Structures", E. Balaguruswamy, TMH Publication, 2003.
3	"Data Structures and Algorithm Analysis in C++", M. Weiss, Pearson Education, Second Edition, 2002.
.4	"Data Structures using C", ReemaThareja, Second Edition, Oxford Publications
5	"Data Structures with C", Schaum's online series, SaymourLipschutz, McGraw Hill Publications.
6	"Data Structures and Algorithms", A.V. Aho, J.E. Hopcroft, J.D. Ullman, Pearson Publication
7	"Data Structures and analysis in C", Mark Allen Weiss, second Edition, Pearson Publication

BTECCE23302:: Data Structure Laboratory

Teaching Scheme		Credits		Examination Scheme	
Lecture	0 Hr./Week	Lecture	0	CIE Marks	15
Tutorial	0 Hr./Week	Tutorial	0	ESE Marks	10
Practical/Studio	2Hr./Week	Practical/Studio	1	Total Marks	25
Total	2Hr./Week	Total	1		

List of Experiments

	Unit 1: Stacks and Queues
1	Program for different stack applications
2	Program for Expression conversion and evaluation using stack
3	Program for different queue applications
	Unit 2: Linked List
4	Program for different types of linked list implementation
5	Program for Generalized Linked Lists.
	Unit 3: Trees
6	Assignment on Binary and Binary Search tree and its traversals
7	Assignment on BST operations
	Unit 4: Advanced Trees
8	Assignment on Threaded binary tree and heap tree
9	Assignment on AVL tree
	Unit 5: Graphs
10	Assignment on Graph traversals (BFS and DFS)
11	Assignment on min. spanning tree and Dijkstra's algorithm
12	Mini Project

BTECCE23303: Fundamentals of Data Science

Course Type		PCC	Semester		III

Teaching Scheme		Credits		Examination Scheme	
Lecture	3 Hr./Week	Lecture	3	CIE Marks	60
Tutorial	0 Hr./Week	Tutorial	0	ESE Marks	40
Practical/Studio	0Hr./Week	Practical/Studio	0	Total Marks	100
Total	3 Hr./Week	Total	3		

Course Description

The course will enable students to understand the essential concepts, tools, and methodologies in the field of data science. Students will gain the skills and hands on practice needed to analyze, visualize and interpret data effectively to address real-world data challenges

Course Outcomes

CO No.	Statement
1	Gain basic understanding of data science principles and life cycle.
2	Interpret data transformation and data measurement operations.
3	Apply basic data cleaning and transform variables to facilitate analysis.
4	Analyze different types of data using statistical operations.
5	Apply standard data visualization and formal inference procedures.

Mapping of COs to POs and PSOs

CO No			POs										PSOs				BTL
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	3																UN
CO2		2															AN
CO3			3														AP
CO4				3													AN
CO5					3								3				AP

Affinity Level: 1- Slight, 2- Moderate, 3-Substantial, BTL: Bloom's Taxonomy Level

Course Content

Unit No-1	Introduction to Data Science	Hours -9	CO	BTL
Introduction, Need for Data Science, Components of Data Science, Data Acquisition and Data Science Life Cycle , Basic Tools of Data Science, Difference between BI and Data Science, Applications of Data Science, Role of Data Scientist.			1	UN

Unit No-2	Data Representation	Hours -10	2	AN
Introduction, Types of Data: numerical, categorical, time series, spatial, binary, text data. Data Transformation, Summarizing Data: Measures of Central Tendency, Measures of Variability Summarizing Data: Measures of Dispersion, Levels of Measurement, Random Variables and Probability Distributions, Discrete and Continuous Random Variable.				

Unit No-3	Data Processing	Hours -8	3	AP
Introduction, Data Cleansing Operations, Processing CSV Data, Processing JSON Data, Processing XLS Data, Data Wrangling, Data Aggregation, Word Tokenization, Stemming and Lemmatization				
Unit No-4	Statistical Data Analysis	Hours -10	4	AN
Introduction, Making Inferences about Populations from samples, Estimator and Estimate, Confidence Interval for Population Mean. Measuring Variance, Normal Distribution, Binomial Distribution, P-Value, Correlation, Simple Linear Regression.				
Unit No-5	Data Visualization	Hours -8	5	AP
Data visualization : Importance and applications of visualizations to problem solving, Data visualization tools and techniques : Chart Properties, Chart Styling, Box Plots, Heat Maps, Scatter Plots, Bubble Charts, 3D Charts, Time Series Data Visualization.				

Textbooks

1	*Statistics by Dr. B. N. Gupta (SBPD Publications)*
2	*Mastering Python for Data Science by Samir Madhavan, PacktPublishingPython for Data Analysis by Wes McKinney, O'Reilly Media, Inc.*

Reference Books / Journal Articles / Weblink

1	*Python Data Science Handbook by Jake Vanderplas, O'REILLY*
2	*Data Science with Python by Rohan Chopra, Packt Publishing*

BTECCE23304:: Fundamental of Data Science Lab

Teaching Scheme		Credits		Examination Scheme	
Lecture	0 Hr./Week	Lecture	0	CIE Marks	15
Tutorial	0 Hr./Week	Tutorial	0	ESE Marks	10
Practical/Studio	2Hr./Week	Practical/Studio	1	Total Marks	25
Total	2Hr./Week	Total	1		

List of Experiments

1	Handling tabular datasets and perform operations of loading data or doing feature engineering on data sets. Perform basic numerical computations like mean, median, range and creation of multi-dimensional arrays.
2	Perform data preprocessing tasks such as data cleaning, handling missing values, and data transformation.
3	Perform data wrangling for formats of merging, grouping and concatenation.
4	Explore the dataset using descriptive statistics to gain insights into the data distribution and identify patterns.
5	For given dataset, measure central tendency and variance. Data analysis in terms of Normal Distribution, Binomial Distribution.
6	To measure statistical relationships in data using Correlation and Linear regression.
7	To perform data visualization of various datasets in terms of charts and plots.

BTECCE23305: Financial Literacy and Banking

Course Type	HSSM	Semester	III

Teaching Scheme		Credits		Examination Scheme	
Lecture	2 Hr./Week	Lecture	2	CIE Marks	50
Tutorial	0 Hr./Week	Tutorial	0	ESE Marks	00
Practical/Studio	0Hr./Week	Practical/Studio	0	Total Marks	50
Total	2 Hr./Week	Total	2		

Course Description

This course helps the student to learn financial planning & control, practical aspects of Account. Focuses on financial management skills to practical situations.

Course Outcomes

CO No.	Statement
1	Implement financial knowledge in real life related to personal context and business context.
2	Gain a comprehensive understanding of the structure and evolution of the Indian banking system.
3	Understand various intelligent sources for investment by analyzing capital, insurance and risks Involved in processing.
4	Explain balance sheet.
5	Acquaint the current financial trends.

Mapping of COs to POs and PSOs

CO No	POs												PSOs				BTL
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1								3									UN
CO2									2								AP
CO3										2							AN
CO4												2					AP
CO5														2			AN

Affinity Level: 1- Slight, 2- Moderate, 3-Substantial, BTL: Bloom's Taxonomy Level

Course Content

Unit No-1	Introduction	Hours -6	CO	BTL
Understanding Basic Accounting Concepts, Golden Rules, Modern approach, Journal Entries, Ledger, Trial Balance – Basic costing concepts.			1	UN

Unit No-2	Financial System	Hours -6	2	AP
.Overview of Indian Financial System – Financial Market – Listing Regulations – Primary markets and Secondary Markets – Foreign Direct Investments – Foreign Institutional Investments – Mutual Funds.				

Unit No-3	**Banking System**	**Hours -6**	3	AN
Indian Banking System – its Structure - Functions – Types of Banks – Types of Deposits and Loans – Central Bank and its functions - Methods of credit control – Indian Money Market and Capital Market - Investment Avenues (Types of Investments), Non – Performing Assets - Challenges and Opportunities in Indian Banking System.				
Unit No-4	**Financial Statements and Budgeting**	**Hours -6**	4	AP
Using Financial Statements and Budgets - Preparation of personal Balance Sheet and its analysis using ratios - Time value of money concept – Capital Budgeting Techniques (Profitability Index, Pay Back Period, NPV etc.) - Insurance their returns and Risk.				
Unit No-5	**Current Financial Trends**	**Hours -6**	5	AN
Current Trends in finance (Blockchain, GST, Commodity Market, Basel Accord, The rise of Fintech in India				

Textbooks

1	Book keeping and Accountancy : Maharashtra state board STD XI

Reference Books

1	Introduction to accounting: S.N Maheshwari
2	Business Finance : Dr. Mahesh Kulkarni and Dr. Suhas Mahajan
3	Indian Financial System : M.Y. Khan
4	https://byjus.com/commerce/class-11-accountancy-chapter-1 introduction-to-accounting/
5	https://www.topperlearning.com/t-s-grewal-solutions/cbse-class-11 commerce-accountancy/financial-accounting

BTECCE23306: Project Based Learning -Python

Course Type		CEP/FP	Semester		III

Teaching Scheme		Credits		Examination Scheme	
Lecture	0 Hr./Week	Lecture	0	CIE Marks	30
Tutorial	0 Hr./Week	Tutorial	0	ESE Marks	20
Practical/Studio	4Hr./Week	Practical/Studio	2	Total Marks	50
Total	4Hr./Week	Total	2		

Course Description

This course provides an introduction to programming and the Python language with core programming concepts like data structures, conditionals, loops, variables, and functions. This course includes an overview of the various tools available for writing and running Python and coding quickly. It also provides hands-on coding exercises using commonly used data structures, writing custom functions, and reading and writing to files. It also introduces to advanced Python programming concepts.

