



## **CURRICULUM R 2022 A (in line with NEP 2020)**

**FRAMEWORK OF CURRICULUM 2022 (in line with NEP 2020)**
**SEMESTER – I**

SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	BS		Mathematics – 1	3	0	2	4	2	5
2	BS		Physics	3	0	2	4	2	5
			Chemistry						
3	HS		English 1	2	0	1	2	1	3
			English 2						
4	PC		Programming Fundamentals using C OR Programming in Python	2	0	2	3	2	4
			Engineering Graphics and Computer Aided Design						
5	ES		Design Thinking	2	0	2	3	2	4
6	ES		Engineering Practices Lab	0	0	4	2	2	4
			Fab Lab						
7	HS		Outreach (NCC, NSS, Y's Men, Rotaract) – Level I	0	0	2	1	4	2
8	HS		Regional Language OR Foreign Language	2	0	0	2	2	2
			Universal Human Values						
9	HS		Tamil Culture and Technology	1	0	0	1	2	1
<b>Total</b>				<b>15</b>	<b>0</b>	<b>15</b>	<b>22</b>	<b>19</b>	<b>30</b>

**SEMESTER – II**

SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	BS		Mathematics – 2	3	0	2	4	2	5
2	BS		Physics	3	0	2	4	2	5
			Chemistry						
3	HS		English 1	2	0	1	2	1	3
			English 2						
4	PC		PC – 1 (Department specific)	3	0	2	4	2	5
5	ES		Programming Fundamentals using C OR Programming in Python	2	0	2	3	2	4
			Engineering Graphics and Computer Aided Design						
6	ES		Engineering Practices Lab	0	0	4	2	2	4
			Fab Lab						
7	HS		Outreach (NCC, NSS, Y's Men, Rotaract) – Level II	0	0	2	1	4	2
8	HS		Regional Language OR Foreign Language	2	0	0	2	2	2
			Universal Human Values						
9	MC		Mandatory Course #1 Mandatory Course I is a Non-credit course (Student shall select one course from the list given under Mandatory Course I)	3	0	0	0	2	3
<b>Total</b>				<b>18</b>	<b>0</b>	<b>15</b>	<b>22</b>	<b>19</b>	<b>33</b>

**FRAMEWORK OF CURRICULUM 2022 A (in line with NEP 2020)**

**SEMESTER – III**

SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	BS	EMA51006	Applied Linear Algebra	3	1	0	4	2	4
2	PC	ECS51004	Data Structures	3	0	2	4	2	5
3	PC	EAD51001	Python for Data Science	2	0	2	3	2	4
4	DE	ECS51***	DE 1	2	0	2	3	2	4
5	PC	ECS51006	Database Management Systems	2	0	2	3	2	4
6	EEC	ECS51800	Design Project – 1	0	0	2	1	6	2
7	ES	ECT51002	Environmental Science and Sustainable Development	2	0	0	2	2	2
8	EEC	ECS51801	Internship -1 (To be carried out in summer after 2 <sup>nd</sup> semester and evaluated in 3 <sup>rd</sup> semester)	0	0	0	1	2	0
9	HS		Advanced Academic Writing	1	0	1	1	1	2
10	MC		Mandatory Course #II	3	0	0	0	2	3
<b>Total</b>				<b>18</b>	<b>1</b>	<b>11</b>	<b>22</b>	<b>23</b>	<b>30</b>

**SEMESTER – IV**

SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	BS	EMA51007	Probability and Statistics	3	1	0	4	2	4
2	PC	ECS51008	Operating Systems	3	0	2	4	2	5
3	PC	ECS51009	Design and Analysis of Algorithms	2	0	2	3	2	4
4	ES	ECS51010	Computer Networks	2	0	2	3	2	4
5	DE	ECS51***	DE 2	2	0	2	3	2	4
6	NE	E**51***	NE 2	2	0	2	3	2	4
7	EEC	ECS51802	Design Project – 2	0	0	2	1	6	2
8	HS		Professional Editing and Project Writing	1	0	1	1	1	2
9	MC		Mandatory Course #III	3	0	0	0	2	3
<b>Total</b>				<b>18</b>	<b>1</b>	<b>13</b>	<b>22</b>	<b>21</b>	<b>32</b>

**FRAMEWORK OF CURRICULUM 2022 A (in line with NEP 2020)**

**SEMESTER – V**

SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	BS	EMA51005	Discrete Mathematics	3	1	0	4	2	4
2	PC	EAD51002	Data Handling and Visualization	2	0	2	3	2	4
3	PC	ECS51013	Artificial Intelligence and Expert Systems	3	0	0	3	2	4
4	DE	ECS51***	DE 3	2	0	2	3	2	4
5	NE	E**51***	NE 3	2	0	2	3	2	4
6	EEC	ECS51803	Design Project – 3	0	0	2	1	6	2
7	ES	EGE51002	Entrepreneurship	2	0	0	2	6	2
8	HS		Public Speaking	1	0	1	1	1	2
9	EEC	ECS51804	Internship -2 (to be evaluated in 5 <sup>th</sup> semester. To be carried out in summer after 4 <sup>th</sup> semester))	0	0	0	1	0	0
<b>Total</b>				<b>15</b>	<b>1</b>	<b>9</b>	<b>21</b>	<b>23</b>	<b>26</b>

**SEMESTER – VI**

SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	PC	ECS51012	Web Programming	2	0	2	3	2	4
2	PC	ECS51016	Machine Learning Concepts	3	0	2	4	2	5
3	PC	ECS51015	Virtualization and Cloud Computing	2	0	2	3	2	4
4	PC	EAD51004	Business Intelligence and Analytics	2	0	2	3	2	4
5	DE	ECS51***	DE 4	2	0	2	3	2	4
6	NE	E**51***	NE 4	2	0	2	3	2	4
7	EEC	ECS51805	Design Project – 4	0	0	2	1	6	2
8	HS		English for Competitive Examinations	1	0	1	1	1	2
<b>Total</b>				<b>14</b>	<b>0</b>	<b>15</b>	<b>21</b>	<b>19</b>	<b>29</b>

FRAMEWORK OF CURRICULUM 2022 A (in line with NEP 2020)									
SEMESTER – VII									
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	PC	EAD51006	Principles of Deep Learning	3	0	2	4	2	5
2	PC	EAD51007	Big Data and Analytics	2	1	0	3	2	3
3	PC	ECS51019	Modern Software Engineering	2	0	2	3	2	4
4	DE	ECS51***	DE 5	2	0	2	3	2	4
5	NE	E**51***	NE 5	2	0	2	3	2	4
6	ES	EGE51003	Research Methodology & IPR	2	0	0	2	2	2
7	EEC	ECS51806	Project Phase 1	0	0	6	3	6	6
8			Verbal Reasoning and Interview Skills	1	0	1	1	1	2
Total				14	1	15	22	19	30
SEMESTER – VIII									
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	EEC		Project Phase 2	0	0	26	13	10	24
Total				0	0	26	13	10	24
Total Credits for the Program							165		

#### CREDIT COUNT

Semester	Credit Count
1	22
2	22
3	22
4	22
5	21
6	21
7	22
8	13
	165

**MANDATORY COURSES I**

S.No	Course Code	Course Title	Periods Per week			Total Contact Periods	Credits
1		Introduction to Women and Gender Studies	3	0	0	3	0
2		Public and Personal Administration	3	0	0	3	0
3		Constitution of India	3	0	0	3	0
4		Law for Engineers	3	0	0	3	0
5		Indian Knowledge System (IKS)	3	0	0	3	0

**MANDATORY COURSES II**

S.No..	Course Code	Course Title	Periods Per week			Total Contact Periods	Credits
1		Wellbeing with Traditional Practices (Yoga, Ayurveda and Siddha)	3	0	0	3	0
2		History of Science and Technology in India	3	0	0	3	0
3		Political and Economic Thought for a Humane Society	3	0	0	3	0
4		State, Nation-Building and Politics in India	3	0	0	3	0
5		Industrial Safety	3	0	0	3	0

**MANDATORY COURSES III**

S.No.	Course Code	Course Title	Periods Per week			Total Contact Periods	Credits
1		Principles of Management	3	0	0	3	0
2		Human Resource Management	3	0	0	3	0
3		Green Technology	3	0	0	3	0
4		Industrial Management	3	0	0	3	0
5		Fintech and Financing new Business	3	0	0	3	0

**COURSES OFFERED BY THE DEPARTMENT OF LANGUAGES**

S.No.	Course Title	Semester	Credit
1	Communication Skills (Improving English communication skills.)	I / II	2
2	Personality Development and Soft Skills (Enhancing the personality through English communication skills)	I / II	2
3	Advanced Academic Writing (Developing essential writing skills for academic and professional settings)	III	1
4	Professional Editing and Project Writing (Presenting the skills of creating professional documents and projects that are clear, concise, and effective)	IV	1
5	Public Speaking	V	1
6	English for Competitive Examinations (Developing the necessary skills and knowledge to succeed in competitive exams)	VI	1
7	Verbal Reasoning and Interview Skills	VII	1

