CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)

NATIONALLY ACCREDITED WITH A^{+} GRADE BY NAAC

TIRUCHIRAPPALLI

PG & RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M. Sc. COMPUTER SCIENCE

SYLLABUS

2026-2027 and Onwards

CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)

PG & RESEARCH DEPARTMENT OF COMPUTER SCIENCE

VISION

To create an ambience for a quality academic erudition which drives technologically adept,innovative and globally competent graduates with ethical values

MISSION

- To have a breath of knowledge across the subject areas of Computer Science
- To professionally enrich the students for successful career in Academic, Industry andResearch
- To promote and inculcate ethics and code of professional practice among students

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	Statements
PEO1	**LEARNING ENVIRONMENT** To facilitate value-based holistic and comprehensive learning by integrating innovative learning practices to match the highest quality standards and train the students to be effective leaders in their chosen fields.
PEO2	**ACADEMIC EXCELLENCE** To provide a conducive environment to unleash their hidden talents and to nurture the spirit of critical thinking and encourage them to achieve their goal.
PEO3	**EMPLOYABILITY** To equip students with the required skills in order to adapt to the changing global scenario and gain access to versatile career opportunities in multidisciplinary domains.
PEO4	**PROFESSIONAL ETHICS AND SOCIAL RESPONSIBILITY** To develop a sense of social responsibility by formulating ethics and equity to transform students into committed professionals with a strong attitude towards the development of the nation.
PEO5	**GREEN SUSTAINABILITY** To understand the impact of professional solutions in societal and environmental contexts and demonstrate the knowledge for an overall sustainable development.

PROGRAMME OUTCOMES FOR M.Sc. COMPUTER SCIENCE PROGRAMME

PO NO.	Programme Outcome On completion of M.Sc. Computer Science The students will be able to
PO 1	**DOMAIN KNOWLEDGE** Acquire the in-depth computing knowledge both conceptual and applied pertaining to the core discipline
PO 2	**PROBLEM SOLVING** Procure knowledge-based skills to satisfy the needs of society and the industry by providing hands on experience of various technologies in Computer Science
PO 3	**INNOVATION AND CRITICAL THINKING** Critically evaluate global issues, recognize the need and identify sustainable solutions through research capabilities towards Nation building initiatives
PO 4	**LIFE LONG LEARNING** Capable of upgrading and advancing knowledge through innovation and technology as evidenced by current developments
PO 5	**LEADERSHIP AND TEAMWORK** Work in collaborative environment through applications of scientific reasoning and communicate effectively to the stakeholders

PROGRAMME SPECIFIC OUTCOMES FOR M.Sc. COMPUTER SCIENCE PROGRAMME

PSO NO.	Programme Specific Outcomes Students of M.Sc. Computer Science will be able to	PO s Addressed
PSO 1	Identify, formulate, and solve complex problems using modern computing tools.	PO 1 PO 2
PSO 2	Demonstrate broad knowledge in core areas of Computer Science with emerging technologies in related domains.	PO 1 PO 2 PO 4
PSO 3	Apply computing knowledge to design and develop innovative solutions, fostering research aptitude and contributing to technological advancement.	PO 2 PO 3 PO 4
PSO 4	Develop strong analytical and technical skills to enhance employability, support higher studies and encourage entrepreneurship.	PO 3 PO 4 PO 5
PSO 5	Exhibit professional ethics, social responsibility and effective communication skills to become competent citizens contributing to societal development.	PO 3 PO 4 PO 5

SEMESTER I

CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)
PG & RESEARCH DEPARTMENT OF COMPUTER SCIENCE
M.Sc. Computer Science
CHOICE BASED CREDIT SYSTEM-LEARNING OUTCOME BASED CURRICULUM FRAMEWORK (CBCS – LOCF)
(For the Candidates admitted from the Academic year 2026-2027 and onwards)

Semester	Course	Course Title	Course Code	Inst. Hrs. / week	Credits	Exam			Total
						Hrs.	Marks		
							Int.	Ext.	
I	Core Course– I (CC-I)	Design and Analysis of Algorithms	26PCS1CC1	6	5	3	30	70	100
	Core Course – II (CC-II)	Mathematical Foundation for Computer Science	26PCS1CC2	6	5	3	30	70	100
	Core Practical –I (CP-I)	Design and Analysis of Algorithms(P)	26PCS1CP1	6	5	3	40	60	100
	Discipline Centric Elective Course-I (DCEC-I)	A. J2EE Technologies	26PCS1DCE1A	5	3	3	30	70	100
		B. Full Stack Development	26PCS1DCE1B						
		C. Natural Language Processing	26PCS1DCE1C						
	Generic Elective Course -I (GEC-I)	A. J2EE Technologies(P)	26PCS1GEP1A	4	2	3	40	60	100
		B. Full Stack Development(P)	26PCS1GEP1B						
	Non-Major Elective Course -I (NMEC-I)	Data Analysis and Visualization(P)	26PCS1NMEP1	3	2	3	40	60	100
	Total			**30**	**22**				**600**

Courses & Credits for PG Science Programmes

Sl. No	Courses	No. of Courses	Hours Allocated	No. of Credits	Marks
1.	Core Course – (CC)	7	6	7*5=35	700
2.	Core Practical – (CP)	4	6	4*5=20	400
3.	Discipline Centric Elective Course - (DCEC)	4	5	4*3=12	400
4.	Generic Elective Course - (GEC)	4	¾	4*2=8	400
5.	Non-Major Elective Course	2	3	2*2=4	200
5.	Skill Enhancement Course- (SEC)	2	3	2*2=4	200
6.	Project	1	4	4	100
7.	Internship	1	-	2	100
8.	Entrepreneurship/Industry Based Course	1	3	2	100
	Total	26		91	2600

The Internal and External marks for theory and practical courses are as follows:

Course	Internal Marks	External Marks
Theory	30	70
Practical	40	60
Internship	20	80
Project	20	80

For Theory courses:

a) The passing minimum for CIA shall be 40% out of 30 marks (i.e. 12 marks)

b) The passing minimum for End Semester Examinations shall be 40% out of 70 marks (i.e. 28 marks)

c) The passing minimum not less than 50% in the aggregate.