Course Outcomes

CO No.	Statement
1	To understand basic concepts in Python
2	To develop applications employing different object-oriented concepts
3	To implement linear algebra functions for arrays using NumPy
4	To demonstrate high-performance data manipulation and analysis using Pandas Library
5	To plot data visualization using Matplotlib and Seaborn libraries.

Mapping of COs to POs and PSOs

CO No	POs												PSOs				BTL
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1			3														UN
CO2					3												AP
CO3						2											AN
CO4							2										AP
CO5														2			AN

Affinity Level: 1- Slight, 2- Moderate, 3-Substantial, BTL: Bloom's Taxonomy Level

Course Content

Unit No-1	Fundamental Concepts of Python	Hours -2	CO	BTL
Introduction to Python, Basic Concepts: Variables and Datatypes, Keywords, Literals, Operators and Expressions: Operators in Python, Input and Output, Control statements: Conditional Statements, Loops, Data Structures: Arrays, List, Tuples, Dictionary, Functions and Modules, File I/O, Exception			1	UN
Unit No-2	Python OOPs Concepts	Hours -2	2	AN
Introduction to OOP, Classes, Objects, Interfaces, Constructor, Inheritance.				

Unit No-3	Data Processing Library in Python	Hours -2	3	AP
NumPy, why do we need NumPy, Working with Arrays, Shaping and transposition, Mathematical Operations, Indexing and slicing, Broadcasting, NumPyArray Attributes, Descriptive Statistics methods, Working with matrices				
Unit No-4	Data Analysis using Python Library	Hours -2	4	AN
Overview of Python Libraries for Data Scientists, reading data using pandas, DataFrames, DataFrames datatypes, DataFrames attributes, Exploring DataFrames, DataFrames methods, group by method, filtering, Slicing, sorting, missing value, Aggregation Functions in Pandas.				
Unit No-5	Data Visualization in Python	Hours -2	5	AP
Plotting libraries in Python, **Matplotlib**: Scatterplot, Histogram, Bar Plot. **Seaborn**: Scatterplot, Histogram, Bar Plot, Box and whiskers plot, Pairwise Plots				

Reference Books / Journal Articles / Weblink

1	https://www.w3schools.com/python/
2	https://www.udemy.com/course/free-python/ https://www.udemy.com/course/basics-of-python-programming-for-beginners-with-jupyter/ https://www.udemy.com/course/datavisualpython/

List of Experiments

1	Create variables of different data types (integer, float, string, boolean). Perform basic operations on them and print the results along with their types using the type () function.
2	Create an array, perform various operations such as insertion, deletion, searching for elements, and iterating through the array. Compare the performance of arrays with lists for certain operations.
3	Write a program to read data from a text file, process the data (such as counting words, lines, and characters), and write the processed data to a new file. Handle potential exceptions that may occur during file operations.
4	Create a program that raises and handles various types of exceptions (such as Value Error, Type Error, and FileNotFoundError). Define and raise custom exceptions to handle specific error conditions in your program.
5	Write a program in Python to demonstrate the concept of a Constructor
6	Write a program in Python to demonstrate the concept of Interface
7	Write a program in Python to demonstrate the concept of Inheritance.
8	Write a program to install NumPy and create arrays using lists and built-in functions. Display the created arrays and their attributes
9	Write a program to create a NumPy array and reshape it into different dimensions. Transpose of the reshaped array and demonstrate swapping axes.
10	Write a program to create two NumPy arrays and perform element-wise addition, subtraction, multiplication, and division. Use universal functions to compute square root, logarithm, and exponential of array elements.
11	Write a program to demonstrate various indexing techniques (e.g., accessing specific elements, rows, columns) and slicing operations to extract subarrays. Include examples of Boolean and fancy indexing.
12	Write a program to create a NumPy array and calculate its mean, median, standard deviation, and variance. Use advanced statistical methods to compute percentiles and correlation coefficients.
13	Write a program to read data from a CSV file using Pandas. Display the first few rows (head()), information (info()), and basic statistics (describe()) of the DataFrame. Save the modified DataFrame to a new CSV file.
14	Write a program to create a DataFrame from a dictionary of lists. Use methods like head(), tail(), info(), and describe() to explore and summarize the DataFrame.

15	Write a program to group data in a DataFrame by a specific column using group by() and compute aggregate statistics (e.g., sum, mean) on grouped data.
16	Write a program to filter rows from a DataFrame based on a condition using boolean indexing or the query() method. Sort the filtered DataFrame by a specific column using sort_values().
15	Write a program to handle missing values in a DataFrame using fillna() or dropna() methods. Perform aggregation operations (sum(), mean(), etc.) on columns of the DataFrame.
17	Write a program to create a simple line plot, scatter plot, histogram, and bar plot using Matplotlib. Customize each plot with appropriate labels, titles, colors, and markers.
18	Write a program to create a box and whiskers plot and an area plot using Matplotlib. Include multiple subplots in a single figure to display different plots side by side.
19	Write a program to create a scatter plot, histogram, bar plot, box plot, and violin plot using Seaborn. Visualize correlations between multiple variables using the pair plot function.
20	Write a program to demonstrate various indexing techniques (e.g., accessing specific elements, rows, columns) and slicing operations to extract subarrays. Include examples of Boolean and fancy indexing.

VE23CE01: Environmental Science - I

Course Type	VEC	Semester	III

Teaching Scheme		Credits		Examination Scheme	
Lecture	2 Hr./Week	Lecture	2	CIE Marks	50
Tutorial	0 Hr./Week	Tutorial	0	ESE Marks	00
Practical/Studio	0Hr./Week	Practical/Studio	0	Total Marks	50
Total	2 Hr./Week	Total	2		

Course Description

This course Develop awareness about environmental issues and also Develop an understanding based on observation and illustration drawn from lived experiences and physical, biological, social and cultural aspects of life, rather than abstractions.

Course Outcomes

CO No.	Statement
1	Understand scope of Environmental science, Study different kinds of Ecosystems
2	Gather information about different environmental resources
3	Understand concept of sustainability and sustainable development
4	Understand requirement and meaning of Biodiversity and threats and challenges to maintain it
5	Understand severity of pollution and develop thought process to reduce it

Mapping of COs to POs and PSOs

CO No	POs												PSOs				BTL
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	3		2			3							3				UN
CO2			3	3					2								AN
CO3							3	3				2					AP
CO4		3							3								AN
CO5		3								3	3		3				AP

Affinity Level: 1- Slight, 2- Moderate, 3-Substantial, BTL: Bloom's Taxonomy Level

Course Content

Unit No-1	Scope of environmental studies and Ecosystem	Hours -6	CO	BTL
Multidisciplinary nature of environmental studies; Scope and importance; What is an ecosystem? Structure and function of ecosystem; Energy flow in an .Ecosystem: food chain, food web and ecological succession.

Case studies of the following ecosystems: a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) | | | 1 | UN |

Unit No-2	Environmental Recourses	Hours -6	2	AN
Land Resources and land use change; Land degradation, soil erosion and Desertification. Deforestation: Causes and impacts due to mining, dam building on environment, Forests, biodiversity and tribal populations. Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state).Heating of earth and circulation of air; air mass formation and precipitation. Energy resources: Renewable and non-renewable energy sources, use of alternate Energy sources, growing energy needs, case studies.				
Unit No-3	Sustainability	Hours -6	3	AP
Concept of sustainability and sustainable development with case studies relevant to computer industry				
Unit No-4	Biodiversity	Hours -6	4	AN
Levels of biological diversity :genetic, species and ecosystem diversity; Biogeography zones of India; Biodiversity patterns and global biodiversity hot spots , India as a mega-biodiversity nation; Endangered and endemic species of India, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.				
Unit No-5	Pollution	Hours -6	5	AP
Environmental pollution : types, causes, effects and controls; Air, water, soil, chemical and noise pollution • Nuclear hazards and human health risks • Solid waste management: Control measures of urban and industrial waste. • Pollution case studies. Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture.				