**FRAMEWORK OF CURRICULUM 2022 A (in line with NEP 2020)**

**SEMESTER – III**

SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	BS	EMA51006	Applied Linear Algebra	3	1	0	4	2	4
2	PC	ECS51004	Data Structures	3	0	2	4	2	5
3	PC	EAD51001	Python for Data Science	2	0	2	3	2	4
4	DE	ECS51***	DE 1	2	0	2	3	2	4
5	PC	ECS51006	Database Management Systems	2	0	2	3	2	4
6	EEC	ECS51800	Design Project – 1	0	0	2	1	6	2
7	ES		Environmental Science and Sustainable Development	2	0	0	2	2	2
8	EEC	ECS51801	Internship -1 (To be carried out in summer after 2 <sup>nd</sup> semester and evaluated in 3 <sup>rd</sup> semester)	0	0	0	1	2	0
9	HS		Advanced Academic Writing	1	0	1	1	1	2
10	MC		Mandatory Course #II	3	0	0	0	2	3
		<b>Total</b>		<b>18</b>	<b>1</b>	<b>11</b>	<b>22</b>	<b>23</b>	<b>30</b>





1: Weakly related, 2: Moderately related and 3: Strongly related	
<b>MODULE 1: Vector Spaces</b> (9L+3T=12)	
Introduction - Definitions and Examples of a Vector Space - Subspace - Linear Dependence and Independence <b>Suggested Reading:</b> Introduction to Mathematical Logic	<b>CO-1</b> <b>BTL-3</b>
<b>MODULE 2: Basis and Dimension</b>	
Definition of Basis and Dimension-Vector Space as a Direct Sum of Subspaces- Null Space and Range Space – Rank – Nullity- Sylvester’s Inequality. <b>Suggested Reading:</b> Basic concepts of rank and cardinality.	<b>CO-2</b> <b>BTL-3</b>
<b>MODULE 3: Inner Product Spaces</b>	
Definitions-examples and properties - Norm as length of a vector- Distance between two vectors-Orthonormal basis-Orthonormal projection-Gram Schmidt processes of orthogonalization. <b>Suggested Reading:</b> Basic concepts of spaces	<b>CO-3</b> <b>BTL-3</b>
<b>MODULE 4 : Linear Transformations</b>	
Definitions and Examples-Properties of linear transformations- Equality of linear transformations- Kernel and Rank of linear Transformations-Composite transformations <b>Suggested Reading:</b> Basics of transformation.	<b>CO-4</b> <b>BTL-3</b>
<b>MODULE 5: Matrix Linear Transformations</b>	
Inverse of a linear transformation- Matrix of a linear transformation- Matrix of the sum of two linear transformations and a scalar multiple of a linear transformation -Matrix of composite linear transformation-Matrix of inverse transformation-Change of basis-Similar matrices. <b>Suggested Reading:</b> Basics of matrices	<b>CO-5</b> <b>BTL-3</b>
<b>TEXT BOOKS</b>	
1.	K. B. Datta (2009) <i>Matrix and Linear Algebra aided with MATLAB</i> , KantiBhushanDatta, PHI Learning Pvt.Ltd, New Delhi.
2.	P.J.Olver and C. Shakiban (2018) <i>Applied Linear Algebra</i> , 2 nd Edition, Kindle Edition, Springer Publications.
<b>REFERENCE BOOKS</b>	
1.	Howard Anton and Chris Rorres (2005) <i>Elementary Linear Algebra</i> , John Wiley and Sons, Inc.
2	K. Hoffmann and R. Kunze (1998) <i>Linear Algebra</i> , Second Ed. Prentice Hall of India, New Delhi.
<b>E BOOKS</b>	
1.	<a href="https://web.stanford.edu/~boyd/vmls/vmls.pdf">https://web.stanford.edu/~boyd/vmls/vmls.pdf</a>
2.	<a href="https://joshua.smcvt.edu/linearalgebra/book.pdf">https://joshua.smcvt.edu/linearalgebra/book.pdf</a>
<b>MOOC</b>	

1.	<a href="https://onlinecourses.nptel.ac.in/noc21_ee38/preview">https://onlinecourses.nptel.ac.in/noc21_ee38/preview</a>
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COURSE TITLE	DATA STRUCTURES			CREDITS	4
COURSE CODE	ECS51004	COURSE CATEGORY	PC	L-T-P-S	3- 0- 2- 2
VERSION	1.0	APPROVAL DETAILS		LEARNING LEVEL	BTL-3

#### ASSESSMENT SCHEME

CIA					ESE	
First Periodical Assessment (Theory)	Second Periodical Assessment (Theory)	Practical Assessments	Observation / lab records as approved by the Department Examination Committee "DEC"	Attendance*	Theory	Practical
15%	15%	10%	5%	5%	25%	25%

<b>Course Description</b>	This is a course suitable for B. Tech students. It deals with basic data structures, arrays, heaps etc. This course develops the knowledge in the graphs, algorithm, creation, deletion, insertion. Also gives an idea about developing the projects in the data structures.
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<b>Course Objective</b>	<ol style="list-style-type: none"> <li>1. To develop the knowledge in the basic designing of algorithms</li> <li>2. To apply the concept of algorithms for the creation, insertion, deletion, searching, and sorting of each data structure.</li> <li>3. To learn the concept of Sort, arrays, linked lists etc.</li> <li>4. To define the idea of graphs and its traversal.</li> <li>5. To develop the implementation knowledge in the projects.</li> </ol>
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<b>Course Outcome</b>	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> <li>1. Compute and analyse the algorithms for efficiency using Asymptotic Notations.</li> <li>2. Develop knowledge of basic data structures such as arrays, linked lists, binary trees, heaps, and hash tables for storage and retrieval of ordered or unordered data.</li> <li>3. Solve problems by applying suitable data structures with the algorithms for the creation, insertion, deletion, searching, and sorting of each data structure.</li> <li>4. Define graphs and illustrate graph traversals.</li> <li>5. Design and develop projects requiring the implementation of the data structures.</li> </ol>
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**Prerequisites: C Programming Language**

#### CO, PO AND PSO MAPPING

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

**1: Weakly related, 2: Moderately related and 3: Strongly related**

#### **MODULE 1: LINEAR DATA STRUCTURES**

**(9L+3P=12)**

Introduction to Data Structures – Fundamental Elements – Asymptotic Notations: Big-Oh, Omega and Theta – Best, Worst and Average case Analysis: Definition and an example -Arrays and its representations – Stacks and Queues – Linked lists - Singly Linked List - Doubly linked list - Linked list-based implementation of Stacks and Queues – Evaluation of Expressions.

##### **Practical Component**

1. Write a c program to implement the various operations of stack using Pointer/Array
2. Implement the functions of Queue
3. Develop the source code to implement the linked list operations
4. Write a c program to convert the infix expression to postfix expression

**CO-1**

**BTL-2**

#### **MODULE 2: NON-LINEAR DATA STRUCTURES**

**(9L+3P=12)**

**Trees:** Introduction to Trees – Basic concepts - Binary Trees – Binary tree representations (Array and list) and Traversals Techniques (Preorder, Inorder, Postorder) – Binary Search Trees – AVL Trees – Splay Trees-Priority Queues – Heaps implementations – Binary Heap.

##### **Practical Component**

1. Write a program to traverse the tree in inorder, preorder and post order.
2. Implement the Binary Search Tree to perform the various operations.
3. Write a Program to simulate the functions of Min heap/Max heap

**CO-2**

**BTL-2**

#### **MODULE 3: GRAPHS**

**(9L+3P=12)**

**Graphs:** Definitions, Terminologies, Matrix and Adjacency List Representation Of Graphs, Elementary Graph operations, Traversal methods: Breadth First Search and Depth First Search-Topological sort – Shortest path problems-Spanning Tree, Connected Components.

##### **Practical Component:**

1. Implement the BFS Traversing
2. Write a program to implement the DFS Traversing
3. Develop the source code to find the shortest path in the given Graph

**CO-3**

**BTL-3**

#### **MODULE 4: SORTING AND SEARCHING**

**(9L+3P=12)**

**Sorting Algorithms:** Basic concepts - Bubble Sort - Insertion Sort - Selection Sort - Quick Sort – Shell sort - Heap Sort - Merge Sort - External Sorting.

**Searching:** Linear Search, Binary Search.

**CO-4**

**BTL-3**

<b>Practical Component:</b>  1. Write a program to implement the Bubble sort and Quick Sort 2. Implement Linear Search and Binary Search algorithms		
<b>MODULE 5: INDEXING AND DISJOINT SETS</b> (9L+3P=12)		
Indexing: Hashing - Hash Functions – Separate Chaining – Open Addressing: Linear Probing- Quadratic Probing- Double Hashing- Rehashing – Extendible Hashing.  Disjoint Sets: Basic data structure - Smart Union Algorithms - Path Compression.  <b>Practical Component:</b>  1.Hash table implementation in c using arrays  2.Implement the various operations of Set		<b>CO-5</b>  <b>BTL-3</b>
<b>TEXT BOOKS</b>		
1.	Ellis Horowitz, S. Sahni, Freed. (2015). <i>Fundamentals of Data Structures in C</i> , 2nd edition.	
2.	D.S.Kushwaha and A.K.Misra(2022),”Data structures A Programming Approach with C”, PHI.	
3.	Puntambekar, A. A., and Dr. M. Sambath. <i>Data Structures</i> . First Edition: May 2023, Technical Publications.	
<b>REFERENCE BOOKS</b>		
1.	Langsam, Y., Augenstein, M. J. And Tanenbaum A. M. (2004). <i>Data Structures using C</i> , Pearson Education Asia.	
2	R.F.GilbergAndB.A.Forouzan (2022),”Data structures: A Pseudo code Approach with C”, 2nd edition,, Cengage Learning.	
3	M.A.Weiss(2022),”Data structures and Algorithm Analysis in C”, 2nd edition,, Pearson.	
<b>E BOOKS</b>		
1.	<a href="https://www.cs.bham.ac.uk/~jxb/DSA/dsa.pdf">https://www.cs.bham.ac.uk/~jxb/DSA/dsa.pdf</a>	
2.	<a href="https://courses.csail.mit.edu/6.851/spring12/scribe/lec12.pdf">https://courses.csail.mit.edu/6.851/spring12/scribe/lec12.pdf</a>	
3.	<a href="http://lib.mdp.ac.id/ebook/Karya%20Umm/Dsa.pdf">http://lib.mdp.ac.id/ebook/Karya%20Umm/Dsa.pdf</a>	
<b>MOOC</b>		
1.	<a href="https://www.mooc-list.com/tags/data-structures">https://www.mooc-list.com/tags/data-structures</a>	
2.	<a href="https://nptel.ac.in/courses/106102064/">https://nptel.ac.in/courses/106102064/</a>	
3.	<a href="https://www.udemy.com/algorithm/">https://www.udemy.com/algorithm/</a>	