For Practical courses:

a) The passing minimum for CIA shall be 40% out of 40 marks (i.e. 16 marks)

b) The passing minimum for End Semester Examinations shall be 40% out of 60 marks (i.e. 24 marks)

c) The passing minimum not less than 50% in the aggregate.

For Internship & Project Work:

a) The passing minimum not less than 50% in the aggregate.

Semester: I	Internal Marks: 30		External Marks: 70	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS / WEEK	CREDITS
26PCS1CC1	DESIGN AND ANALYSIS OF ALGORITHMS	CORE COURSE	6	5

Course Objective

- To understand fundamental algorithmic design strategies using asymptotic notations.
- Analyze time and space complexity rigorously
- To apply algorithmic paradigms and dynamic programming to solve computational problems.
- To evaluate advanced algorithmic techniques and NP-completeness concepts.
- To design efficient algorithms for real-world problems and assess their computational feasibility and limitations.

Prerequisites

Basic concepts of programming fundamentals and discrete mathematics

Course Features with Relevance Status

S. No.	Course features	Relevance Status
1	Course emphasis on Employability/Entrepreneurship/ Skill Development	Employability, Entrepreneurship, Skill Development
2	Course integrates cross cutting issues relevant to Professional Ethics / Gender Sensitization / Environment and Sustainability /Human Values/ Indian Knowledge Systems (IKS)	Professional Ethics, Environment and Sustainability, IKS
3	Course relevant to Local/Regional/National/Global needs	Global needs
4	Course focus on Sustainable Developmental Goals (SDG)	SDG 4, 8, 9, 12, 13

Course Outcome and Cognitive Level Mapping

On the successful completion of the course, students will be able to

CO Number	CO Statement	Cognitive Level
CO1	Define and compare algorithm concepts and their time complexity	K1, K2
CO2	Construct algorithm techniques to implement searching and sorting methods	K3
CO3	Analyze algorithm performance using different analytical methods	K4
CO4	Justify the suitability of various algorithm design techniques for different problem scenarios	K5
CO5	Design algorithmic solutions for real-time applications	K6

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	2	3	3	1	3	2
CO2	3	3	3	2	3	3	3	2	3	3
CO3	3	2	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	2	1	2
CO5	3	3	3	3	3	3	3	2	3	3

"1"–Slight (Low) Correlation "2"–Moderate (Medium) Correlation
"3"–Substantial (High) Correlation "-"–indicates there is no Correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Introduction:** Algorithm, Fundamentals of Algorithmic Problem Solving, Important Problem Types. **Fundamentals of the Analysis of Algorithm**: The Analysis Framework, Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis of Non-recursive & Recursive Algorithms. **Brute Force Search:** Selection Sort, Bubble Sort, Sequential Search, Brute-Force String Matching, Exhaustive Search, Depth-First Search, Breadth-First Search.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
II	**Decrease–and–Conquer:** Insertion Sort, Topological Sorting, Binary Search, Interpolation Search. **Divide-and-Conquer:** Merge Sort, Quick Sort, Multiplication of Large Integers, Strassen's Matrix Multiplication **Transform-and-Conquer:** Presorting, Balanced Search Trees, Heaps and Heap Sort, Problem Reduction. **Space and Time Trade-Offs:** Hashing, B-Trees.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
III	**Dynamic Programming and Greedy Techniques:** Knapsack Problem, Optimal Binary Search Trees, Warshall's and Floyd's Algorithms. **Greedy Technique:** Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees and Codes.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
IV	**Iterative Improvement:** Simplex Method, Maximum-Flow Problem. **Limitations of Algorithm Power:** Lower-Bound Arguments, Decision Trees, P, NP, and NP-Complete Problems.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
V	**Backtracking:** n-Queens Problem, Hamiltonian Circuit Problem, Subset-Sum Problem, Branch-and-Bound: Assignment Problem, Knapsack Problem, Traveling Salesman Problem, Approximation Algorithms for the knapsack problem	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
VI	**Self Study for Enrichment:** **(Not included for End Semester Examination)** **Advanced Algorithms**: Parallel Algorithms for Sorting, Searching and Merging, Randomized Algorithms.		CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

Text Book

1. Anany Levitin, Introduction to the Design and Analysis of Algorithms (3e), Pearson Education India-2017, (Chapters 1-12)

Reference Books

1. Richard Neapolitan, Foundations of Algorithms, Jones & Bartlett Learning, Fifth Edition,2011.
2. Thomas H. Cormen, Charles, E.Leiserson,Ronald L.Rivest,Cufford stein, Introduction to Algorithms, Third Edition, The MIT Press,2010.
3. E. Horowitz, S. Sahni, Fundamentals of Computer Algorithms, Second Edition, Universities Press,2018.
4. A.V. Aho, J.V. Hopcroft, J.D. Ullmann, The Design and Analysis of Computer Algorithms, Second Edition, Pearson Education,2009.