Textbooks

1	Morgen, M.D. Morgen J.M. and Wiersima J.H. 1993, Environmental Science: Managing Physical and Biological Resources Wm C Brown Publishers London.
2	Dhaliwal G.S., Sangha G.S. and Ralhan P.K. 2000, Fundamentals of Environmental Science, Kalyani Publishers, New Delhi.
3	Khopkar, S.M. 1993 : Environmental Pollution Analysis, Wiley Eastern Limited New York

Reference Books / Journal Articles / Weblink

1	De, A.K. 1990, Environmental Chemistry, Wiley Eastern Ltd., New Delhi.
2	Sodhi G.S. 2005, Fundamentals of Environmental Chemistry : Narosa Publishing House, New Delhi
3	Morgen, M.D. Morgen J.M. and Wiersima J.H. 1993, Environmental Science Managing Physical and Biological Resources Wm C Brown PublishersLondon.

MT23CE01A: Discrete Mathematics

Course Type		MC	Semester		III

Teaching Scheme		Credits		Examination Scheme	
Lecture	3 Hr./Week	Lecture	3	CIE Marks	60
Tutorial	0 Hr./Week	Tutorial	0	ESE Marks	40
Practical/Studio	0Hr./Week	Practical/Studio	0	Total Marks	100
Total	3 Hr./Week	Total	3		

Course Description

The course will enable student understand, explain and apply the foundational Mathematical Concepts at the core of Computer Science. It will also enable Students to Model Problem Using Graph & Trees, to Understand set, function and relational models to understand Practical Examples and Interpret the associated Operations and Terminologies in Context, to acquire the knowledge of logic and proof techniques, To Learn how abstract algebra is used in coding theory.

Course Outcomes

CO No.	Statement
1	Formulate problems precisely, solve the problems, apply formal proof techniques, and explain the reasoning clearly.
2	Apply appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts.
3	Design and analyze real world engineering problems by applying set theory, propositional logic and to construct proofs using mathematical induction.
4	Specify, manipulate and apply equivalence relations; construct and use functions and apply these concepts to solve new problems.
5	Model and solve computing problem using tree and graph and solve problems using appropriate algorithms.

Mapping of COs to POs and PSOs

CO No	POs												PSOs				BTL
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1			2														UN
CO2		2															AN
CO3	2		2														AP
CO4					3												AN
CO5				2									3				AP

Affinity Level: 1- Slight, 2- Moderate, 3-Substantial, BTL: Bloom's Taxonomy Level

Course Content

Unit No-1	Set Theory and Logic	Hours -9	CO	BTL
Introduction and significance of Discrete Mathematics **Sets–** Naïve Set Theory (Cantorian Set Theory), Axiomatic Set Theory, Set Operations, Cardinality of set, Principle of inclusion and exclusion. **Types of Sets** – Bounded and Unbounded Sets, Diagonalization Argument, Countable and Uncountable Sets, Finite and Infinite Sets, Countably Infinite and Uncountably Infinite Sets, Power set **Propositional Logic-** logic**,** Propositional Equivalences, Application of Propositional Logic-Translating English Sentences, Proof. **EXCEMPLER/CASE STUDIES :** Know about the great philosophers- Georg Cantor, Richard Dedekind and Aristotle			1	UN
Unit No-2	Relations & Functions	Hours -9	2	AN
Relations and their Properties, n-ary relations and their applications, Representing relations, Closures of relations, Equivalence relations, Partitions, Transitive closure and Warshall 's algorithm. Functions- Surjective, Injective and Bijective functions, Identity function, Partial function, Invertible function, Constant function, Inverse functions and Compositions of functions, The Pigeonhole Principle. EXCEMPLER/CASE STUDIES: Know about the great philosophers-Dirichlet				
Unit No-3	Graph Theory	Hours -9	3	AP
Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, the handshaking lemma. Single source shortest path-Dijkstra's Algorithm, Planar Graphs, Graph Colouring. EXCEMPLER/CASE STUDIES: Google Map				
Unit No-4	Trees	Hours -9	4	AN
Introduction, properties of trees, Binary search tree, tree traversal, decision tree, prefix codes and Huffman coding, cut sets Spanning Trees and Minimum Spanning Tree = Kruskal 's and Prim 's algorithms, The Max flow- Min Cut Theorem (Transport network). EXCEMPLER/CASE STUDIES: Tic-Tac-Toe Game Tree				
Unit No-5	Algebraic Structures and Coding Theory	Hours -9	5	AP
The structure of algebra, Algebraic Systems, Semi Groups, Monoids, Groups, Homomorphism and Normal Subgroups, and Congruence relations, Rings, Integral Domains and Fields, Coding theory EXCEMPLER/CASE STUDIES: Cryptography used in World War II				

Textbooks

1	*Kenneth H. Rosen, "Discrete Mathematics and its Applications"‖, Tata McGraw-Hill, ISBN 978- 0-07-288008-3*
2	*Bernard Kolman, Robert C. Busby and Sharon Ross, "Discrete Mathematical Structures"‖, Prentice-Hall of India /Pearson, ISBN: 0132078457, 9780132078450.*

Reference Books / Journal Articles / Weblink

1	*Narsingh Deo, "Graph with application to Engineering and Computer Science", Prentice Hall of India, 1990, 0 – 87692 – 145 – 4.*
2	*Eric Gossett, "Discrete Mathematical Structures with Proofs", Wiley India Ltd, ISBN:978-81- 265-2758-8.*
	Sriram P.and Steven S., "Computational Discrete Mathematics", Cambridge University Press, ISBN 13: 978-0-521-73311-3.

OE23CE01: Mobile Computing

Course Type		OE	Semester		III

Teaching Scheme		Credits		Examination Scheme	
Lecture	3 Hr./Week	Lecture	3	CIE Marks	60
Tutorial	0 Hr./Week	Tutorial	0	ESE Marks	40
Practical/Studio	0Hr./Week	Practical/Studio	0	Total Marks	100
Total	3 Hr./Week	Total	3		

Course Description

The course will enable student understand, explain and apply the foundational Mathematical Concepts at the core of Computer Science. It will also enable Students to Model Problem Using Graph & Trees, to Understand set, function and relational models to understand Practical Examples and Interpret the associated Operations and Terminologies in Context, to acquire the knowledge of logic and proof techniques, To Learn how abstract algebra is used in coding theory.

Course Outcomes

CO No.	Statement
1	Understand the basic concepts and scope of mobile computing with Public Switched Telephone Network.
2	Understand the architecture and components of Global System for Mobile Communications
3	Understand the Current Mobile Computing Techniques.
4	Understand different Operating systems in Mobile.
5	Understand the application development and security in Mobile.

Mapping of COs to POs and PSOs

CO No	POs												PSOs				BTL
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	2																UN
CO2		2															AN
CO3			2														AP
CO4		2															AN
CO5														3			AP

Affinity Level: 1- Slight, 2- Moderate, 3-Substantial, BTL: Bloom's Taxonomy Level

Course Content

Unit No-1	Introduction to Mobile Computing	Hours -9	CO	BTL
Introduction to Mobile computing, Constraints in mobile computing, Application of mobile computing, Generations of mobile wireless 1G to 5G, Future of mobile computing, Radio frequency Technology, Public Switched Telephone network, (PSTN), Public Communication service (PCS), PCS Architecture, Blue tooth, Ad-hoc Networks.			1	UN
Unit No-2	Global System for Mobile Communications	Hours -9	2	AN

Global System for Mobile Communications (GSM) architecture, Mobile Station, Base Station System, Switching subsystem, GSM location management, Transaction management, Mobile database, Introduction to location management HLR and VLR, Case study: 5G mobile communications			
Unit No-3	**Current Mobile Computing Techniques**	**Hours -9**	**3**	**AP**
Introduction to 5G Technology, Key differences between 4G and 5G, Vision and goals of 5G, Mobile Cloud Computing and its applications, Cloud Services Integration, Edge Computing, Concept and architecture of edge computing, Overview of IoT and its significance in mobile computing, Overview of wearable devices, Integration with mobile computing			
Unit No-4	**Mobile Operating Systems**	**Hours -9**	**4**	**AN**
Overview of mobile operating systems: Android, iOS, Windows Mobile, Mobile OS architecture and design, Application development frameworks and environments Mobile user interfaces and design principles, Case studies of popular mobile applications			
Unit No-5	**Security and Application Development**	**Hours -9**	**5**	**AP**
Basics of mobile application development, Introduction to programming languages for mobile apps (Java, Swift, Kotlin), Development tools, Developing, Testing and debugging mobile applications, Security challenges in mobile computing, Common threats and vulnerabilities in mobile systems, Mobile Security Techniques, Case studies of mobile security breaches and solutions			

Textbooks

1	*Jochen Schiller, "Mobile Communications", Second Edition, Pearson Education, 2003*
2	*Raj Kamal, "Mobile Computing", Oxford University Press, 2007*

Reference Books / Journal Articles / Weblink

1	*William Stallings, "Wireless Communications and Networks", Pearson Education, 2002.*
2	*Asoke K. Talukdar, "Mobile Computing", Tata McGraw-Hill Education,2010.*
3	*5G Mobile and Wireless Communications Technology, Afif Osseiran, Jose F. Monserrat, Patrick Marsch, Cambridge University Press, 1st Edition, 2016.*

SEM IV

BTECCE23401::Computer Graphics and Gaming

Course Type		PCC	Semester		4

Teaching Scheme		Credits		Examination Scheme	
Lecture	3 Hr./Week	Lecture	3	CIE Marks	60
Tutorial	0 Hr./Week	Tutorial	0	ESE Marks	40
Practical/Studio	0 Hr./Week	Practical/Studio	0	Total Marks	100
Total	3 Hr./Week	Total	3		

Course Description

This course helps the student to understand the role of Computer Graphics in Animation and Gaming. The C Programming and fundamentals of Data Structures is the prerequisite for this course. The course highlights the drawing of basic geometric shapes with 2D and 3D transformations and clipping of objects. It also introduces the basics of animation and gaming platforms.