COURSE TITLE	PYTHON FOR DATA SCIENCE			CREDITS	3
COURSE CODE	EAD51001	COURSE CATEGORY	PC	L-T-P-S	2-0-2-2
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 4
<b>ASSESSMENT SCHEME</b>					

First Periodical Assessment (Theory)	Second Periodical Assessment (Theory)	Practical Assessment	Observation / Lab records	Attendance	End Semester Examination (Theory)	End Semester Examination (Practical)									
15%	15%	10%	5%	5%	25%	25%									
Course Description	This is a course suitable for B. Tech students. It deals with basic data structures, arrays, heaps etc. This course develops the knowledge in the graphs, algorithm, creation, deletion, insertion. Also gives an idea about developing the projects in the data structures.														
Course Objective	<div>1. To identify the need for data science and solve basic problems using Python built-in data types and their methods.</div> <div>2. To design an application with user-defined modules and packages using OOP concept</div> <div>3. To employ efficient storage and data operations using NumPy arrays.</div> <div>4. To apply powerful data manipulations using Pandas.</div> <div>5. To perform data preprocessing and visualization using Pandas</div>														
Course Outcome	<div>Upon completion of this course, the students will be able to</div> <div>1. Identify the need for data science and solve basic problems using Python built-in data types and their methods.</div> <div>2. Design an application with user-defined modules and packages using OOP concept</div> <div>3. Employ efficient storage and data operations using NumPy arrays.</div> <div>4. Apply powerful data manipulations using Pandas.</div> <div>5. Do data preprocessing and visualization using Pandas</div>														
Prerequisites: Basic Programming Knowledge															
CO vs PO / PSO MAPPING															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	3	3	-	-	3	-	-	-	-	-	-	1	3	-	-
CO-2	3	3	3	-		-	1	2	-	-	-	3	3	2	-
CO-3	3	3	1	-	-	-	-	-	-	-	2	3	3	-	-
CO-4	3	3	1	-	3	-	1	-	-	2	-	3	3	-	-
CO-5	3	3	3	-	2	-	-	-	-	-	-	3	3	2	-
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: INTRODUCTION TO DATA SCIENCE AND PYTHON PROGRAMMING							(9L+6P)								
Introduction to Data Science - Why Python? - Essential Python libraries - Python Introduction- Features, Identifiers, Reserved words, Indentation, Comments, Built-in Data types and their Methods: Strings, List, Tuples, Dictionary, Set - Type Conversion- Operators.  Decision Making- Looping- Loop Control statement- Math and Random number functions. User defined functions - function arguments & its types.  Lab experiment:  1. Implement basic Python programs for reading input from console.													CO-1  BTL-2		

<ol style="list-style-type: none"> <li>2. Perform Creation, indexing, slicing, concatenation and repetition operations on Python built-in data types: Strings, List, Tuples, Dictionary, Set</li> <li>3. Solve problems using decision and looping statements.</li> <li>4. Apply Python built-in data types: Strings, List, Tuples, Dictionary, Set and their methods to solve any given problem</li> <li>5. Handle numerical operations using math and random number functions</li> <li>6. Create user-defined functions with different types of function arguments.</li> </ol> <p>Software: PyCharm</p>	
<b>MODULE 2: FILE, EXCEPTION HANDLING AND OOP (9L+6P)</b>	
<p>User defined Modules and Packages in Python- Files: File manipulations, File and Directory related methods - Python Exception Handling.</p> <p>OOPs Concepts -Class and Objects, Constructors – Data hiding- Data Abstraction- Inheritance.</p> <p>Lab experiment:</p> <ol style="list-style-type: none"> <li>1. Create packages and import modules from packages.</li> <li>2. Perform File manipulations- open, close, read, write, append and copy from one file to another.</li> <li>3. Handle Exceptions using Python Built-in Exceptions</li> <li>4. Solve problems using Class declaration and Object creation.</li> <li>5. Implement OOP concepts like Data hiding and Data Abstraction.</li> <li>6. Solve any real-time problem using inheritance concept.</li> </ol> <p>Software: PyCharm</p>	<p><b>CO-2</b></p> <p><b>BTL-2</b></p>
<b>MODULE 3: INTRODUCTION TO NUMPY (9L+6P)</b>	
<p>NumPy Basics: Arrays and Vectorized Computation- The NumPy ndarray- Creating ndarrays- Data Types for ndarrays- Arithmetic with NumPy Arrays- Basic Indexing and Slicing - Boolean Indexing-Transposing Arrays and Swapping Axes.</p> <p>Universal Functions: Fast Element-Wise Array Functions- Mathematical and Statistical Methods-Sorting- Unique and Other Set Logic.</p> <p>Lab experiment:</p> <ol style="list-style-type: none"> <li>1. Create NumPy arrays from Python Data Structures, Intrinsic NumPy objects and Random Functions.</li> <li>2. Manipulation of NumPy arrays- Indexing, Slicing, Reshaping, Joining and Splitting.</li> <li>3. Computation on NumPy arrays using Universal Functions and Mathematical methods.</li> <li>4. Import a CSV file and perform various Statistical and Comparison operations on rows/columns.</li> <li>5. Load an image file and do crop and flip operation using NumPy Indexing.</li> </ol> <p>Software: PyCharm</p>	<p><b>CO-3</b></p> <p><b>BTL-3</b></p>
<b>MODULE 4: DATA MANIPULATION WITH PANDAS (9L+6P)</b>	

Introduction to pandas Data Structures: Series, DataFrame, Essential Functionality: Dropping Entries- Indexing, Selection, and Filtering- Function Application and Mapping- Sorting and Ranking.		CO-4  BTL-3	
Summarizing and Computing Descriptive Statistics- Unique Values, Value Counts, and Membership. Reading and Writing Data in Text Format.			
Lab experiment:			
1. Create Pandas Series and DataFrame from various inputs.			
2. Import any CSV file to Pandas DataFrame and perform the following:  (a) Visualize the first and last 10 records (b) Get the shape, index and column details (c) Select/Delete the records(rows)/columns based on conditions. (d) Perform ranking and sorting operations. (e) Do required statistical operations on the given columns. (f) Find the count and uniqueness of the given categorical values.  Rename single/multiple columns.  Software: PyCharm			
MODULE 5:DATA CLEANING PREPARATION AND VISUALIZATION (9L+6P)			
Data Cleaning and Preparation: Handling Missing Data - Data Transformation: Removing Duplicates, Transforming Data Using a Function or Mapping, Replacing Values, Detecting and Filtering Outliers- String Manipulation: Vectorized String Functions in pandas.  Plotting with pandas: Line Plots, Bar Plots, Histograms and Density Plots, Scatter or Point Plots.  Lab experiment:		CO-5  BTL-3	
1.Import any CSV file to Pandas DataFrame and perform the following:  (a) Handle missing data by detecting and dropping/ filling missing values. (b) Transform data using apply () and map() method. (c) Detect and filter outliers. (d) Perform Vectorized String operations on Pandas Series.  Visualize data using Line Plots, Bar Plots, Histograms, Density Plots and Scatter Plots.  Software: PyCharm			
TEXT BOOKS			
1.	Y. Daniel Liang, “Introduction to Programming using Python”, Pearson,2012.		
2.	Wes McKinney, “Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython”, O’Reilly, 2 <sup>nd</sup> Edition,2018.		
REFERENCE BOOKS			
1.	Wesley J. Chun, “Core Python Programming”, Prentice Hall,2006.		
2.	Mark Lutz, “Learning Python”, O’Reilly, 4 <sup>th</sup> Edition, 2009.		