Web References

1. https://nptel.ac.in/courses/106105191
2. https://ocw.mit.edu/courses/6-046j-design-and-analysis-of-algorithms-spring-2015/
3. https://web.stanford.edu/class/cs161/
4. https://www.cse.iitb.ac.in/~shivaram/teaching/old/cs211/
5. https://www.geeksforgeeks.org/design-and-analysis-of-algorithms/
6. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/
7. https://cp-algorithms.com/

Pedagogy

Lecture-based Learning, Presentation and Discussion

Course Designer

Dr. A. R. Jasmine Begum

CORE COURSE –II(CC–II)
MATHEMATICAL FOUNDATION FOR COMPUTER SCIENCE
(For M.Sc Computer Science)

Semester I	Internal Marks: 30		ExternalMarks:70	
COURSECODE	**COURSETITLE**	**CATEGORY**	**Hrs / Week**	**CREDITS**
26PCS1CC2	**MATHEMATICAL FOUNDATION FOR COMPUTER SCIENCE**	**CORE**	**6**	**5**

(2026-2027and Onwards)

Course Objective

- **Explore** the basic concepts of Discrete Mathematics, Graph Theory.
- **Acquire** the knowledge of Fundamentals in Combinatorics.
- **Analyze** the method of logical reasoning to solve variety of problems.

Prerequisite

Basic Knowledge in Relations,Functions and Graph Theory.

S. No.	Course Features	Relevance Status
1.	Course emphasis on Employability/Entrepreneurship/Skill Development	Employability, Entrepreneurship, Skill Development
2.	Course integrates cross cutting issues relevant to Professional Ethics/Gender sensitization/ Environment and Sustainability/ Human Values/ Indian Knowledge System	Professional Ethics
3.	Course relevant to Local/Regional/National/ Global needs	Global need
4.	Course focus on Sustainable Developmental Goals	SDG 4,8,9,12

CourseOutcomes

Course Outcome and Cognitive Level Mapping

CONumber	COStatement On the successful completion of the course, students will be able to	CognitiveLevel
CO1	Define the various concepts in Relations, Combinatorics and Graphs.	K1
CO2	Understand the different terminologies of functions, Predicate Calculus, Recurrence Relations and Graphs and Fuzzy sets.	K2
CO3	Analyze the problems in different aspects and give solutions in their respective streams.	K3
CO4	Examine some methodologies for the related area in an effective manner.	K4
CO5	Apply the notions to distinct problems and get solutions in a easy way.	K5

Mapping of COwithPO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	2	2	3	2	2	3	2	2	2	3
CO2	2	2	3	2	2	2	2	2	2	3
CO3	3	2	3	2	2	3	2	2	3	3
CO4	3	2	2	2	2	2	2	2	2	2
CO5	2	2	2	3	3	2	3	3	2	2

"1" – Slight (Low) Correlation ¬ "2" – Moderate (Medium) Correlation ¬
"3" – Substantial (High) Correlation ¬ "-" indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Basic Concepts Of Set Theory:**Notation – Inclusion of Equality of Sets – The power set – Some Operations on Sets – Venn Diagrams – Cartesian Products.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**Foundations:**Logic **Predicate Calculus:**WellFormed formulas– Truth Table of Well Formed Formula –Tautology, Contradiction and Contingency–Equivalence of Formulas–Algebra of Propositions–Normal Forms of Well –Formed Formulas–Rules of Inference for Propositional Calculus**.**	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**Combinatorics:** Permutations–Combinations–Permutations with Repetitions– Combinations with Repetitions–Permutations of sets with indistinguishable objects. **Recurrence Relations:**Formulation as Recurrence Relations– Solving Recurrence Relation by Iteration– Solving Recurrence Relations– Solving Linear Homogeneous Recurrence Relations of OrderTwo.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**Graphs**–Connected Graphs –Examples of Special Graphs–Eule Graphs–Hamiltonian Circuits and Paths.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**From Classical(Crisp) Sets to Fuzzy Sets:** Fuzzy sets: Basic types – Fuzzy sets: Basic Concepts. **Fuzzy Sets Versus Crisp Sets:**Additional Properties of α – cuts. **Operations on Fuzzy Sets:** Types of Operations– Fuzzy Complement.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	**Self Study for Enrichment:** **(Not included for End Semester Examination)** Multisets – Functionally Complete Sets**- -Crisp sets:** An Overview	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Tremblay, J.P. and Manohar, R. (1997). *Discrete Mathematical Structures with Applications to Computer Science*, Tata McGraw- HillPublishing CompanyLimited,NewDelhi.
2. Chandrasekaran. N, and Umaparvathi.M(2015), *Discrete Mathematics,* PHI Learning Private Limited,NewDelhi.
3. George. J. Klir and Bo Yuan(2013), *Fuzzy Sets And Fuzzy Logic,* Prentice Hall ofIndia,NewDelhi.

Chapters and Sections

UNIT-I	Chapter 2: Sections 2-1.1 to 2-1.5, 2-1.9[1]
UNIT-II	Chapter 1: Section1.1[2]
	Chapter 2:Sections2.1-2.5, 2.7, 2.8[2]
UNIT-III	Chapter 3: Sections3.1-3.5[2]
	Chapter 6: Sections6.1-6.4[2]
UNIT- IV	Chapter 10: Sections 10.1-10.4[2]
UNIT- V	Chapter 1: Sections 1.3, 1.4 [3]
	Chapter 2: Sections 2.1 [3]
	Chapter 3: Sections 3.1, 3.2 [3]

ReferenceBooks

1. Ralph,P.Grimaldi.(2002).*Discrete and Combinatorial Mathematics,* Pearson AsiaEducation.
2. NarsinghDeo.(1997). *Graph Theory With Applications To Engineering & Computer Science.*PrenticeHallofIndia,NewDelhi.
3. Ganesh, G.J.M. (2006). *Introduction To Fuzzy Sets And Logic*, Prentice-HallofIndia,NewDelhi.

Web References

1. **https://www.youtube.com/results?search_query=negation+of+the+statement**
2. **https://www.youtube.com/results?search_query=permutation**
3. **https://www.youtube.com/results?search_query=graph+theory+definitions+and+examples**
4. **https://www.youtube.com/results?search_query=trees+in+graph+theory**
5. **https://discrete.openmathbooks.org/pdfs/dmoi-tablet.pdf**
6. **https://www.maths.ed.ac.uk/~v1ranick/papers/wilsongraph.pdf**

Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Quiz, Seminar.