Course Outcomes

CO No.	Statement
1	Understand computer graphics fundamentals and use algorithms to draw line, circle, and polygons.
2	Perform various transformations and numerical on 2D object and apply different clipping algorithms on polygons.
3	Apply transformations on 3D objects and systematically solve numerical problems based on transformations and projections.
4	Detect hidden surfaces and interpret the difference between curves and fractals.
5	Construct animation based demonstrating system using segments and various gaming platforms.

Mapping of COs to POs and PSOs

CO No			POs										PSOs				BTL
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	3																AP
CO2		3															AP
CO3				2													AP
CO4						3											AN
CO5														3			AN

Affinity Level: 1- Slight, 2- Moderate, 3-Substantial, BTL: Bloom's Taxonomy Level

Course Content

Unit No 1	Fundamentals of Scan Conversion	Hours 10	CO	BTL
Overview of Computer Graphics, Computer Graphics Application and Software, Display adapters, Display modes, Pixel, Frame Buffer, Display devices, Aspect Ratio, Display file structure, Display file interpreter.			1	UN
Mathematical foundations: Lines and line representations, Intersection of lines, NormalizedDevice Coordinates (NDC).				
Scan conversions: DDA and Bresenham's line drawing algorithms, Bresenham and Midpoint circle drawing algorithms, Aliasing and Anti-aliasing,				
Polygons: Introduction, Types of polygons, Inside-outside test of polygon. Polygon filling algorithms:Seed fill, Boundary fill, Edge fill, Fence fill, Scan line fill algorithm.				
Unit No 2	**2D Transformations and Clipping**	**Hours 9**	**2**	**AP**
2D Transformations: Introduction, Scaling, Rotation, Translation, Derivation of matrix representation of 2D transformation, Homogeneous coordinates for transformations, Reflection Transformations, rotation about an arbitrary point, Inverse transforms, and shear transforms. Numerical Problems on 2D transformation. **Windowing and Clipping**: Introduction, Window, Viewport, Window to viewport transformation, Line clipping: Cohen Sutherland algorithm, Mid-point line clipping algorithm, Polygon clipping: Sutherland Hodgeman algorithm, Weiler-Atherton algorithm, Text clipping, Interior and Exterior clipping.				
Unit No 3	**3D Transformations and Projections**	**Hours 9**	**3**	**AN**
3D Transformations: Introduction, 3D point representation, Left handed system, Right handedsystem. Scaling, Rotation, Translation, Matrix representation, Derivation of Rotation matrices along the main axis, Rotation about an arbitrary axis, Reflectiontransformation with respect to main axes and planes, Numerical Problems on 3Dtransformations. **Projection**: 3D Projection concept, parallel and perspective projections, 3D clipping.Introduction to file formats: Bmp, Jpeg, Gif, Tiff, PNG.				
Unit No 4	**Hidden Surfaces, Curves and Fractals**	**Hours 8**	**4**	**AP**
Introduction, Techniques for efficient Visible Surface Algorithms, Categories of algorithms, Back face removal, The Z-Buffer Algorithm, Scan-line method, Painter's algorithms (depth sorting), Area sub-division method, Binary Space Partition method, comparison of the methods.**Curve generation**: Curve continuity, Interpolation, Lagrange interpolating algorithms, Spline. curve representation, B-Spline Curves, Bezier Curves, Fractals, Hilbert curve, Triadic Koch Curve, Fractal lines and surfaces.				
Unit No 5	**Introduction to Animation and Gaming**	**Hours 9**	**5**	**AN**
Segment: Introduction, Segment table, Segment Creation, Closing, Delete and renaming, Image transformation, Display structures used for segment. **Animation:** Introduction to animation, Conventional and Computer based animation, Real time Animation, Methods of Controlling animation, Animation Guidelines. **Graphics tools:** Study of 2D / 3D Graphics tools: 3D Studio Max, Maya. **Gaming:** Gaming Platforms, General Purpose GPU, NVIDIA Workstations: Tesla, Quadra.				

Textbooks

1	*"Computer Graphics", D. Hearn, M. Baker, 2nd Edition, Pearson Education, 2002, ISBN 81-7808-794-4*
2	*"Procedural Elements for Computer Graphics", D. Rogers, 2nd Edition, Tata McGraw-Hill Publication,2001, ISBN 0-07-047371-4*

Reference Books / Journal Articles / Weblink

1	*"Computer Graphics", S. Harrington, 2nd Edition, McGraw-Hill Publications, ISBN 0 - 07 -100472 -6.*
2	*"Computer Graphics Principles and Practice", J. Foley, V. Dam, S. Feiner, J. Hughes, 2nd Edition,Pearson Education, 2003, ISBN 81-7808-038-9.*

BTECCE23402:: Computer Graphics and Gaming Lab

Teaching Scheme		Credits		Examination Scheme	
Lecture	0 Hr./Week	Lecture	0	CIE Marks	15
Tutorial	0 Hr./Week	Tutorial	0	ESE Marks	10
Practical/Studio	2 Hr./Week	Practical/Studio	1	Total Marks	25
Total	2 Hr./Week	Total	1		

List of Experiments

1	Implementation of Line drawing algorithms
2	Implementation of Circle drawing algorithms
3	Implementation of Polygon Filling algorithms
4	Implementation of various 2D Transformations
5	Implementation of a Line Clipping algorithms
6	Implementation of a Polygon Clipping algorithms
7	Implementation of basic 3D Transformations
8	Study of various graphical file formats
9	Implementation of Curves and Fractals
10	Assignment of Animation
11	Mini Project

BTECCE23403:: Database Management Systems

Course Type		PCC	Semester		4

Teaching Scheme		Credits		Examination Scheme	
Lecture	3 Hr./Week	Lecture	3	CIE Marks	60
Tutorial	-- Hr./Week	Tutorial	0	ESE Marks	40
Practical/Studio	0 Hr./Week	Practical/Studio	0	Total Marks	100
Total	3 Hr./Week	Total	3		

Course Description

The course will enable student understand the different issues involved in the design and implementation of a database system. Student will learn the physical and logical database designs, database modeling, relational, hierarchical, and network models. Student will learn to use data manipulation language to query, update, and manage a database. Student will understand essential DBMS concepts such as: database security, integrity, concurrency, storage strategies etc. The students will get the hands-on practice of using SQL and PL/SQL concepts.

Course Outcomes

CO No.	Statement
1	Design and construct data models, logical database models of an organization
2	Develop a database system using relational database query languages and PL/SQL
3	Apply and relate the concepts of transaction, concurrency control, recovery and security in database
4	Recognize the purpose of query processing, optimization and demonstrate the SQL query evaluation
5	Build a database management system that satisfies relational theory and provides users with business queries.