3.	Jake VanderPlas, “Python Data Science Handbook: Essential Tools for Working with Data”, O’Reilly, 2017.
<b>E BOOKS</b>	
1.	<a href="https://www.cs.uky.edu/~keen/115/Haltermanpythonbook.pdf">https://www.cs.uky.edu/~keen/115/Haltermanpythonbook.pdf</a>
<b>MOOC</b>	
1.	<a href="https://www.edx.org/learn/python">https://www.edx.org/learn/python</a>
2.	<a href="https://www.coursera.org/learn/python">https://www.coursera.org/learn/python</a>

COURSE TITLE	DATABASE MANAGEMENT SYSTEMS			CREDITS	3	
COURSE CODE	ECS51006	COURSE CATEGORY	PC	L-T-P-S	2-0-2-2	
VERSION	1.0	APPROVAL DETAILS		LEARNING LEVEL	BTL-3	
ASSESSMENT SCHEME						
CIA					ESE	
First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	Theory	Practical
15%	15%	10%	5%	5%	25%	25%
Course Description	Focuses on concepts and structures necessary to design and implement a database management system. Various modern data models, data security and integrity, and concurrency are discussed. An SQL database system is designed and implemented as a group project.					
Course Objective	1. To learn the basic concepts of DB systems. 2. To know about SQL Queries. 3. To Apply the concept of relational DB theory and to write relational algebra expressions for queries. 4. To be able to demonstrate the Transaction Processing and Concurrency Control. 5. To be aware about Object Oriented DB, Distributed DB, Data Warehousing and Mobile databases.					



Course Outcome	Upon completion of this course, the students will be able to														
	1. Recall the basic concepts of database systems.														
	2. Identify the SQL Queries for a given scenario.														
	3. Illustrate relational database theory, and be able to write relational algebra expressions for queries.														
	4. Demonstrate transaction processing and concurrency control.														
5. Explain Object oriented dB, Distributed dB, Data Warehousing and Mobile databases.															
Prerequisites: Nil															
CO, PO AND PSO MAPPING															
CO	PO - 1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	P O- 7	PO- 8	PO-9	PO - 10	PO- 11	PO- 12	PSO- 1	PSO- 2	PSO- 3
CO-1	2	3	2	3	3	-	-	-	-	-	3	-	1	3	3
CO-2	2	3	2	3	3	-	-	-	-	-	3	-	1	3	3
CO-3	2	3	2	3	3	-	-	-	-	-	3	-	1	3	3
CO-4	2	3	2	3	3	-	-	-	-	-	3	-	1	3	3
CO-5	2	3	2	3	3	-	-	-	-	-	3	-	1	3	3
1: Weakly related, 2: Moderately related, and 3: Strongly related															
MODULE 1: CONCEPTUAL MODELING AND SQL (6L+6L)															
Introduction to File and Database Systems- Database system structure – Data Models – Introduction to Network and Hierarchical Models – ER model – Relational Model – Relational Algebra and Calculus- SQL – Data definition- Queries in SQL													CO-1  BTL-2		
Suggested reading: <a href="http://nptel.ac.in/courses/106106093/1">http://nptel.ac.in/courses/106106093/1</a>															
Practical Component:  1. To study and execute Basic SQL commands (create table, use, drop, insert).															
MODULE 2: RELATIONAL MODEL (6L+6L)															
SQL Updates- Views – Compound Conditions-Aggregate Functions-Grouping-Integrity and Security – Relational Database design – Functional dependencies and Normalization for Relational Databases (up to BCNF)													CO-2  BTL-3		
Suggested reading: <a href="http://nptel.ac.in/courses/106106093/4">http://nptel.ac.in/courses/106106093/4</a>															
Practical Component:  1. To execute the viewing commands (select, update) 2. To execute the commands to modify the structure of table (alter, delete) and to execute															

3. To execute the commands that involve compound conditions (and, or, in, not in, between, not between, like, not like) 4. To execute the aggregate functions (sum, count, max, min, average) 5. To execute the grouping commands (group by, order by)	
<b>MODULE 3: DATA STORAGE AND QUERY PROCESSING (6L+6L)</b>	
Record storage and Primary file organization- Secondary storage Devices- Operations on Files- Heap File- Sorted Files- Hashing Techniques – Index Structure for files –Different types of Indexes- B-Tree - B+Tree – Query Processing.  <b>Suggested reading:</b> <a href="http://nptel.ac.in/courses/106106093/11">http://nptel.ac.in/courses/106106093/11</a>  <b>Practical Component:</b> 1. To execute the commands involving data constraints. 2. To execute the commands for joins (cross join, inner join, outer join). 3. To execute the various set operations. 4. To execute the various scalar functions and string functions (power, square, substring, reverse, upper, lower, concatenation). 5. To study and execute procedures and triggers in PL-SQL.	<b>CO-3</b>  <b>BTL-3</b>
<b>MODULE 4: TRANSACTION MANAGEMENT (6L+6L)</b>	
Transaction Processing – Introduction- Need for Concurrency control- Desirable properties of Transaction- Schedule and Recoverability- Serializability and Schedules – Concurrency Control – Types of Locks- Two Phases locking- Deadlock- Recovery Techniques.  <b>Suggested reading:</b> <a href="http://nptel.ac.in/courses/106106093/18">http://nptel.ac.in/courses/106106093/18</a>  <b>Practical Component:</b> 1. To study and execute the commands involving indexes 2. To study and execute the conditional controls and case statement in PL-SQL	<b>CO-4</b>  <b>BTL-3</b>
<b>MODULE5: OBJECT ORIENTED DB AND WAREHOUSING (6L+6L)</b>	
Object Oriented Databases- Need for Complex Data types- OO data Model -ETL-Metadata- Enterprise warehouse (EWD)-Data mart- Virtual Warehouse- Operational Data Store (ODS)- OLAP-OLTP- Distributed databases- Distributed data Storage-Mobile Databases.  <b>Suggested reading:</b> <a href="http://nptel.ac.in/courses/106106093/31">http://nptel.ac.in/courses/106106093/31</a>  <b>Practical Component:</b> 1. Experiment the features of WEKA tool kit such as Explorer, Knowledge flow interface, Experimenter, command-line interface and navigate the options of select attributes panel, reprocess panel, classify panel, cluster panel, associate panel and visualize) 2. Load a data set (ex. Weather dataset, Iris dataset, etc.) and Perform data pre-processing tasks and demonstrate pre-processing operations on data sets.	<b>CO-5</b>  <b>BTL-3</b>
<b>TEXT BOOKS</b>	

1.	Abraham Silberschatz, Henry F. Korth and S. Sudarshan- —Database System Concepts  , Sixth Edition, McGraw-Hill, 2011.
2.	Puntambekar, A. A., and Dr. M. Muthukumaran. Database Management Systems. First Edition: May 2023, Technical Publications.
<b>REFERENCE BOOKS</b>	
1.	Ramez Elmasri and Shamkant B. Navathe, —Fundamental Database Systems  , Seventh Edition, Pearson Education,2016.
2.	Raghu Ramakrishnan, —Database Management System, Tata McGraw-Hill Publishing Company, Third Edition, 2014.
3.	Jiawei Han, Micheline Kamber, Jian Pei -Data Mining Concepts and Techniques, Morgan Kaufmann, Third Edition, 2012.
<b>E BOOKS</b>	
1.	<a href="https://inspirit.net.in/books/database/Database%20System%20Concepts.pdf">https://inspirit.net.in/books/database/Database%20System%20Concepts.pdf</a>
<b>MOOC</b>	
1.	<a href="https://www.udemy.com/database-management-system/">https://www.udemy.com/database-management-system/</a>
2.	<a href="https://www.edx.org/course/database-systems-concepts-design-gtx-cs6400x-1">https://www.edx.org/course/database-systems-concepts-design-gtx-cs6400x-1</a>

COURSE TITLE	Design Project- I			CREDITS	1
COURSE CODE	ECS51800	COURSE CATEGORY	PC	L-T-P-S	0-0-2-6
Version	1.0	Approval Details		LEARNING LEVEL	BTL-4
ASSESSMENT SCHEME					
CIA					Project report and Viva – Voce (ESE)
First Review		Second Review	Third Review		
20%		20%	10%		
20%		10%		50%	
Course Description	This course is mainly focused on team building and product development as it will make them industry ready. To apply the concepts, principles and algorithms learnt in the field of computer science and build products/tools/applications addressing the needs of real-world societal issues.				
Course Objective	<div><div></div><div>1. To analyse, design and develop products/tools/applications to solve the issues related to real world problems.</div><div>2. To apply the concepts, principles and algorithms learnt in the field of computer science.</div><div>3. To exercise the lifecycle of project development by following the principles of software engineering.</div><div>4. To inculcate the qualities of team building and develop the skills of technical document writing.</div><div>5. To examine the various algorithms of study and thus to evaluate and compare the output generated.</div></div>				

Course Outcome	Upon completion of this course, the students will be able to														
	<div>1. Analyse, design and develop products/tools/applications to address the societal needs.</div> <div>2. Design, develop and test program segments that constitute a software/hardware product</div> <div>3. Demonstrate the software engineering principles and improve the project management skills</div> <div>4. Appraise the hardware/software product developed in the form of technical presentations demonstrations and report generation through team work.</div> <div>5. Examine and make a comparative analysis of the algorithms involved in the course of the project work.</div>														
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	3	3	3	3	3	3	3	3	3	3	3	1	3	3	3
CO-2	3	3	3	3	3	3	3	3	3	3	3	1	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3	3	1	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3	3	1	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3	3	1	3	3	3
1: Weakly related, 2: Moderately related and 3: Strongly related															
Note															
<div><div>●</div>The students in convenient groups of not more than 3 members have to identify a product for design and fabrication.</div> <div><div>●</div>Every project work shall have a guide who is the member of the faculty of the Department.</div> <div><div>●</div>Design, develop, test and implement a hardware/software system that is demonstrable with required data set.</div> <div><div>●</div>Assessment is based on creativity, applicability to the society, project development skills, team work.</div> <div><div>●</div>Technical communication, presentation and report writing skills form an essential component in assessment.</div>													CO1, CO2, CO3, CO4, CO5 /BTL4		