Course Designer

Dr. S. Saridha

Semester: I	Internal Marks: 40		External Marks: 60	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS / WEEK	CREDITS
26PCS1CP1	DESIGN AND ANALYSIS OF ALGORITHMS (P)	CORE	6	6

Course Objective

- To develop the ability to design and implement classical algorithmic techniques
- To experimentally analyze and evaluate the time and space complexity of implemented algorithms.
- To apply graph algorithms and optimization techniques to solve computational problems efficiently.
- Compare theoretical complexity with practical execution results
- To compare exact and approximation algorithms and assess their effectiveness for solving real-world optimization problems.

Prerequisites

Basic knowledge of programming concepts and problem-solving techniques

Course Features with Relevance Status

S. No.	Course Features	Relevance Status
1	Course emphasis on Employability/Entrepreneurship/Skill Development	Employability, Entrepreneurship, Skill Development
2	Course integrates cross cutting issues relevant to Professional Ethics / Gender Sensitization / Environment and Sustainability /Human Values/ Indian Knowledge Systems (IKS)	Professional Ethics, Environment and Sustainability, IKS
3	Course relevant to Local/Regional/National/Global needs	Global needs
4	Course focus on Sustainable Developmental Goals (SDG)	SDG 4, 8, 9, 12, 13

Course Outcome and Cognitive Level Mapping

On the successful completion of the course, students will be able to

CO Number	CO Statement	Cognitive Level
CO1	Recall and describe fundamental algorithm concepts, including time complexity, graph algorithms, and problem-solving techniques	K1
CO2	Relate the working principles of algorithmic techniques such as divide and conquer, greedy methods, dynamic programming, and backtracking	K2
CO3	Implement the fundamental algorithm design strategies for solving problems	K3
CO4	Analyze the performance and behavior of algorithms using different test cases	K4
CO5	Evaluate and design efficient algorithmic solutions for real-world problems	K5, K6

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	2
CO2	3	2	3	3	2	3	3	2	3	2
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	2	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3

"1" – Slight (Low) Correlation "2" – Moderate (Medium) Correlation

"3" – Substantial (High) Correlation "-" –indicates there is no Correlation

List of Exercises

Using Java

1. Time complexity measurement of a non-recursive procedure.
2. Matrix multiplication using Strassen's method.
3. Basic B-Tree operations, insertion and search.
4. Knapsack problem solution in Java using:
    a) Greedy technique (Fractional Knapsack)
    b) Dynamic Programming approach (0/1 Knapsack)
5. Transitive closure of a graph computation with Warshall's method.
6. All-pairs shortest paths determination with Floyd's method.
7. Minimum Spanning Tree generation with Prim's method.
8. Huffman Coding tree construction and prefix code generation.
9. Using Backtracking:
    a) Sum of subsets
    b) N-Queens

Web References

1. https://www.geeksforgeeks.org/analysis-of-algorithms-set-1-asymptotic-analysis/
2. https://docs.oracle.com/javase/8/docs/api/java/lang/System.html#nanoTime
3. https://www.programiz.com/dsa/floyd-warshall-algorithm
4. https://www.tutorialspoint.com/java/index.htm
5. https://archive.nptel.ac.in/noc/courses/noc16/SEM1/noc16-cs04
6. https://swayam.gov.in/nd1_noc22_cs29

Pedagogy

Live Demonstration, Learning through problem solving

Course Designer

Dr. A. R. Jasmine Begum

Semester : I	Internal Marks:30		External Marks:70	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS/WEEK	CREDITS
26PCS1DCE1A	J2EE TECHNOLOGIES	DISCIPLINE CENTRIC ELECTIVE	5	3

Course Objective

- To provide a comprehensive understanding of Java 2 Platform, Enterprise Edition (J2EE) and its components
- To understand the core concepts and elements of JSP, including implicit objects, scope, and error handling
- To know servlet life cycle and exception handling in web applications
- To explore the core concepts of EJB and the different types of beans
- To learn the structure and components of a Struts-based application

Prerequisites

Basic knowledge of Java Programming, Web Technologies

Course Features with Relevance Status

S. No.	Course Features	Relevance Status
1.	Course emphasis on Employability/Entrepreneurship/Skill Development	Employability/ Entrepreneurship/Skill Development
2.	Course integrates cross cutting issues relevant to Professional Ethics / Gender Sensitization / Environment and Sustainability /Human Values/ Indian Knowledge Systems (IKS)	Professional Ethics
3.	Course relevant to Local/Regional/National/Global needs	Global
4.	Course focus on Sustainable Developmental Goals (SDG)	SDG 4, 8 and 9

Course Outcome and Cognitive Level Mapping

On the successful completion of the course, students will be able to

CO Number	CO Statement	Cognitive Level
CO1	Demonstrate a clear understanding of the J2EE architecture and its components	**K1**
CO2	Implement database connectivity and perform data operations in web applications	**K2**
CO3	Apply programming constructs and server-side technologies to develop web services	**K3**
CO4	Analyze and integrate J2EE technologies to build dynamic and interactive web applications	**K4**
CO5	Design and develop framework-based development concepts using J2EE	**K5, K6**

Mapping of CO with PO and PSO

Cos	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO1	3	3	2	2	1	3	2	1	2	2
CO2	3	3	2	2	2	3	3	2	2	3
CO3	3	3	3	2	3	3	3	2	2	2
CO4	3	3	3	3	2	3	3	3	2	3
CO5	3	3	3	3	3	3	3	3	3	3