Mapping of COs to POs and PSOs

CO No						POs								PSOs			BTL
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	3																AP
CO2		3															AP
CO3			2														AP
CO4					2												AN
CO5													3				AN

Affinity Level: 1- Slight, 2- Moderate, 3-Substantial, BTL: Bloom's Taxonomy Level

Course Content

Unit No 1	Introduction and Design Theory	Hours 9	CO	BTL
Introduction: Need of Database Management System, Evolution, Data Abstraction, Data Independence, System Architecture of DBMS; Data Models: Entity Relationship (ER) Model, Extended ER Model, Relational Data Model **Normalization:** Need, Functional Dependency, Inference Rules, FD Closure, Minimal Cover, Decomposition Properties, Normal Forms (upto BCNF), Multi-valued Dependency (4NF),		1	UN

Unit No 2	**SQL and PL/SQL**	**Hours 10**	**2**	**AP**
SQL Concepts : Basics of SQL, DDL,DML,DCL, structure – creation, alteration, defining constraints – Primary key, foreign key, unique, not null, check, IN operator, aggregate functions, Built-in functions –numeric, date, string functions, set operations, sub-queries, correlated sub-queries, join, Exist, Any, All , view and its types., transaction control commands.				
Unit No 3	**Advanced PL/SQL & Transaction Management**	**Hours 10**	**3**	**AN**
PL/SQL Concepts : Cursors, Stored Procedures, Stored Function, Database Triggers **Transaction Management :** Basic concept of a Transaction, Transaction Management, Properties of Transactions, Concept of Schedule, Serial Schedule, Serializability: Conflict and View, Cascaded Aborts, Recoverable and Non recoverable Schedules,				
Unit No 4	**Concurrency Control, Recovery methods & Query processing and optimization**	**Hours 7**	**4**	**AP**
Concurrency Control: Need, Locking Methods, Deadlocks, Time- stamping Methods, Optimistic Techniques, **Recovery methods:** Shadow-Paging and Log-Based Recovery, Checkpoints. **Query processing and optimization:** Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization				
Unit No 5	**Emerging Databases and Case Studies**	**Hours 9**	**5**	**AN**
Limitations of Conventional Databases , Multimedia Database, Temporal Databases, Spatial Databases, Cloud Databases, Google Big Table, No SQL, SQLite				

Textbooks

1	*Silberschatz A., Korth H., Sudarshan S., "Database System Concepts", 6 th Edition, McGraw Hill Publishers, ISBN 0-07-120413-X*
2	*Rob, Coronel, "Database Systems", Seventh Edition,*

Reference Books / Journal Articles / Weblink

1	*S.K.Singh, "Database Systems : Concepts, Design and Application", 2nd Edition, Pearson, 2013, ISBN 978-81-317-6092-5*
2	*Connally T., Begg C., "Database Systems", 3rd Edition, Pearson Education, 2002, ISBN 81-7808-861-4*
3	*"Fundamentals of Database Systems", Elmasri, Navathe, Pearson Education, ISBN 81-297- 0228- 2, 5th Edition.*

BTECCE23404:: Database Management Systems Lab

Teaching Scheme		Credits		Examination Scheme	
Lecture	0 Hr./Week	Lecture	0	CIE Marks	15
Tutorial	0 Hr./Week	Tutorial	0	ESE Marks	10
Practical/Studio	2 Hr./Week	Practical/Studio	1	Total Marks	25
Total	2 Hr./Week	Total	1		

List of Experiments

1	Create tables with appropriate constraints for the relational schema. a) Create Views on the table. b) Create Indices on the table c) Create Sequence on the table d) Alter the schema by adding/removing columns and constraints. Write DML queries.
2	Execute 'SELECT' queries on the suitable database by using the following methods. a) Using order by clause b) Using group by clause c) Using aggregate functions d) Using having clause e) Using set operators. f) Use SQL single row functions for date, time, string etc.
3	Create suitable database and perform following operations. a) Write equijoin, non-equijoin, self-join and outer join queries. b) Write queries containing single row / multiple row / correlated subqueries using operator like c) Write queries containing single row / multiple row / correlated subqueries using operator = d) Write queries containing single row / multiple row / correlated subqueries using operator in e) Write queries containing single row / multiple row / correlated subqueries using operator any f) Write queries containing single row / multiple row / correlated subqueries using operator all g) Write queries containing single row / multiple row / correlated subqueries using operator exists. Write DML queries containing subqueries. Study a set of query processing strategies.
4	Choose a suitable database system and perform following operations a) Write meaningful stored procedures in PL/SQL. b) Make use of cursors and different arguments. c) Write useful stored functions to perform complex computation. d) Write row level and statement level triggers in PL/SQL.
5	Choose a suitable database system you propose to work. a) Perform requirements analysis in detail for design of the database. b) Design an entity-relationship (ER) data model for the selected database system.
6	Develop a Mini project in a group by using all the concepts you have learnt.

BTECCE23405: Technology Skill Development -2 (JAVA)

Course Type	VSEC	Semester	4

Teaching Scheme		Credits		Examination Scheme	
Lecture	1Hr./Week	Lecture	1	CIE Marks	30
Tutorial	-- Hr./Week	Tutorial	-	ESE Marks	20
Practical/Studio	2 Hr./Week	Practical/Studio	1	Total Marks	50
Total	3Hr./Week	Total	2		

Course Description

This course helps to learn Object Oriented programming paradigm with help of JAVA, java advanced concepts and API. Identifies and analyzes real world practices of web and database implementation.

Course Outcomes

CO No.	Statement
1	Extend their knowledge in utilizing the appropriate advanced features of Java for using emerging frameworks.
2	Understand database programming using JDBC and exception handling.
3	Design dynamic web application.
4	Compare the servlet and JSP usage in dynamic web design
5	Use best practices of advanced database technologies.

Mapping of COs to POs and PSOs

CO No	POs												PSOs				BTL
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1			3														UN
CO2					3												AP
CO3						2											AP
CO4							2										AP
CO5														3			AP

Affinity Level: 1- Slight, 2- Moderate, 3-Substantial, BTL: Bloom's Taxonomy Level

Course Content

Unit No 1	Fundamentals of JAVA	Hours 3	CO	BTL
JVM, Java OOP Concepts (Constructor, Abstraction, Inheritance, Polymorphism, Interfaces), keywords, variable, Packages, Exceptional Handling, Multithreading, Collections.			1	UN
Unit No 2	**JDBC**	**Hours 3**	**2**	**AP**
Database Connectivity (JDBC): Merging Data from Multiple Tables: Joining, Manipulating, Database Programming using JDBC, Prepared Statements, Transaction Processing, Stored Procedures.				

Unit No 3	Servlets	Hours 3	3	AP
Servlet Overview and Architecture, Interface Servlet and the Servlet Life Cycle, Handling HTTP get Requests, Handling HTTP post Requests, Developing and Deploying Servlets on Application Server.				
Unit No 4	Jakarta Server Pages(JSP)	Hours 3	4,5	AP
Basic JSP Architecture, Life Cycle of JSP (Translation, compilation), JSP Expressions, JSP Actions, Implicit Objects, JSP page Directive, The HttpServletRequest Object, The HttpServletResponse Object, Tag Libraries, Exception Handling.				

Textbooks

1	*Advanced Java 2: development for enterprise applications", Clifford J. Berg, Sun ISBN: 0130848751, Microsystems Press, 2000*
2	*"Advanced Java networking", Dick Steflik, Prashant Sridharan, ISBN: 0130844667, Prentice Hall PTR, 2000.*

Reference Books / Journal Articles / Weblink

1	*"Java: The Complete Reference", Herbert Schildt, McGraw Hill Publication, Seventh Edition, ISBN: 007063677X, 2006.*
2	*"Java generics and collections", Thomas Powell, O'Reilly Media, ISBN:0596527756, 2006*
3	*"Java EE 7" for Beginners, Sharanam shah, Vaishali shah, SPD, ISBN:13:978-93-5110-349-3*
4	*https://www.codecademy.com/learn/learn-java* *https://www.udemy.com/java-tutorial/* *https://www.tutorialspoint.com/java/index.html*

List of Experiments

1	Design a java application to demonstrate the use of constructors.
2	Design a java application to demonstrate use of Polymorphism.
3	Design a java application to demonstrate use of abstraction and Encapsulation.
4	Demonstrate use of methods, Exception Handling using try, catch, Multi catch and Finally block.
5	Develop a java application using multithreading.
6	Demonstrate the use of Arraylist in java.
7	Design a java application to demonstrate use of JDBC.
8	Design a java application to demonstrate use of Servlet using database.
9	Develop a java application using JSP.
10	Mini Project:-Students have to implement the mini project which includes following concepts ➢ Java inheritance and Polymorphism ➢ Exceptions ➢ GUI ➢ Collection and JDBC

BTECCE23406 :: Project Management

Course Type		HSSM	Semester		4

Teaching Scheme		Credits		Examination Scheme	
Lecture	2Hr./Week	Lecture	2	CIE Marks	50
Tutorial	-- Hr./Week	Tutorial	-	ESE Marks	0
Practical/Studio	--Hr./Week	Practical/Studio	-	Total Marks	50
Total	2Hr./Week	Total	2		

Course Description

This course helps the student to understand the project planning, budgeting process. It will also focus on risk analysis, creation of effective and deliverable project plans. It will also identify roles and work with cross functional teams.