<b>COURSE TITLE</b>	<b>ENVIRONMENTAL SCIENCE AND SUSTAINABLE DEVELOPMENT</b>			<b>CREDITS</b>	<b>2</b>
<b>COURSE CODE</b>	<b>ECT51002</b>	<b>COURSE CATEGORY</b>	<b>ES</b>	<b>L-T-P-S</b>	<b>2-0-0-2</b>
<b>Version</b>	<b>1.0</b>	<b>Approval Details</b>		<b>LEARNING LEVEL</b>	<b>BTL-3</b>
<b>ASSESSMENT SCHEME</b>					
<b>First Periodical Assessment</b>	<b>Second Periodical Assessment</b>	<b>Seminar/ Assignments/ Project</b>	<b>Surprise Test / Quiz etc., as approved by the Department</b>	<b>Attendance</b>	<b>ESE</b>

			Examination Committee “DEC”												
15%	15%	10%	5%	5%	50%										
Course Description	To expose the students to the basics of environmental science and sustainable development.														
Course Objective	1. To make the students aware of the natural resources and to educate them to understand the need for preserving the resources. 2. To provide knowledge on the various aspects of environmental pollution and issues. 3. To provide basic knowledge and concepts of sustainability. 4. To educate the students about the concepts of sustainable habitat. 5. To give a broad knowledge on environmental management system.														
Course Outcome	Upon completion of this course, the students will be able to  1. Recognise the effects of over exploitation of natural resources and their impact on day-to-day life on earth. 2. Apply the sustainable solutions for environmental pollution and issues. 3. Implement the concepts of sustainability in the product development. 4. Use appropriate methods for designing green house and maintaining sustainable cities, transport system, industries, etc. 5. Manage the environment for sustainable product development.														
Prerequisites: Basic knowledge of science and environment.															
CO, PO AND PSO MAPPING															
CO	PO - 1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	PO- 7	PO- 8	PO- 9	PO - 10	PO- 11	PO- 12	PSO- 1	PSO- 2	PSO-3
CO-1	2	2	2	-	-	1	3	-	-	-	-	2	To be marked by respective department		
CO-2	2	2	2	-	-	1	3	-	-	-	-	2			
CO-3	2	2	2	-	-	1	3	-	-	-	-	2			
CO-4	2	2	2	-	-	1	3	-	-	-	-	2			
CO-5	2	2	2	-	-	1	3	-	-	-	-	2			
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: NATURAL RESOURCES													(6L)		

<p>Introduction - Forest resources: Use and over-exploitation – Water resources: Use and over-utilization – Mineral resources: Use and exploitation – Food resources: World food problems, effects of modern agriculture – Energy resources: conventional and nonconventional, solar energy, fuel cells, wind energy, hydro plants, bio-fuels, Energy derived from oceans, geothermal energy – Land resources: Use and over-exploitation – Role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.</p> <p>Field study – Documentation of nearby environmental assets – river / forest / grassland / hill / mountain.</p>	<p><b>CO-1</b></p> <p><b>BTL-3</b></p>
<p><b>MODULE 2: ENVIRONMENTAL POLLUTION AND ISSUES (6L)</b></p>	
<p>Air pollution, effects of air pollutions; Water pollution – sources, sustainable waste water treatment; Solid waste – sources, impacts, zero waste concept, 3R concept, Global environmental issues – Resource degradation, climate change, global warming, ozone layer depletion – Regional and local environmental issues – Carbon credits and carbon trading, carbon foot print.</p> <p>Field Study - Observe a pond nearby and analyze the different measures that can be adopted for its conservation.</p>	<p><b>CO-2</b></p> <p><b>BTL-3</b></p>
<p><b>MODULE 3: SUSTAINABILITY (6L)</b></p>	
<p>Introduction, need of sustainability – Social, environmental and economic sustainability concepts – sustainable development, Nexus between technology and sustainable development, challenges for sustainable development – multilateral environmental agreements and protocols – clean development mechanism (CDM) – Environmental legislations in India – water act, air act.</p> <p>Field Study - Assessment of sustainability in your neighbourhood in education / housing / water resources / energy resources / food supplies/ land use / environmental protection, etc.</p>	<p><b>CO-3</b></p> <p><b>BTL-3</b></p>
<p><b>MODULE 4: CONCEPTS OF SUSTAINABLE HABITAT (6L)</b></p>	
<p>Green buildings: material for sustainable design, green building certification, methods for increasing energy efficiency of buildings – sustainable urbanisation - sustainable transport – Industrialisation and poverty reduction – Industrial processes: material selection, pollution prevention, industrial ecology, industrial symbiosis.</p> <p>Assignment – Explore the different methods that can be adopted for maintaining a sustainable transport system in your city.</p>	<p><b>CO-4</b></p> <p><b>BTL-3</b></p>
<p><b>MODULE 5: ENVIRONMENTAL MANAGEMENT (6L)</b></p>	
<p>Environmental management: Principles and strategies, Indicators of environmental quality – economic valuation - environmental cost-benefit analysis – Fiscal incentives in pollution control and management – Environmental management system: ISO 14000, Life Cycle Analysis (LCA) – scope and goal, bio-mimicking – Environmental Impact Assessment (EIA) – Procedures of EIA in India.</p> <p>Assignment – Conducting an EIA study of a small project (example, construction of house, road, bridge, etc.) in your local area.</p>	<p><b>CO-5</b></p> <p><b>BTL-3</b></p>
<p><b>TEXT BOOKS</b></p>	

1.	Basu, M., Savarimuthu, X. (2017). <i>Fundamentals of Environmental Studies</i> , Cambridge University Press, 1 <sup>st</sup> Edition.
2.	Bhavik R. Bakshi (2019). <i>Sustainable Engineering: Principles and Practice</i> , Cambridge University Press, 1 <sup>st</sup> Edition.
3.	Mulligan, C. (2020). <i>Sustainable Engineering: Principles and Implementation</i> , CRC Press, 1 <sup>st</sup> Edition.
<b>REFERENCE BOOKS</b>	
1.	Wasewar, K. L., Rao, S. N. (2022). <i>Sustainable Engineering, Energy, and the Environment Challenges and Opportunities</i> , CRC Press, 1 <sup>st</sup> Edition.
2.	Singh, J.S., Singh, S.P., Gupta, S. R. (2017). <i>Ecology, Environmental Science and Conservation</i> . S. Chand Publishing Company, New Delhi,
<b>E BOOKS</b>	
1.	<a href="https://www.hzu.edu.in/bed/E%20V%20S.pdf">https://www.hzu.edu.in/bed/E%20V%20S.pdf</a>
2.	<a href="https://library.oapen.org/handle/20.500.12657/33379">https://library.oapen.org/handle/20.500.12657/33379</a>
<b>MOOC</b>	
1.	<a href="https://www.my-mooc.com/en/categorie/environmental-science">https://www.my-mooc.com/en/categorie/environmental-science</a>
2.	<a href="https://www.coursera.org/specializations/sustainable-cities">https://www.coursera.org/specializations/sustainable-cities</a>

COURSE TITLE	INTERNSHIP- I			CREDITS	1
COURSE CODE	ECS51801	COURSE CATEGORY	PC/DE/NE	L-T-P-S	0-0-0-2
Version	1.0	Approval Details	XX	LEARNING LEVEL	BTL-3
ASSESSMENT SCHEME					
CIA					ESE
Technical report/ Certificate		Presentation and Viva- voce			
30%		70%			
Course Description	This course is mainly focused on providing links to classroom learning with industry. To apply the concepts, principles and algorithms learnt in the field of computer science and build products/tools/applications addressing the needs of real-world societal issues.				
Course Objective	1. To analyse, design and develop products/tools/applications to solve the issues related to real world problems. 2. To learn critical thinking and problem-solving knowledge in an applied work setting 3. To get professional behaviour and knowledge. 4. To develop the skills of technical document writing and presentation. 5. To develop communication skills and technical knowledge.				

<b>Course Outcome</b>	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> <li>1. Analyse, design and develop products/tools/applications to address the societal needs.</li> <li>2. Design, develop and test program segments that constitute a software/hardware product</li> <li>3. Demonstrate the software engineering principles and improve the project management skills</li> <li>4. Appraise the hardware/software product developed in the form of technical presentations, demonstrations and report generation through team work.</li> <li>5. Display his communication skills and elaborate on his skillset achieved.</li> </ol>
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#### CO, PO AND PSO MAPPING

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

1: Weakly related, 2: Moderately related and 3: Strongly related

#### Note

- A student has to compulsorily attend Summer / Winter internship during 3rd year for a minimum period of one month.
- In lieu of Summer / Winter internship, the student is permitted to register for undertaking case study / project work under an engineering faculty of the Institute and carry out the project for minimum period of one month.
- In both the cases, the internship report in the prescribed format duly certified by the faculty in-charge shall be submitted to the HoD.
- Assessment is based on creativity, applicability to the society, project development skills, team work.
- Technical communication, presentation and report writing skills form an essential component in assessment.