"1" – Slight (Low) Correlation "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation "-" indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Introduction**: Java EE 7 Overview – Evolution of Java – Starting with Java – Exploring Enterprise Architecture Types – Objectives of Enterprise Applications – Exploring the new features of the Java EE Platform – Exploring the Java EE 7 Platform – Architecture – Container – Web servers – Application servers – **JDBC:** Database Connectivity from Java – Performing Insert, Delete and Select Operations.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
II	**Servlet Programming:** Introduction – Structure - Objectives – Basics of Servlet – Servlet Life Cycle – Servlet Programming – Handling the client-side form data – Methods to read the data – Handling the request headers – Generate the server response – Handling the response header. **Managing Advance Features in Servlet:** Managing Cookies – Managing Sessions.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
III	**Basics of Java Server Pages:** Introduction – Structure - Objectives – Java Server Pages – JSP Life Cycle – Overview of JSP – Basic Scripting Elements – JSP Directives - Page directive - The errorPage and isErrorPage attributes - Include files - Forwarding re- quests with jsp:forward - taglib directive.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
IV	**Working with EJB**: Fundamentals – Classifying EJBs - Introducing Session Beans - Implementing Session Beans – Introducing Session Bean – Implementing Session Beans - Introducing the MDB – Implementing the MDB - Managing 'Transactions in Java EE Applications.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
V	**Getting Started with Spring:**- Spring - Initializing a Spring application - Writing a Spring application - Surveying the Spring landscape – **Developing web Application**: Displaying information - Processing form submission - Validating form input - Working with view controllers – **Working with Data:** Reading and writing data with JDBC - Persisting data with Spring Data JPA.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

VI	**Self Study for Enrichment:** (Not included for End Semester Examinations) Hibernates – Java Server Faces - Securing Spring: Enabling Spring Security - Configuring Spring Security - Securing web requests – Creating REST services: Writing RESTful controllers - Enabling hypermedia - Enabling data-backed services – Reactive Spring - Cloud Native Spring.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

Text Books

1. Dabhi, N., Patel, D., & Patel, A. (2023). *Web development toolkit for Java developers*. BPB Publications.(Unit I, Unit II & Unit III)
2. Kogent Learning Solutions Inc. (2014). *Java Server Programming Java EE 7 (J2EE 1.7) black book*. Dreamtech Press.(Unit I & IV)
3. Craig Walls. (2019). *Spring in action* (5th ed.). Manning Publications.(Unit V)

Reference Books

1. Rajesh Boggavarapu, "Complete Java-J2EE Guide: understand easy Java and J2EE briefly", Sun Micro Systems, 2019

2. Rhuan Rocha, Joao Purificacao , "Java EE 8 Design Patterns and Best Practices: Build enterprise-ready scalable applications with architectural design patterns" Packt Publishing Limited, 2018

Web References

1. https://www.java4coding.com/contents/servlet/jee-tutorial
2. https://mindmajix.com/j2ee-tutorial
3. https://www.digitalocean.com/community/tutorials/java-tutorial-java-eetutorials
4. https://www.udemy.com/course/java-struts-spring-hibernate-jsp-ejb-jsf-jws-maven/?srsltid=AfmBOorn-O6j_NEeArzeV9kloihWpbWbbc1crshHLGdJt4YwU_IB0ME5&couponCode=CM260427IN

Pedagogy

Lecture based Learning, Presentation and Discussion, Assignment and Demonstration

Course Designer

Dr. P. Muthulakshmi

Semester : I	Internal Marks:30		External Marks:70	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS/WEEK	CREDITS
26PCS1DCE1B	FULL STACK DEVELOPMENT	DISCIPLINE CENTRIC ELECTIVE	5	3

Course Objective

- To understand the architecture of full stack web development.
- To develop server-side applications using Node.js and Express.
- To implement database connectivity using MongoDB.
- To build client-side applications using Angular and React.
- To develop MERN based web applications.

Prerequisites

Basic knowledge of Programming, HTML, CSS and JavaScript

Course Features with Relevance Status

S. No.	Course Features	Relevance Status
1.	Course emphasis on Employability/Entrepreneurship/Skill Development	Employability/ Entrepreneurship/Skill Development
2.	Course integrates cross cutting issues relevant to Professional Ethics / Gender Sensitization / Environment and Sustainability /Human Values/ Indian Knowledge Systems (IKS)	Professional Ethics
3.	Course relevant to Local/Regional/National/Global needs	Global
4.	Course focus on Sustainable Developmental Goals (SDG)	SDG 4, 8 and 9

Course Outcome and Cognitive Level Mapping

On the successful completion of the course, students will be able to

CO Number	CO Statement	Cognitive Level
CO1	Define the concepts, architecture and components of full stack web application development.	K1
CO2	Summarize programming constructs and client-side and server-side technologies used in the development of web services and APIs.	K2
CO3	Apply database connectivity and perform data manipulations in web applications.	K3, K4
CO4	Analyze and integrate front-end and back-end frameworks to build dynamic and interactive web applications.	K4
CO5	Assess and develop a complete full stack application using modern frameworks and deployment practices.	K5, K6

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO1	3	3	2	2	1	3	2	1	2	2
CO2	3	3	2	2	2	3	3	2	2	3
CO3	3	3	3	2	3	3	3	2	2	2
CO4	3	3	3	3	2	3	3	3	2	3
CO5	3	3	3	3	3	3	3	3	3	3