Course Outcomes

CO No.	Statement
1	Understand the basics of Project Management and importance of knowledge areas
2	Estimate scope and time factor for project.
3	Implement Project Quality factors
4	Analyze Human Resource requirements
5	Predict risks associated with Project Management activities

Mapping of COs to POs and PSOs

CO No	PO												PSO				BTL
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1									3								UN
CO2										3							AP
CO3											3						AP
CO4												2					AP
CO5														1			AP

Affinity Level: 1- Slight, 2- Moderate, 3-Substantial, BTL: Bloom's Taxonomy Level

Course Content

Unit No 1	Introduction to Project Management	Hours 6	CO	BTL
	Project definition, Project Attributes, The Triple Constraint, Project Management Knowledge Areas, Project Management Tools and Techniques, Project Success. The Role of the Project Manager, Suggested Skills for ProjectManagers, Importance of People and Leadership Skills, Project Integration Management, Developing a Project Charter, developing a Project Management Plan, Performing Integrated Change Control, Change Control on Information Technology Projects, Change Control System, Closing Projects, or Phases.		1	UN
Unit No 2	Project scope and time management	Hours 6	2	AP
	Project Scope Management, Collecting Requirements, Defining Scope, Work Breakdown Structure, The WBS Dictionaryand Scope Baseline, Verifying Scope, Controlling Scope, The Importance of Project Schedules, Defining Activities, Sequencing Activities, Dependencies, Estimating Activity Resources, Estimating Activity Durations, Developing the Schedule, Gantt Charts, Critical Path Method, Program Evaluation and Review Technique (PERT)			
Unit No 3	Project cost and quality	Hours 6	3	AP
	The Importance and Basic Principles of Cost Management, Types of Cost Estimates, Cost Estimation Tools and Techniques, Determining the Budget, The Importance of Project Quality Management, Planning Quality, Performing Quality Assurance, Performing Quality Control, Tools and Techniques for Quality Control, Deming 14 Points, Ishikawa model, Taguchiand Robust Design Methods, ISO Standards, PDCA cycle, The Cost of Quality, Maturity Models.			
Unit No 4	Human resource & communication management	Hours 6	4	AP
	Developing the Human Resource Plan, Project Organizational Charts, Responsibility Assignment Matrices, Staffing Management Plans and Resource Histograms, Resource Assignment, Resource Loading, Resource Leveling, Developing the Project Team, Training, Team-Building Activities, Managing the Project Team, Project Communications Management, Identifying Stakeholders, Managing Stakeholders, Planning Communications- Formal and Informal Methods for Distributing Information, Selecting the Appropriate Communications Medium, Reporting Performance.			
Unit No 5	Project risk management	Hours 6	5	AP
	The Importance of Project Risk Management, Planning Risk Management, Common Sources of Risk on Information Technology Projects, Identifying Risks, Suggestions for Identifying Risks, The Risk Register, Performing Qualitative Risk Analysis, Using Probability/Impact Matrixes to Calculate Risk Factors, Top Ten Risk Item Tracking, Performing Quantitative Risk Analysis, Decision Trees and Expected Monetary Value, Simulation, Sensitivity Analysis, Planning Risk Responses, Monitoring and Controlling Risks.			

Textbooks

1	Information Technology Project Management, Kathy Schwalbe, Sixth Edition, Course Technology, ISBN-13: 978-1-111-22175-1, ISBN-10: 1-111-22175-8
2	Software Project Management, A United Framework, Walker Royce
3	Essentials of Software Project Management, second edition, Richard Bechtold (Author) Publisher: Management Concepts; second edition (April 12, 2007) ISBN-10:1567261868 ISBN-13: 978-1567261868
4	Software Project Management, Bob Hughes, Mike Cotterill Publisher: McGraw-Hill Publishing Co.; 4Rev Ed edition (November 1, 2005) ISBN-10: 0077109899 ISBN-13-978-0077109899

Reference Books / Journal Articles / Weblink

1	Quality Software Project Management, Robert T. Futrell, Donald F. Shafer, Linda I. Shafer Publisher: Prentice Hall PTR; 1st edition (January 24, 2002ISBN-10: 0130912972 ISBN-13: 978-0130912978
2	Software Engineering Project Management, 2nd Edition, Edward Yourdon, Richard H. Thayer Publisher: Wiley-IEEE Computer Society Pr; 2 Sub edition (May 10, 2000) ISBN-10: 0818680008 ISBN-13: 978-0818680007
3	Software Engineering, Ian Sommerville, 8th Edition, Addison-Wesley, 2006, ISBN-10: 0321313798, ISBN-13: 9780321313799
4	Software Engineering: A Practitioner's Approach, 6/e, Roger S Pressman, McGraw Hill, 2005, ISBN: 0072853182

BTECCE23407 : :Leadership and Personality Development

Course Type	AEC	Semester	4

Teaching Scheme		Credits		Examination Scheme	
Lecture	2 Hr./Week	Lecture	2	CIE Marks	50
Tutorial	0 Hr./Week	Tutorial	0	ESE Marks	00
Practical/Studio	0Hr./Week	Practical/Studio	0	Total Marks	50
Total	2 Hr./Week	Total	2		

Course Description

This course on Leadership and Personality Development equips students with essential leadership skills and fosters personal growth. It focuses on understanding leadership theories, self-awareness, communication skills, team dynamics, and ethical practices to prepare students for effective leadership roles in professional and personal contexts.

Course Outcomes

CO No.	Statement
CO1	Analyze different leadership styles and apply them in professional settings.
CO2	Identify personal strengths and weaknesses using personality assessments.
CO3	Develop effective communication and interpersonal skills for leadership roles.
CO4	Foster teamwork and collaboration using conflict resolution strategies.
CO5	Connect academic knowledge with industry practices through interaction with industry professionals.

Mapping of COs to POs and PSOs

CO No	POs												PSOs				BTL
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1									3								UN
CO2										2							AP
CO3											2						AN
CO4								2									AP
CO5														3			AN

Affinity Level: 1- Slight, 2- Moderate, 3-Substantial, BTL: Bloom's Taxonomy Level

Course Content

Unit No-1	Introduction to Leadership	Hours -6	CO	BTL
Definition and importance of leadership, Different leadership styles (Transformational, Transactional, Servant Leadership),Leadership vs. Management, Traits of successful leaders Industry Guest Lecture: Real-life leadership experiences and challenges			1	UN
Unit No-2	Personality Development	Hours -6	2	AP
Personality theories (Big Five, MBTI),Self-awareness and self-assessment tools, Building self-confidence and emotional intelligence, Practical workshops on personality assessments, Industry Panel: Insights on the importance of personality in professional growth				
Unit No-3	Communication Skills	Hours -6	3	AP
Verbal and non-verbal communication, Effective listening and feedback, Public speaking and presentation skills, Conflict resolution and negotiation techniques, Case Study Analysis: Real-life communication challenges in industries				
Unit No-4	Team Dynamics and Collaboration	Hours -6	4	AN
Building effective teams, Stages of team development (Forming, Storming, Norming, Performing), Role of a leader in team dynamics, Group activities to foster collaboration, Industry Workshop: Industry leaders' experiences with team challenges				
Unit No-5	Connecting with the Industry	Hours -6	5	AN
Leadership challenges in different industries (IT, Healthcare, Manufacturing), Current trends in leadership and personal development, Networking strategies for professional development, Industry Round Table: Q&A with professionals from various sectors, Practical project: Leadership case study with a focus on industry issues				

Textbooks

1	Leadership and Self-Deception by Arbinger Institute.
2	Emotional Intelligence by Daniel Goleman.

Reference Books

1	*"Leadership: Theory and Practice", Peter G. Northouse.*
2	*"Personality: Classic Theories and Modern Research", Howard S. Friedman and Miriam W. Schustack.*
3	*"The Art of Communicating", Thich Nhat Hanh.*
4	*"Team work and Team play" , Sivasailam 'Thiagi' Thiagarajan and Glenn Parker.*
5	*"Drive: The Surprising Truth About What Motivates Us", Daniel H. Pink.*

BTECCE23408:: From Campus to Corporate - I

Course Type		AEC	Semester		4

Teaching Scheme		Credits		Examination Scheme	
Lecture	2 Hr./Week	Lecture	2	CIE Marks	50
Tutorial	0 Hr./Week	Tutorial	0	ESE Marks	00
Practical/Studio	0 Hr./Week	Practical/Studio	0	Total Marks	50
Total	2 Hr./Week	Total	2		

Course Description

This course helps the student to transition smoothly from a campus environment to the corporate environment. It aids the student to understand the evolution of a industry, understand how a typical company in this industry or domain are set up and organized, how to apply knowledge gained into practical situations, gaining life skills, and learning the basics of entrepreneurship.

Course Outcomes

CO No.	Statement
1	Examine how a typical company in this industry or domain is set up and organized, its evolution and how to dissect it.
2	Apply knowledge to various aspects of industry such as design thinking, product solutions, management and specifications.
3	Imbibe life skills such as continuous learning and improvement, time management, multitasking and communication.
4	Understand the different aspects of entrepreneurship and study the entrepreneurial mindset.
5	Analyze case studies of various types of industries.