**CO1, CO2, CO3,  
CO4, CO5 /BTL3**

COURSE TITLE		ADVANCED ACADEMIC WRITING				CREDITS	1
COURSE CODE			COURSE CATEGORY	HS	L - T - P - S	1 - 0 - 0 - 1	
Version	1.0	Approval Details				LEARNING LEVEL	BTL – 4
ASSESSMENT SCHEME							
First Periodical Assessment	Second Periodical Assessment	Weekly assignment/ lab record and viva as approved by the Department Examination Committee “DEC”	Surprise Test / Quiz., as approved by the Department Examination Committee “DEC”	Attendance	End Semester Examination (ESE) Theory + Practical		
15 %	15%	10 %	5 %	5 %	50%		



<b>Course Description</b>	Advanced Academic Writing is a course that focuses on developing writing skills for an academic setting. Students will write essays, research papers and take part in discussions on course topics. The course aims to help students understand the writing process, communicate their ideas more effectively and become more proficient in writing for academic purposes.
<b>Course Objective</b>	<p>By the end of this course, students will be able to:</p> <ol style="list-style-type: none"> <li>1. Gain a comprehensive grasp of the foundational principles of academic writing, including the purpose, structure, and conventions specific to different genres through vocabulary skills.</li> <li>2. Develop the ability to construct sentences and paragraphs that are clear, concise, and coherent. Students will demonstrate mastery in organizing and presenting information, thereby improving readability and comprehension for their intended readership.</li> <li>3. Apply effective techniques for editing and revising their written work. Students will display the capacity to critically evaluate and enhance their writing by identifying and rectifying errors, inconsistencies, and areas in need of improvement.</li> <li>4. Produce precise, well-structured documents that conform to established academic standards. This includes employing proper formatting, citation, and referencing practices to ensure the credibility and integrity of their scholarly contributions.</li> <li>5. Employ a diverse array of writing techniques, such as employing logical progression, utilizing transition words, and effectively incorporating evidence and examples. These skills will enhance clarity, coherence, and overall persuasiveness in students' academic writing, resulting in more impactful and engaging scholarly discourse.</li> </ol>
<b>Course Outcome</b>	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> <li>1. Understand the fundamentals of academic writing, including the purpose, structure, and conventions of different genres through vocabulary enhancement.</li> <li>2. Construct clear, concise, and cohesive sentences and paragraphs.</li> <li>3. Demonstrate the ability to edit and revise written work.</li> <li>4. Produce accurate and well-structured documents.</li> <li>5. Utilize a range of writing techniques to enhance clarity and coherence.</li> </ol>

**Prerequisites:** Plus Two English-Intermediate Level

#### CO, PO AND PSO MAPPING

CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	2	2	-	-	-	3	2	3	-	3	To be marked by respective department		
CO2	-	-	-	3	-	-	-	3	3	3	2	3			
CO3	-	-	2	3	2	-	-	3	2	3	3	3			
CO4	-	2	2	-	-	-	2	3	-	3	2	3			
CO5	-	-	3	-	-	-	-	-	2	3	2	3			

**1: Weakly related, 2: Moderately related and 3: Strongly related**

#### **MODULE 1: Understanding the Fundamentals of Academic Writing (3L + + 6P = 9)**

Fundamental Aspects of Academic Writing –Introduction to Academic writing- purpose of Academic writing – Common types – Format of Long and Short Writing Tasks – Features of academic Writing – Simple and Complex Sentences

**Practicum:** Vocabulary enhancement by learning new terms (Alphabets from A-E)

**CO-1  
BTL-2**

#### **MODULE 2: Writing Skills (3L + 6P = 9)**

Constructing Clear, Concise, and Cohesive Sentences and Paragraphs- Introduction to Sentence Structure- Crafting Effective Sentences- Using Transitions for Cohesion- Developing Paragraph Structure-Effective communicative Skills in writing – visual information – working in groups- Developing Effective Topic Statement

**Practicum:** Vocabulary enhancement by learning new terms (Alphabets from F-J)

**CO-2  
BTL-3**

#### **MODULE 3: Writing Techniques (3L + 6P = 9)**

**(3L + 6P = 9)**

Introduction to Writing Techniques- Writing Models (Letter – Report – CV – Email) - Sentence Structure and Variety- Essay writing- Writing for technical and non-technical purposes, Note Making, Formal and Informal writings- Clarity and Consciousness and writing- Applying Advanced Academic Writing Techniques- Use of AI tools in academic writing-Formatting and Citation (MLA/APA/Chicago stylesheet) <b>Practicum:</b> Vocabulary enhancement by learning new terms (Alphabets from U-Z)		<b>CO-5 BTL-4</b>
<b>MODULE 4: Accuracy in Writing Skill</b> (3L + 6P = 9)		
Introduction to accuracy in writing- Abbreviations – Academic Vocabulary - Understanding Document Structure- Research Techniques- Argumentation and Critical Thinking – Use of Transitional Words. <b>Practicum:</b> Vocabulary enhancement by learning new terms (Alphabets from P-T)		<b>CO-4 BTL-3</b>
<b>MODULE 5: Editing &amp; Revising Written Work</b> (3L + 6P = 9)		
Editing and Proofreading-Importance of Editing- Self-Editing Techniques- Revising for Clarity and Coherence- Enhancing Academic Style and Tone- Revising for Conciseness and Word Choice- Editing Grammar and Syntax -Identifying the common errors- Proof Reading symbols- Checking for Formatting and Citation Accuracy (MLA/APA) <b>Practicum:</b> Vocabulary enhancement by learning new terms (Alphabets from K-O)		<b>CO-3 BTL-3</b>
<b>TEXT BOOKS</b>		
1	Sherine, Akkara & et al. (2023). Advanced Academic writing: Cleverfox Publishing, Chennai.	
<b>REFERENCE BOOKS</b>		
1.	Giltrow, Janet, et al (2017). Academic Writing: An Introduction. 3rd ed., Broadview Press, UK	
2.	V Narayanaswami (2017). Strengthen Your Writing. Orient Blackswan Press, UK	
3.	Audio Learn (2015). The 1000 Most Common SAT Words, Audio Learn Publishers, UK	
4.	GR Pillai, K Rajeevan & PB Nair (2015). Written English for You. Emerald Publishers, India	
<b>E Books</b>		
1.	<a href="https://edisciplinas.usp.br/pluginfile.php/3928474/mod_resource/content/1/Introduction%20to%20Academic%20Writing.pdf">https://edisciplinas.usp.br/pluginfile.php/3928474/mod_resource/content/1/Introduction%20to%20Academic%20Writing.pdf</a>	
2.	<a href="https://www.routledge.com/rsc/downloads/A_Practical_Guide_to_Academic_Writing_for_International_Students-A_Routledge_FreeBook-_FINAL_VERSION_.pdf">https://www.routledge.com/rsc/downloads/A_Practical_Guide_to_Academic_Writing_for_International_Students-A_Routledge_FreeBook-_FINAL_VERSION_.pdf</a>	
3.	<a href="https://joepucc.io/static_assets/projects/SAT-vocab.pdf">https://joepucc.io/static_assets/projects/SAT-vocab.pdf</a>	
<b>MOOC Courses</b>		
1	<a href="https://www.coursera.org/specializations/academic-english">https://www.coursera.org/specializations/academic-english</a>	
2	<a href="https://www.coursera.org/learn/introduction-to-academic-writing">https://www.coursera.org/learn/introduction-to-academic-writing</a>	

**DEPARTMENT ELECTIVE – I (SEMESTER III)**

COURSE TITLE	TIME SERIES ANALYSIS AND FORECASTING							CREDITS			3				
COURSE CODE	EAD51500			COURSE CATEGORY			PC/DE/NE		L-T-P-S			2-0-2-2			
Version	1.0			Approval Details			XX		LEARNING LEVEL			BTL-3			
ASSESSMENT SCHEME															
CIA												ESE			
First Periodical Assessment (Theory)	Second Periodical Assessment (Theory)			Practical Assessments			Observation / lab records as approved by the Department Examination Committee “DEC”		Attendance*			THEORY		PRACTICAL	
15%	15%			10%			5%		5%			25%		25%	
Course Description	A time series essentially is a series of quantitative values. These values are obtained over time, and often have equal time intervals between them. These intervals can be quite different and may consist of yearly, quarterly, monthly or hourly buckets for instance.														
Course Objective	1. To knowledge of basic concepts in time series analysis and forecasting. 2. To analyze the use of time series models for forecasting and the limitations of the methods. 3. To ability to criticize and judge time series regression models. 4. To distinguish the ARIMA modelling of stationary and nonstationary time series. 5. To Compare with multivariate times series and other methods of applications														
Course Outcome	Upon completion of this course, the students will be able to  1. Describe the basic concepts in time series analysis and forecasting. 2. Apply Aggregation and Smoothing the time series models for forecasting and the limitations of the methods. 3. Criticize and judge time series regression models. 4. Distinguish the ARIMA modelling of stationary and nonstationary time series. Compare with multivariate times series and other methods of applications														
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	3	2	2	2	1	-	-	-	-	-	-	2	2	2	2
CO-2	3	2	1	2	1	-	-	-	-	-	-	2	2	2	2
CO-3	3	2	2	1	2	-	-	-	-	-	-	2	3	3	3