"1" – Slight (Low) Correlation "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation "-" indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**BASICS OF FULL STACK** Basic Web Development Framework - User, Browser, Web Server and Backend Services – Stack Components - JavaScript fundamentals: Variables, Data Types, Operators – Control Statements – Functions – Objects – Strings – Arrays – Error Handling – WordNet.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
II	**NODE JS** Introduction to Node.js – Installation – Node Package Manager – Creating Node.js Application – Events and Listeners – Timers – Callbacks – File Handling and Data I/O – Implementing HTTP Services in Node.js.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
III	**MONGODB** NoSQL Concepts – MongoDB Environment Setup – User Accounts and Access Control – Database Administration – Collections – MongoDB Node.js Driver – Accessing and Manipulating Databases and Collections.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
IV	**EXPRESS AND ANGULAR** Express Framework – Routing – Request and Response Objects – Angular – TypeScript – Components – Expressions – Data Binding – Built-in Directives.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
V	**REACT** MERN Stack – React Components – State Management – REST API Integration – Webpack – React Router – Server Side Rendering.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
VI	**Self Study for Enrichment:** (Not included for End Semester Examinations) Streams - Cluster Module - MongoDB Data Modeling Best Practices - Security in Express - JWT authentication in a MERN – Redux – React Router and hooks.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

Text Books

1. Brad Dayley, Brendan Dayley, Caleb Dayley, 'Node.js, MongoDB and Angular Web Development', Addison-Wesley, Second Edition, 2018- (Unit I to III)
2. Vasan Subramanian, 'Pro MERN Stack, Full Stack Web App Development with Mongo,Express, React, and Node', Second Edition, Apress, 2019.-(Unit IV and V)

Reference Books

1. Chris Northwood, 'The Full Stack Developer: Your Essential Guide to the Everyday Skills
2. Expected of a Modern Full Stack Web Developer', Apress; 1st edition, 2018
3. Kirupa Chinnathambi, 'Learning React: A Hands-On Guide to Building Web Applications Using
4. React and Redux', Addison-Wesley Professional, 2nd edition, 2018

Web References

1. https://www.tutorialspoint.com/the_full_stack_web_development/index.asp
2. https://www.coursera.org/specializations/full-stack-react
3. https://www.udemy.com/course/the-full-stack-web-development/

Pedagogy

Lecture based learning, Presentation and Discussion and Case Study

Course Designer

Ms. S. Udhaya Priya

Semester : I	Internal Marks:30		External Marks:70	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS/WEEK	CREDITS
26PCS1DCE1C	NATURAL LANGUAGE PROCESSING	DISCIPLINE CENTRIC ELECTIVE	5	3

Course Objective

- To introduce the fundamental concepts, theories, and challenges of Natural Language Processing(NLP).
- To develop practical skills in processing raw text using python and structured program development.
- To enable learners to apply tagging and supervised machine learning techniques.
- To provide an understanding of semantic analysis, feature-based grammars and logical representations.

Prerequisites

Basic knowledge of Programming, HTML, CSS and JavaScript

Course Features with Relevance Status

S. No.	Course Features	Relevance Status
1.	Course emphasis on Employability/Entrepreneurship/Skill Development	Employability &Skill Development
2.	Course integrates cross cutting issues relevant to Professional Ethics / Gender Sensitization / Environment and Sustainability /Human Values/ Indian Knowledge Systems (IKS)	Professional Ethics, IKS
3.	Course relevant to Local/Regional/National/Global needs	Global
4.	Course focus on Sustainable Developmental Goals (SDG)	SDG 4, 8 and 9

Course Outcome and Cognitive Level Mapping

On the successful completion of the course, students will be able to

CO Number	CO Statement	Cognitive Level
CO1	List fundamental concepts of NLP, linguistics, and standard data formats used in language processing	**K1**
CO2	Understand how key concepts from NLP and linguistics are used to describe and analyze language	**K2**
CO3	Identify the suitable data structures and algorithms used in NLP	**K3**
CO4	Analyze and evaluate the methods and algorithms used to process different types of textual data	**K4, K5**
CO5	Design models to extract grammatical features and apply principles of propositional and first-order logic in NLP applications	**K6**

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO1	3	3	2	2	3	3	3	2	3	2
CO2	3	3	3	2	2	3	3	3	3	2
CO3	2	3	3	2	2	3	3	2	3	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	2	3

"1" – Slight (Low) Correlation "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation "-" indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Introduction: Natural Language Processing - origin of NLP – Language and Knowledge - challenges of NLP – Language and Grammar – NLP Applications **- Language Processing and Python**: Computing with Language: Texts and Words - A Closer Look at Python: Texts as Lists of Words - Computing with Language: Simple Statistics - Back to Python: Making Decisions and Taking Control -Automatic Natural Language Understanding. **Accessing Text Corpora and Lexical Resources**: Accessing Text Corpora- Conditional Frequency Distributions -More Python: Reusing Code - Lexical Resources – WordNet.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
II	**Processing Raw Text**: Accessing Text from the Web and from Disk - Strings: Text Processing at the Lowest Level- Text Processing with Unicode- Regular Expressions for Detecting Word Patterns- Useful Applications of Regular Expressions - Normalizing Text - Regular Expressions for Tokenizing Text - Segmentation –Formatting: From Lists to Strings .**Writing Structured Programs** : Back to the Basics- Sequences- Questions of Style - Functions: The Foundation of Structured Programming - Doing More with Functions- Program Development- Algorithm Design-A Sample of Python Libraries.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
III	**Categorizing and Tagging Words**: Using a Tagger-Tagged Corpora- Mapping Words to Properties Using Python Dictionaries-Automatic Tagging- N-Gram Tagging-Transformation Based Tagging- Determine the Category of a Word. **Learning to Classify Text**: Supervised Classification- Examples of Supervised Classification-Evaluation-Decision Trees-Naive Bayes Classifiers- Maximum Entropy Classifiers-Modeling Linguistic Patterns.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