Mapping of COs to POs and PSOs

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	BTL
							POs							PSOs			BTL
CO1									2								UN
CO2						2											AN
CO3												3					AP
CO4											3						AN
CO5														2			AP

Affinity Level: 1- Slight, 2- Moderate, 3-Substantial, BTL:Bloom's Taxonomy Level

Course Content

Unit No 1	Companies & Industry	Hours 5	CO	BTL
EVOLUTION OF TECHNOLOGY: Understand the evolution of a industry / domain and how it has changed over time and why.			1	UN
INNOVATION AGE: Understanding Innovation and how new Impactful ideas have evolved.				

COMPANY ORGANIZATION: Understand how a typical company in this industry or domain are set up and organized. What are the commonalities and what can change based on size or type within the domain. **UNDERSTANDING COMPANIES:** Understanding companies - Domain, Offering, Customers, Strategy. Understand how to dissect a company to get a 360 deg view of their domain, products, customers they serve and what seems to be their strategy and why.				
Unit No 2	**Application of Knowledge**	**Hours 10**	**2**	**AN**
PRODUCT SOLUTIONING: Product Solutioning and Development - Understanding beyond the theory. Understand how products are solutioned and built and what are the kind of considerations in the real world to create a effective product development and delivery. **PRODUCT MANAGEMENT:** Product Management - Understanding beyond the theory. Understand how opportunities and ideas are evangalised and translated into product specifications and offerings for the market **METRICS AND MEASUREMENTS:** What is not measurable is not real. Understand metrics/KPIs/OKRs as they are used in the industry to measure various aspects of product , operations and company performance. **DESIGN THINKING:** Design Thinking is a creative approach that pulls together what's designable from a human point of view with what is technologically feasible and economically viable. **UNDERSTANDING UX AND UI:** UX is how products are seen, understood and consumed by customers. what makes it a great experience for a customer and how products are designed for the best possible experience Usability by end user - UX and other key concepts and its importance. **EFFECTIVE PRODUCT SPECIFICATIONS:** Writing good product or service specifications which can be translated to building a good product . How to understand a need in the market and translate it into detailed specifications with good coverage of use cases and application and which can be used to build a good product or service. **DOING EFFECTIVE RESEARCH:** How to do effective product, competition or technical research and use it effectively . Doing research and using it effectively for your needs is essential in a company. Understand how to do it effectively and use it. **RELEASING A PRODUCT TO THE MARKET:** What it takes to release a product to the market right every time. Understand the importance and techniques of releasing a product to the market and what all has to be considered to you get it right the first time. **QUALITY - UNDERSTANDING BEYOND THE THEORY:** Quality starts right from deciding what to build and creating requirements to all the way to being able to maintain it easily. Understand what is Quality in the industry and what all you have to consider and plan for to get end to end quality for your product or service. **TESTING & AUTOMATION:** Testing and testing automation - understand beyond the theory . What is effective testing coverage and automation . How those choices on what to test, how much and what needs to be automated are made and what type of automations exist. **SOURCE CODE CONTROL:** Importance of source code control and tools used in industry **LIFECYCLE:** Understand common and key tools used in the industry and what their purpose				

is and how they can be used effectively.				
Unit No 3	**Life Skills**	**Hours 7**	**3**	**AP**
CONTINUOUS LEARNING AND IMPROVEMENT: Continuous learning cannot happen accidently . Understand the technique to identify learning areas and follow through on making the learning happen. **OWNERSHIP:** Ownership is a widely used word but how does one understand how to measure it and thus demonstrate it ? **TIME MANAGEMENT AND MULTI TASKING:** Learn how to manage time and multi task effectively and with proper priority scheme. **BEING AN EFFECTIVE MENTEE AND MENTOR:** How does one become a good mentee to get the most out of a mentor and how to effectively mentor when you are needed to. **BEING INQUISITIVE:** Why asking questions is more difficult than giving answers? Hands on exercise. How to manage fear and have a way to understand and ask effective questions and learn. **ARTICULATION AND COMMUNICATION:** What is communication vs articulation and how does one do good articulation to get the message across most effectively. What is communication vs articulation and how does one do good articulation to get the message across most effectively **IMPACTFUL INTRODUCTIONS:** How to present yourself and do impactful presentations while managing expectations, constraints and make the most of the opportunity to present. **YOUR FIRST BOSS AND BEYOND:** Role and importance of first boss in a person's career.				
Unit No 4	**Entrepreneurship**	**Hours 4**	**4**	**AN**
SALES 101: Learn what 'sales' is and different types by product and industry. Understand basics of sales , sales techniques, metrics and success criteria **FUNDING FOR STARTUPS:** What does it mean to bootstrap a company and how is it done ? what are the challenges and best practices to attract funding and stand out for investors ? **STARTUPS: SUCCESS AND ENTREPRENEURAL MINDSET:** Can anyone become a entrepreneur or do we need to develop a mindset, skill set and temperament for it ? What is the definition of success at various stages of. a startup and how to understand and manage it ?				
Unit No 5	**Case studies**	**Hours 4**	**5**	**AN**
Case studies of different types of industries				

Textbooks

1	*"From College to Career: Making a Successful Transition to the Corporate World",Gerald Gilbert Bustamente (Author), Linda Taylor Bustamente, iUniverse, ISBN: 0595-43-157-7*

Reference Books / Journal Articles / Weblink

1	*The Corporate Jungle: Your Guide to Understanding Workplace People and Politics, Seema Raghunath*
2	*"How to Win Friends and Influence People", Dale Carnegie*

VE23CE02: Environmental Science II

Course Type		VEC	Semester	4

Teaching Scheme		Credits		Examination Scheme	
Lecture	2Hrs./Week	Lecture	2	CIE Marks	50
Tutorial	0 Hrs./Week	Tutorial	0	ESE Marks	00
Practical/Studio	0 Hrs./Week	Practical/Studio	0	Total Marks	50
Total	2 Hrs./Week	Total	2		

Course Description

This course develops awareness about environmental issues and also develop an understanding based on observation and illustration drawn from lived experiences and physical, biological, social and cultural aspects of life, rather than abstractions.

Course Outcomes

CO No.	Statement
1	Gain a comprehensive understanding of major environmental issues such as climate change, global warming, ozone layer depletion, acid rain, and their impact on human societies and ecosystems.
2	Learn about the environmental laws, policies, and international agreements designed to address environmental problems.
3	Explore human-environment interactions, including the impact of human populations on the environment and the principles of sustainable development.
4	Understand disaster management strategies, including monitoring, prediction, and mitigation of natural disasters.
5	Develop skills in environmental communication and public awareness campaigns to promote sustainable practices in communities.

Mapping of COs to POs and PSOs

CO No	POs												PSOs				BTL
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1									3								UN
CO2									2								AP
CO3										2							AN
CO4								2									AP
CO5														2			AN

Affinity Level: 1- Slight, 2- Moderate, 3-Substantial, BTL:Bloom's Taxonomy Level

Course Content

Unit No 1	Climate Change and Global Environmental Issues	6 Hours	CO	BTL
- Climate Change and Global Warming - Ozone Layer Depletion - Acid Rain and its impacts on agriculture and human health - Environmental Movements (Chipko, Silent Valley, Bishnois of Rajasthan) - Global and Local Movements Against Climate Change			1	UN

Unit No 2	**Environmental Policies & Practices**	**6 Hours**	2	AP
• Environmental Laws: Environment Protection Act, Air and Water Pollution Control Acts, Wildlife Protection Act, Forest Conservation Act • International Environmental Agreements: Montreal and Kyoto Protocols, CBD, Chemical Weapons Convention • Nature Reserves, Tribal Rights, and Human-Wildlife Conflicts in India				

Unit No 3	**Human Communities and the Environment**	**6 Hours**	3	AN
• Impact of Human Population Growth on Environment • Carbon Footprint and Sustainable Practices • Resettlement and Rehabilitation of Project-Affected Persons (Case Studies)				

Unit No 4	**Disaster Management**	**6 Hours**	4	AP
• Understanding and Managing Natural Disasters: Floods, Earthquakes, Cyclones, and Landslides • Monitoring, Prediction, and Mitigation Techniques • Case Studies of Disaster Management				

Unit No 5	**Environmental communication and public Awareness**	**6 Hours**	5	AN
• Role of Ethics and Religions in Environmental Conservation • Environmental Communication and Public Awareness Campaigns • Case Studies and Community-based Environmental Communication				

Textbooks

Text Books :
1. Morgen, M.D. Morgen J.M. and Wiersima J.H. 1993, Environmental Science: Managing Physical and Biological Resources Wm C Brown Publishers London.
2. Dhaliwal G.S., Sangha G.S. and Ralhan P.K. 2000, Fundamentals of
3. Environmental Science, Kalyani Publishers, New Delhi.
4. Khopkar, S.M. 1993 : Environmental Pollution Analysis, Wiley Eastern Limited New York
5. Dr. Y. K. Singh, 2006, Environmental Science, New age International Publishers