CO-4	3	2	2	1	2	-	-	-	-	-	-	2	2	2	2
CO-5	3	2	2	1	1	-	-	-	-	-	-	2	2	2	2
<b>1: Weakly related, 2: Moderately related and 3: Strongly related</b>															
<b>MODULE 1: INTRODUCTION TO TIME SERIES ANALYSIS</b>														<b>(6L+ 6P)</b>	
<p>Introduction to Time Series and Forecasting -Different types of data-Internal structures of time series-Models for time series analysis-Autocorrelation and Partial autocorrelation.</p> <p>Examples of Time series Nature and uses of forecasting-Forecasting Process-Data for forecasting –Resources for forecasting.</p> <p>Lab experiment:</p> <ol style="list-style-type: none"> <li>1.Time Series Data Cleaning</li> <li>2.Loading and Handling Times series data</li> <li>3. Preprocessing Techniques</li> </ol>														<p><b>CO-1</b></p> <p><b>BTL-3</b></p>	
<b>MODULE 2: STATISTICS BACKGROUND FOR FORECASTING</b>														<b>(6L+ 6P)</b>	
<p>Graphical Displays -Time Series Plots - Plotting Smoothed Data - Numerical Description of Time Series Data - Use of Data Transformations and Adjustments- General Approach to Time Series Modeling and Forecasting- Evaluating and Monitoring Forecasting Model Performance.</p> <p><b>Lab Experiment:</b></p> <ol style="list-style-type: none"> <li>1.How to Check Stationarity of a Time Series.</li> <li>2. How to make a Time Series Stationary?</li> <li>3. Estimating &amp; Eliminating Trend. <ul style="list-style-type: none"> <li>● Aggregation</li> <li>● Smoothing</li> <li>● Polynomial Fitting</li> </ul> </li> <li>4.Eliminating Trend and Seasonality <ul style="list-style-type: none"> <li>● Differencing</li> </ul> </li> </ol> <p>Decomposition</p>														<p><b>CO-2</b></p> <p><b>BTL-3</b></p>	
<b>MODULE 3: TIME SERIES REGRESSION MODEL</b>														<b>(6L+ 6P)</b>	
<p>Introduction - Least Squares Estimation in Linear Regression Models - Statistical Inference in Linear Regression- Prediction of New Observations - Model Adequacy Checking -Variable Selection Methods in Regression - Generalized and Weighted Least Squares- Regression Models for General Time Series Data- Exponential Smoothing-First order and Second order.</p> <p><b>Lab Experiment:</b></p> <ol style="list-style-type: none"> <li>1.Moving Average time analysis data.</li> <li>2.Smoothing the Time analysis Data.</li> <li>3.Check out the Time series Linear and non-linear trends.</li> <li>4.Create a modelling .</li> </ol>														<p><b>CO-3</b></p> <p><b>BTL-3</b></p>	
<b>MODULE 4: AUTOREGRESSIVE INTEGRATED MOVING AVERAGE (ARIMA) MODELS</b>														<b>(6L+ 6P)</b>	

Autoregressive Moving Average (ARMA) Models - Stationarity and Invertibility of ARMA Models - Checking for Stationarity using Variogram- Detecting Nonstationarity - Autoregressive Integrated Moving Average (ARIMA) Models - Forecasting using ARIMA - Seasonal Data - Seasonal ARIMA Models- Forecasting using Seasonal ARIMA Models Introduction - Finding the “BEST” Model -Example: Internet Users Data- Model Selection Criteria - Impulse Response Function to Study the Differences in Models - Comparing Impulse Response Functions for Competing Models .		CO-4  BTL-3
<b>Lab Experiment:</b>  1.Modelling time series <ul style="list-style-type: none"><li>● Moving average</li><li>● Exponential smoothing</li><li>● ARIMA</li></ul> 2. Seasonal autoregressive integrated moving average model (SARIMA)		
<b>MODULE 5: MULTIVARIATE TIME SERIES MODELS AND FORECASTING</b> (6L+ 6P)		
Multivariate Time Series Models and Forecasting - Multivariate Stationary Process- Vector ARIMA Models - Vector AR (VAR) Models - Neural Networks and Forecasting -Spectral Analysis - Bayesian Methods in Forecasting.		CO-5  BTL-3
<b>Lab Experiment:</b>  Dependence Techniques <ul style="list-style-type: none"><li>● Multivariate Analysis of Variance and Covariance</li><li>● Canonical Correlation Analysis</li><li>● Structural Equation Modeling</li></ul> Inter-Dependence Techniques <ul style="list-style-type: none"><li>● Factor Analysis</li></ul> Cluster Analysis		
<b>BOOKS</b>		
1.	Introduction To Time Series Analysis And Forecasting, 2nd Edition, Wiley Series In Probability And Statistics, By Douglas C. Montgomery, Cheryl L. Jen(2015)	
2.	Master Time Series Data Processing, Visualization, And Modeling Using Python Dr. Avishek Pal Dr. Pks Prakash (2017)	
<b>REFERENCE BOOKS</b>		
1	Peter J. Brockwell Richard A. Davis Introduction To Time Series And Forecasting, Third Edition. (2016).	
2	Multivariate Time Series Analysis and ApplicationsWilliam W.S. Wei Department of Statistical Science Temple University, Philadelphia, PA, SA This edition first published 2019 John Wiley & Sons Ltd.	
3	Time Series Analysis by James D Hamilton Copyright © 1994 by prince town university press	
<b>E Resources for Reference</b>		
1.	<a href="https://neptune.ai/blog/time-series-tools-packages-libraries">https://neptune.ai/blog/time-series-tools-packages-libraries</a>	
2.	<a href="https://www.analyticsvidhya.com/blog/2021/10/a-comprehensive-guide-to-time-series-analysis/">https://www.analyticsvidhya.com/blog/2021/10/a-comprehensive-guide-to-time-series-analysis/</a>	
3.	<a href="https://otexts.com/fpp2/">https://otexts.com/fpp2/</a>	
<b>MOOC</b>		

1.	<a href="https://www.coursera.org/learn/practical-time-series-analysis">https://www.coursera.org/learn/practical-time-series-analysis</a>
2.	<a href="https://www.udemy.com/topic/time-series-analysis/">https://www.udemy.com/topic/time-series-analysis/</a>

COURSE TITLE		STATISTICAL ANALYSIS FOR DATA SCIENCE						CREDITS			3				
COURSE CODE		ECS51501		COURSE CATEGORY		PC/DE/NE		L-T-P-S			2-0-2-2				
Version		1.0		Approval Details		XX		LEARNING LEVEL			BTL-3				
ASSESSMENT SCHEME															
CIA										ESE					
First Periodical Assessment (Theory)		Second Periodical Assessment (Theory)		Practical Assessments		Observation / lab records as approved by the Department Examination Committee “DEC”		Attendance*			THEORY		PRACTICAL		
15%		15%		10%		5%		5%			25%		25%		
Course Description		The students shall develop datasets, basic concepts of the various distribution and sampling and be able to apply them in practical situations.													
Course Objective		1. To analyze data and how to use statistics in practice 2. To predict or explain different behaviors and events 3. To prepare data for the analysis 4. To collect data and create a survey 5. To draw conclusions and have profits from the results of your data analysis													
Course Outcome		Upon completion of this course, the students will be able to  1. Perform exploratory analysis on the datasets 2. Learn the various distribution and sampling 3. Perform Hypothesis Testing on datasets 4. Apply statistical inference for Regression 5. Apply statistical inference for Classification													
Prerequisites: Python for Data Science/ R for Data Science															
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	3	3	3	3	3	-	-	-	2	2	2	-	3	3	3

CO-2	3	3	3	3	3	-	-	-	2	2	2	-	3	3	3
CO-3	3	3	3	3	3	-	-	-	2	2	2	-	3	3	3
CO-4	3	3	3	3	3	-	-	-	2	2	2	-	3	3	3
CO-5	3	3	3	3	3	-	-	-	2	2	2	-	3	3	3
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: EXPLORATORY ANALYSIS (9L+ 6P)															
Elements of Structured, Estimates of Location - Mean, Median, Mode, Outliers, Estimates of Variability- Standard Deviation, Z-Score, Frequency Table and Histograms, Correlation  Lab Experiment  1. Rainfall prediction data set – draw correlation between the features  2. Find the outliers in the Housing Price dataset													CO-1  BTL-3		
MODULE 2: DATA SAMPLING AND DISTRIBUTION (9L+ 6P)															
Normalization, Sampling Data-Simple Random sampling, Stratified, Cluster Sampling, Sampling Error/Bias. Bootstrapping, Central Limit Theorem, Confidence intervals, Normal distribution, Binomial distribution, Poisson distribution  Lab Experiment  1. For a given dataset, display a chosen feature using different mean values  2. Display the confidence interval of a chosen feature based on a sample													CO-2  BTL-3		
MODULE 3: HYPOTHESIS (9L+ 6P)															
A/B Testing, Hypothesis Tests- null, one-way, two-way, P-value, Type 1 & 2 errors, t-tests, multiple testing, degrees of freedom, ANOVA, Chi-Square Tests, Power and Sample Size  Lab Experiment  1. Perform t-test on a feature in a dataset  2. Create Boxplots for different groups of a feature													CO-3  BTL-3		
MODULE 4: REGRESSION AND PREDICTION (9L+ 6P)															
Simple Linear Regression, Multiple Linear Regression, Confidence and Prediction Intervals, Categorical Variables, Multicollinearity, Polynomial Regression  Lab Experiment  1. Create a Linear Regression model for a dataset and display the error measures  2. Chose a dataset with categorical data and apply linear regression model													CO-4  BTL-3		
MODULE 5: CLASSIFICATION (9L+ 6P)															
INaive Bayes, Discriminant Analysis, Logistic Regression, Evaluating Classification Models, Strategies for Imbalanced Data													CO-5  BTL-3		