IV	**Extracting Information from Text**: Information Extraction- Chunking-Developing and Evaluating Chunkers- Recursion in Linguistic Structure- Named Entity Recognition-Relation Extraction. **Analyzing Sentence Structure**: Some Grammatical Dilemmas-Use of Syntax - Context-Free Grammar-Parsing with Context-Free Grammar-Dependencies and Dependency Grammar- Grammar Development.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
V	**Building Feature-Based Grammars:** Grammatical Features-Processing Feature Structures-Extending a Feature-Based Grammar. **Analyzing the Meaning of Sentences:** Natural Language Understanding- Propositional Logic-First-Order Logic- The Semantics of English Sentences- Discourse Semantics. **Managing Linguistic Data:** Life Cycle of a Corpus – Acquiring data – working with XML.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
VI	**Self Study for Enrichment:** (Not included for End Semester Examinations) Applications and Case Studies: Question Answering and Machine Reading- Machine Translation- Text Generation	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

Text Books

1. Steven Bird, Ewan Klein and Edward Loper (2009).*Natural Language Processing with Python*. 1st Edition, O'Reilly Media. (Unit 1: Chapter 1, 2; Unit 2: Chapter 3,4; Unit 3: Chapter 5, 6 ;
   Unit 4:Chapter 7, 8; Unit 5: Chapter 9,10,11)
2. U. S. Tiwary and Tanveer Siddiqui(2008), *Natural Language Processing and Information Retrieval,* Oxford University Press.(Unit 1: Chapter 1)

Reference Books

1. Daniel Jurafsky and James H.Martin(2013).*Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition.* 2nd Edition, Pearson Education.
2. Nitin Hardeniya, Jacob Perkins, Deepti Chopra, Nisheeth Joshi, Iti Mathur (2016). *Natural Language Processing: Python and NLTK.*1st Edition, Packt Publishing.
3. Clark, A., Fox, C., & Lappin, S. (2013). *The handbook of computational linguistics and Natural Language Processing.* John Wiley & Sons.
4. Bender, E. M., & Lascarides, A. (2019). *Linguistic fundamentals for Natural Language Processing II: 100 essentials from semantics and pragmatics. Synthesis Lectures on Human Language Technologies*, 12(3), 1-268.
5. Hapke, H. M., Lane, H., & Howard, C. (2019). *Natural Language Processing in Action: Understanding, analyzing and generating text with Python*. Kindle Edition, Manning Publications

Web References

5. https://nptel.ac.in/courses/106101007
6. https://training-coursematerial.com/training/Natural_Language_Processing_in_Python
7. https://www.nltk.org/book/ch03.html
8. https://www.tutorialspoint.com/natural_language_processing/index.htm

Pedagogy

Lecture based learning , Presentation and Discussion, Seminar and Assignment

Course Designer

Dr. P. Muthulakshmi

Semester : I	Internal Marks:40		External Marks:60	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS /WEEK	CREDITS
26PCS1GEP1A	J2EE TECHNOLOGIES (P)	GENERIC ELECTIVE	4	3

Course Objective

- To understand the process of establishing a connection between Java applications and a MySQL database using JDBC (Java Database Connectivity)
- To understand the role of servlets in web applications
- To explore how servlets are initialized, handled, and destroyed within the web container
- To implement session-based data storage and retrieval within a web application
- To get familiar with the Struts architecture

Prerequisites

Basic knowledge of Java Programming, Web Technologies

Course Features with Relevance Status

S. No.	Course Features	Relevance Status
1.	Course emphasis on Employability/Entrepreneurship/Skill Development	Employability/ Entrepreneurship/Skill Development
2.	Course integrates cross cutting issues relevant to Professional Ethics / Gender Sensitization / Environment and Sustainability /Human Values/ Indian Knowledge Systems (IKS)	Professional Ethics
3.	Course relevant to Local/Regional/National/Global needs	Global
4.	Course focus on Sustainable Developmental Goals (SDG)	SDG 4, 8 and 9

Course Outcome and Cognitive Level Mapping

On the successful completion of the course, students will be able to

CO Number	CO Statement	Cognitive Level
CO1	Relate the key concepts of J2EE technologies, including JDBC, Servlets, JSP and Struts for developing web applications	K1
CO2	Illustrate the architecture and working of client-server web applications and the servlet life cycle	K2
CO3	Develop web application using JDBC, Servlets, and JSP for database interaction and dynamic content generation	K3
CO4	Examine and validate session management techniques for building efficient web applications	K4, K5
CO5	Build and deploy a web application integrating database connectivity and session handling	K6

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO1	3	2	2	2	2	3	1	2	2	1
CO2	3	3	2	3	3	2	3	2	3	2
CO3	3	2	3	3	3	3	3	3	2	3
CO4	3	3	3	2	3	2	3	3	3	3
CO5	3	3	3	3	3	3	3	2	3	3

"1" – Slight (Low) Correlation "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation "-" indicates there is no correlation

List of Exercises

1. Implement a servlet to accept username and display a greeting message.
2. Demonstrate the servlet life cycle methods by printing messages.
3. Implement and manage session tracking using HTTP Session.
4. Establish a JDBC connection with Servlet.
5. Develop a JSP page to display static and dynamic contents.
6. Demonstrate JSP elements: declarations, expressions and scriptlets.
7. Establish a JDBC connection with JSP.
8. Create a Stateless Session Bean that returns a welcome message.
9. Create a Stateful Session Bean that stores and retrieves a student's name.
10. Create a Login form using Struts.
11. Develop Student Portal System.