Reference Books / Journal Articles / Weblink

1. De, A.K. 1990, Environmental Chemistry, Wiley Eastern Ltd., New Delhi.
2. Sodhi G.S. 2005, Fundamentals of Environmental Chemistry : Narosa Publishing House, New Delhi.
3. Morgen, M.D. Morgen J.M. and Wiersima J.H. 1993, Environmental Science Managing Physical and Biological Resources Wm C Brown Publishers London.
4. Caralyn Zehnder, Kalina Manoylov, Samuel Mutiti, Christine Mutiti, Allison VandeVoort, 2018, Introduction to Environmental Science (edition 2), Springer

MT23CE02A ::Computational Theory

Course Type		MC	Semester		4

Teaching Scheme		Credits		Examination Scheme	
Lecture	3 Hr./Week	Lecture	3	CIE Marks	60
Tutorial	-- Hr./Week	Tutorial	-	ESE Marks	40
Practical/Studio	-- Hr./Week	Practical/Studio	-	Total Marks	100
Total	3 Hr./Week	Total	3		

Course Description

This course introduces students to the mathematical foundations of computation including automata theory; the theory of formal languages and grammars; the notions of algorithm, decidability, complexity, and computability. Provides knowledge on mathematical proofs for computation and

Course Outcomes

CO No.	Statement
1	Infer the applicability of various automata theoretic models for recognizing formal languages.
2	Discriminate the expressive powers of various automata theoretic and formal language theoretic computational models.
3	Illustrate significance of non-determinism pertaining to expressive powers of various automata theoretic models.
4	Comprehend general purpose powers and computability issues related to state machines and Grammars.
5	Explain the relevance of Church-Turing thesis, and the computational equivalence of Turing machine model with the general purpose computers.

Mapping of COs to POs and PSOs

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	BTL
						Pos								PSOs			
CO1	3																AP
CO2		3															AP
CO3						1											AP
CO4												3					AN
CO5														3			AN

Affinity Level: 1- Slight, 2- Moderate, 3-Substantial, BTL: Bloom's Taxonomy Level

Course Content

Unit No 1	Finite Automata	Hours 9	CO	BTL
Introduction to Automata, Computability and Complexity theory, Automaton as a model of computation, Central Concepts of Automata Theory: Alphabets, Strings, Languages. Decision Problems Vs Languages. Finite Automata, Structural Representations, Deterministic Finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, transition table, Language of DFA, construction of DFAs for Languages, Product construction, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Conversion of NFA with epsilon transitions to DFA, Automata with output. Applications and Limitation of Finite Automata.			1	AP
Unit No 2	Regular and Non Regular Languages	Hours 9	2	AP
Regular expression (RE), Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleene's Theorem: Equivalence Regular expressions and DFAs, Closure properties of Regular Languages (union, intersection, complementation, concatenation, Kleene's closure). Applications of Regular expressions, Myhill-Nerode theorem and its applications: proving non-regularity, lower bound on number of states of DFA, State Minimization algorithm, Equivalence testing of DFAs. Non Regular Languages, Pumping Lemma for regular Languages.				
Unit No 3	Context Free Grammars (CFG)	Hours 9	3	AP
Context Free Grammars: Definition, Examples, Derivation and syntax trees, Languages of CFG, Constructing CFG. Derivation trees, Ambiguity in CFGs, Removing ambiguity, Inherent ambiguity. Simplification of CFGs, Normal forms for CFGs: CNF and GNF. Applications of CFG.				
Unit No 4	Push Down Automata (PDA), Non-Context Free Languages, Context Sensitive Languages	Hours 9	4	AN
Push Down Automata: Description and definition, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic, Non-deterministic PDAs, CFG to PDA construction (with proof). Equivalence of PDA and CFG (without proof). Closure properties of CFLs (Union, Concatenation, Kleene closure, reversal). Intersection of CFLs and Regular language. Pumping lemma for CFLs. Context Sensitive Languages: Definition and Examples of Context Sensitive Grammars, Linear Bounded Automata. Chomsky hierarchy of languages.				
Unit No 5	Introduction to Turing Machines	Hours 9	5	AN
Turing Machines: Basic model, definition and representation, Instantaneous Description, Language acceptance by TM. Design of Turing Machine, Church's Machine, Robustness of Turing Machine model and equivalence with various variants: Two-way/One-way infinite tape TM, multi-tape TM, non-deterministic TM, Universal Turing Machines. Recursive and Recursively Enumerable languages and their closure properties.				

Textbooks

1	*Hopcroft J, Motwani R, Ullman, Addison-Wesley, "Introduction to Automata Theory, Languages and Computation", Second Edition, ISBN 81-7808-347-7.*
2	*Michael Sipser, Course Technology, "Introduction to Theory of Computation", Third Edition, ISBN-10:053494728X*

Reference Books / Journal Articles / Weblink

1	*J. Martin, "Introduction to Languages and the Theory of computation", Third edition, Tata McGraw-Hill, ISBN 0-07-049939-x, 2003.*

OE23CE02:: Information and Application Security

Course Type		OE	Semester		4

Teaching Scheme		Credits		Examination Scheme	
Lecture	3Hr./Week	Lecture	3	CIE Marks	60
Tutorial	0Hr./Week	Tutorial	0	ESE Marks	40
Practical/Studio	0Hr./Week	Practical/Studio	0	Total Marks	100
Total	3Hr./Week	Total	3		

Course Description

This course provides a foundational understanding of application security concepts, vulnerabilities, and best practices. It equips students with the knowledge and skills to secure applications against common threats, emphasizing the OWASP Web Application Security Testing Guide and industry standards.

Course Outcomes

CO No.	Statement
1	Understand and apply secure software development principles.
2	Analyze and mitigate common web application vulnerabilities.
3	Conduct application security testing using industry-standard tools.
4	Implement secure authentication, authorization, and session management mechanisms.
5	Audit and enhance application security configurations using logging and monitoring strategies.

Mapping of COs to POs and PSOs

CO No	POs												PSOs				BTL
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	3																UN
CO2				3													AP
CO3					3												AN
CO4							2										AP
CO5																3	AN

Affinity Level: 1- Slight, 2- Moderate, 3-Substantial, BTL: Bloom's Taxonomy Level

Course Content

Unit No 1	Information Security Fundamentals and Secure Software Development	Hours 9	CO	BTL
CIA Triad (Confidentiality, Integrity, Availability), Threat Landscapes and Risk Management, Access Control Models, Security Standards and Compliance, Secure Software Development Lifecycle (SDLC), OWASP Top 10 Vulnerabilities Overview, Web Application Architecture Fundamentals.			1	UN

Unit No 2	**Input Validation, Data Protection, and Vulnerability Mitigation**	Hours 9	**2**	**AP**
Input Validation and Output Encoding, Cross-Site Scripting (XSS), SQL Injection, Buffer Overflows, Canonicalization Issues, Sensitive Data Protection (At Rest and In Transit), Data Encryption and Mitigating Information Disclosure.				
Unit No 3	**Authentication, Authorization, and Session Management**	Hours 10	**3**	**AN**
Authentication Mechanisms and Attacks (Brute Force, Dictionary), Authorization Flaws (Privilege Escalation, Role-Based Access Control), Multi-Factor Authentication (MFA), Secure Session Management Techniques, Cookie Replay Attacks, Man-in-the-Middle Attacks, Session Hijacking and Misuse Prevention.				
Unit No 4	**Application Security Testing Tools and Techniques**	Hours 7	**4**	**AP**
Static Application Security Testing (SAST), Dynamic Application Security Testing (DAST), Burp Suite and OWASP ZAP, Nikto and Nmap for Vulnerability Scanning, Exploit Development Basics, Misconfiguration Testing, Cross-Site Request Forgery (CSRF) Prevention.				
Unit No 5	**Cryptography, Logging, and Advanced Security Practices**	Hours 9	**5**	**AN**
Key Management and Modern Encryption Algorithms, Secure Random Number Generation, Parameter Manipulation (Cookie Tampering, HTTP Header Injection), Error and Exception Handling Practices, Logging and Monitoring for Security Assurance, Content Security Policy (CSP) Enforcement, Emerging Trends and Case Studies in Application Security.				

Textbooks

1	*"Web Application Security: Exploitation and Countermeasures for Modern Web Applications" by Andrew Hoffman, ISBN: 978-1492053118*
2	*"The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws" by Dafydd Stuttard and Marcus Pinto, ISBN: 978-1118026472*
3	*"Information Security: Principles and Practices" by Mark S. Merkow and Jim Breithaupt, ISBN: 978-0789749499*

Reference Books / Journal Articles / Weblink

1	*"OWASP Top 10: The Ten Most Critical Web Application Security Risks" by OWASP Foundation*
2	*"Hacking: The Art of Exploitation" by Jon Erickson, ISBN: 978-1593271442.*
3	*"Cryptography and Network Security: Principles and Practice" by William Stallings, ISBN: 978-0134444284*