Lab Experiment		
1. Apply Naïve Bayes algorithm on a dataset and estimate the accuracy		
2. Apply Logistic Regression algorithm on a dataset and estimate the accuracy		
TEXT BOOKS		
1.	Bruce, Peter, and Andrew Bruce. Practical statistics for data scientists: 50 essential concepts. " O'Reilly Media, Inc.", 2017.	
2.	James D. Miller,"Statistics for Data Science ",Packt Publishing Limited (17 November 2017)	
REFERENCE BOOKS		
1	Dodge, Yadolah, ed. Statistical data analysis and inference. Elsevier, 2014.	
2	Ismay, Chester, and Albert Y. Kim. Statistical Inference via Data Science: A Modern Dive into R and the Tidyverse. CRC Press, 2019.	
E RESOURCES FOR REFERENCE		
1.	<a href="https://leanpub.com/LittleInferenceBook">https://leanpub.com/LittleInferenceBook</a>	
MOOC		
1.	<a href="https://www.coursera.org/learn/statistical-inference">https://www.coursera.org/learn/statistical-inference</a>	
2.	<a href="https://www.datacamp.com/community/open-courses/statistical-inference-and-data-analysis">https://www.datacamp.com/community/open-courses/statistical-inference-and-data-analysis</a>	

COURSE TITLE	TOOLS AND TECHNIQUES FOR DATA SCIENCE			CREDITS	3	
COURSE CODE	ECS51504	COURSE CATEGORY	PC/DE/NE	L-T-P-S	2-0-2-2	
Version	1.0	Approval Details	XX	LEARNING LEVEL	BTL-3	
ASSESSMENT SCHEME						
CIA					ESE	
First Periodical Assessment (Theory)	Second Periodical Assessment (Theory)	Practical Assessments	Observation / lab records as approved by the Department Examination Committee “DEC”	Attendance*	THEORY	PRACTICAL
15%	15%	10%	5%	5%	25%	25%
Course Description	This course focused to familiarize the tools required to learn for data science and techniques which are used for application specific, like Jupyter Notebooks, JupyterLab, RStudio IDE, Git, GitHub, and Watson Studio.					



Course Objective	1. To know the basic concepts in Clean and preprocess the raw data using WEKA and Excel 2. To understand the different models used for data processing. 3. To ability to use the text analytics. 4. To learn the tools and techniques like Jupyter and R studio.														
Course Outcome	Upon completion of this course, the students will be able to  1. Illustrate the Clean and preprocess the raw data using WEKA and Excel 2. Apply the given data to the appropriate model using Scikit and TensorFlow 3. Use NLTK tool for text analytics 4. Create visualization of data using Matplotlib and Tableau. 5. Solve the real time problems of data analytics														
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	3	2	2	2	1	-	-	-	-	-	-	2	2	2	2
CO-2	3	2	1	2	1	-	-	-	-	-	-	2	2	2	2
CO-3	3	2	2	1	2	-	-	-	-	-	-	2	3	3	3
CO-4	3	2	2	1	2	-	-	-	-	-	-	2	2	2	2
CO-5	3	2	2	1	1	-	-	-	-	-	-	2	2	2	2
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: CLEANING AND PREPROCESSING														(6L+ 6P)	
Introduction- Preprocessing Data -File Conversion - Opening File From A Local File System - Opening File From A Web Site - Reading Data From A Database - Preprocessing Window- Building Classifier, Cluster, Association-Attribute Selection-Data Visualization. Excel: Statistical Capabilities-Average, Mean, Stand Deviation, Median, Graphs-Scatter Plot, Bar Graphs  Lab experiment: <ul style="list-style-type: none"><li>Preprocessing Data(Any arff Data)</li><li>File Conversion(arff to Xls)</li><li>Building “Classifiers(choose the classifier algorithm)</li><li>Setting Test Options(select the test option )</li><li>Visualization of Results</li><li>Using Excel find the Average, Standard Deviation</li><li>Create an histogram using the features in the dataset</li></ul>													CO-1  BTL-2		
MODULE 2: MODELING														(6L+ 6P)	

<p>Introduction to Scikit learn – Installation basics – fitting and predicting (estimator basics) - Transformers and pre-processors - Pipelines: chaining pre-processors and estimator - Model evaluation - Automatic parameter searches</p> <p>TensorFlow Fundamentals- basic computation - Installation of TensorFlow - Tensors and NumPy - Loading and Preprocessing data - Linear and Logistic regression with TensorFlow - Training convolutional neural network in TensorFlow - deploying model</p> <p><b>Lab experiment:</b></p> <ul style="list-style-type: none"> <li>• Predicting a continuous-valued attribute associated with an object for a stock pricing application using scikit learn estimator basics</li> <li>• Addition and multiplication of array tensors using TensorFlow</li> <li>• Classify the vehicles in a Traffic image data set using Tensorflow.</li> </ul> <p>Regression and visualization of sigmoidal function using TensorFlow</p>	<p><b>CO-2</b></p> <p><b>BTL-3</b></p>
<b>MODULE 3: APPLICATION</b>	
<p>Overview of NLTK- Tool Installation -Tokenize Words and Sentences-POS Tagging &amp; Chunking-Stemming and Lemmatization-WordNet with NLTK.</p> <p>Introduction about jupyter notebook-Notebook Basics-Running Code-Markdown cells-Importing Jupyter Notebook as module- connecting to an existing Ipython kernel using Qt Console</p> <p><b>Lab experiment:</b></p> <ol style="list-style-type: none"> <li>1. Write a Python NLTK program to split the text sentence/paragraph into a list of words.</li> <li>2. Write a Python NLTK program to tokenize a twitter text.</li> <li>3..DataCleaning and transformation</li> <li>4.Statistical modeling</li> <li>5.Data visualization</li> </ol>	<p><b>CO-3</b></p> <p><b>BTL-3</b></p>
<b>MODULE 4: VISUALIZATION</b>	
<p>Visualization with Matplotlib- Figures and Subplots- Colors, Line Styles, Ticks, Labels, and Legends - Saving Plots to File - Line Plots, Scatter Plots, Density and Contour Plots, Histograms, Three-Dimensional Plotting and Geographic Data with Basemap.</p> <p>Visualization with Tableau: Introduction – Adding Data Sources in Tabeau – Creating Data Visualizations – Aggregate Functions, Calculated Fields, and Parameters – Table Calculations – Maps – Advanced Analytics: Trends, Forecasts, Clusters and other Statistical Tools</p> <p><b>Lab experiment:</b></p> <ol style="list-style-type: none"> <li>1. Using matplotlib, plot the following: <ul style="list-style-type: none"> <li>• A Line plot with multiple lines and suitable legends, styles, colors, ticks, title and labels on X and Y axis.</li> <li>• A Scatter plot for two different groups comparing their income and expense and save the plot to a file.</li> <li>• A three-dimensional contour plot of a three-dimensional cosine function.</li> </ul> </li> <li>2. Create Motion Charts using Tableau</li> <li>3. Design Dashboards using Tableau</li> </ol>	<p><b>CO-4</b></p> <p><b>BTL-3</b></p>
<b>MODULE 5: CASE STUDY</b>	

Case Study 1: Data Science and Machine Learning tools for mining insights from the student data.		CO-5  BTL-3
Case Study 2: Adaptive Learning based on the analysis of student data.		
Lab experiment:		
<ul style="list-style-type: none"><li>To track the courses in which the performance of the students was not up to the mark. It leads to developing a backup program to deal with the cause behind this to improve student performance.</li><li>To collect various data related to students such as their marks, strengths, weaknesses, cultural areas of interest as well as the scenarios in which they hesitate.</li></ul>		
BOOKS		
1.	Aurélien Géron, “Hands-On Machine Learning with Scikit-Learn and Tensor Flow” O'Reilly, 2017.	
2.	Bharath Ramsundar, Reza Bosagh Zadeh (2018). “TensorFlow for Deep Learning”, O'Reilly, 2018.	
REFERENCE BOOKS		
1	Statistical Analysis with Excel for Dummies, Joseph Schmuller, John Wiley & Sons, Inc, 2013.	
2	Alexander Loth, “Visual Analytics with Tableau”, Wiley Publisher, First Edition, 2019.	
3	Jake VanderPlas, “Python Data Science Handbook: Essential Tools for Working with Data”, O'Reilly, 2017.	
E Resources for Reference		
1.	<a href="https://www.cs.auckland.ac.nz/courses/compsci367s1c/tutorials/IntroductionToWeka.pdf">https://www.cs.auckland.ac.nz/courses/compsci367s1c/tutorials/IntroductionToWeka.pdf</a>	
2.	<a href="https://www.geeksforgeeks.org/best-tools-and-technologies-for-data-science/">https://www.geeksforgeeks.org/best-tools-and-technologies-for-data-science/</a>	
3.	<a href="https://www.tutorialspoint.com/tableau/index.htm">https://www.tutorialspoint.com/tableau/index.htm</a>	
MOOC		
1.	<a href="http://scikit-learn.org/stable/">http://scikit-learn.org/stable/</a>	
2.	<a href="https://www.tensorflow.org/tutorials/keras/classification">https://www.tensorflow.org/tutorials/keras/classification</a>	
3.	<a href="https://www.coursera.org/learn/python-data-analysis#syllabus">https://www.coursera.org/learn/python-data-analysis#syllabus</a>	