Web References

1. https://developer.mozilla.org/enS/docs/Learn/Getting_started_with_the_web/HTML_basics
2. https://www.codejava.net/java-web-applications/servlet/using-http-session-in-servlet
3. https://www.javaspringdeveloper.com/java/jsp-tutorial
4. https://www.udemy.com/topic/jsp/
5. https://www.codeproject.com/Articles/82936/Stateful-Session-Beans-and-State

Pedagogy

Live Demonstration and Enquiry based learning

Course Designer

Dr. P. Muthulakshmi

Semester : I	Internal Marks:40		External Marks:60	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS/WEEK	CREDITS
26PCS1GEP1B	FULL STACK DEVELOPMENT(P)	GENERIC ELECTIVE	4	3

Course Objective

- To understand the architecture of full-stack web development.
- To develop server-side applications using Node.js and Express.
- To implement database connectivity using MongoDB.
- To build client-side applications using Angular and React.
- To develop MERN-based web applications.

Prerequisites

Basic knowledge of Programming, HTML, CSS and JavaScript

Course Features with Relevance Status

S. No.	Course Features	Relevance Status
1.	Course emphasis on Employability/Entrepreneurship/Skill Development	Employability/ Entrepreneurship/Skill Development
2.	Course integrates cross cutting issues relevant to Professional Ethics / Gender Sensitization / Environment and Sustainability /Human Values/ Indian Knowledge Systems (IKS)	Professional Ethics
3.	Course relevant to Local/Regional/National/Global needs	Global
4.	Course focus on Sustainable Developmental Goals (SDG)	SDG 4, 8 and 9

Course Outcome and Cognitive Level Mapping

On the successful completion of the course, students will be able to

CO Number	CO Statement	Cognitive Level
CO1	Outline client-side scripting and form validation using JavaScript	**K2**
CO2	Develop server-side applications using Node.js and Express framework	**K3**
CO3	Build database connectivity and CRUD operations using MongoDB/MySQL	**K3**
CO4	Analyze and design interactive single page applications using React	**K4**
CO5	Design and deploy a complete full stack application using authentication and containerization tools	**K5, K6**

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO1	3	3	2	2	3	3	2	2	2	2
CO2	3	3	2	2	2	3	3	2	2	3
CO3	3	3	3	2	3	3	3	2	2	2
CO4	3	3	3	3	2	3	3	3	2	3
CO5	3	3	3	3	3	3	3	3	3	3

"1" – Slight (Low) Correlation "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation "-" indicates there is no Correlation

List of Exercises

1. Implement form validation using JavaScript.
2. Retrieve and display data using the Fetch API.
3. Set up and run a basic static web server using Node.js.
4. Develop an Express.js server to process and store form data in JSON format.
5. Perform CRUD operations using:
    a) MongoDB
    b) MySQL
6. Build a React-based counter application.
7. Design and integrate a React Todo application.
8. Implement and validate user authentication using cookies.
9. Configure and access a virtual machine using SSH.
10. Deploy a Node.js application using Docker.

Web References

1. https://developer.mozilla.org/en-US/docs/Learn/Forms/Form_validation
2. https://www.w3schools.com/js/js_validation.asp
3. https://nodejs.dev/en/learn/creating-a-simple-http-server/
4. https://react.dev/learn/tutorial-tic-tac-toe
5. https://expressjs.com/en/resources/middleware/cookie-parser.html

Pedagogy

Hands on training and Technology based learning

Course Designer

Ms. S. Udhaya Priya

Semester: I	Internal Marks:40		External Marks:60	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS /WEEK	CREDITS
26PCS1NMEP1	DATA ANALYSIS AND VISUALIZATION (P)	NON-MAJOR ELECTIVE	3	2

Course Objectives

- To perform basic calculations and formatting of data
- To expose the visual representation methods and techniques that increase the understanding of complex data
- To Create interactive dashboards and professional reports
- To gain knowledge in good design practices for visualization of data
- To enable students to communicate insights effectively through structured and visually appealing data visualizations

Prerequisites

Basic Computer Knowledge

Course Features with Relevance Status

S. No.	Course features	Relevance Status
1	Course emphasis on Employability/Entrepreneurship/Skill Development	Employability, Entrepreneurship, Skill Development
2	Course integrates cross cutting issues relevant to Professional Ethics / Gender Sensitization / Environment and Sustainability /Human Values/ Indian Knowledge Systems (IKS)	Professional Ethics, Environment and Sustainability
3	Course relevant to Local/Regional/National/Global needs	Global need
4	Course focus on Sustainable Developmental Goals (SDG)	SDG 4, 8, 9, 12, 13

Course Outcomes (COs) with Cognitive Level Mapping

On the successful completion of the course, students will be able to

CO Number	CO Statement	Cognitive Level
CO1	Relate the tools and functions used in MS Excel, Power BI, Tableau, and Python for data analysis	K1
CO2	Illustrate the process of data handling, visualization, and dashboard creation across different analytics platforms	K2
CO3	Make use of various data analysis techniques to import, transform, and visualize data for real time scenarios	K3
CO4	Analyze and evaluate different datasets using appropriate tools and visualization techniques and generate reports	K4, K5
CO5	Design and develop interactive dashboards and reports using custom datasets.	K6

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO1	3	3	2	2	1	3	2	1	2	2
CO2	3	3	2	2	2	3	3	2	2	3
CO3	3	3	3	2	3	3	3	2	2	2
CO4	3	3	3	3	2	3	3	3	2	3
CO5	3	3	3	3	3	3	3	3	3	3

"1" – Slight (Low) Correlation "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation "-" indicates there is no correlation

List of Exercises

Using MS-Excel

1. Importing data
2. Demonstrate the usage of essential Functions and Methods
3. Publish Worksheet as Web Page with Interactivity
4. Using Pivot Tables and Charts to create dashboards

Using Power BI

1. Report Generation
2. Filtering Data
3. Chart Preparation
4. Book Mark Creation
5. Dashboard Creation
6. Data Visualization

Using Tableau

1. Connecting and Preparing Data for Visualization
2. Data Analysis and report generation
3. Dashboard Creation

Using Python

1. Working with Libraries
2. Cleaning and Preparing Data
3. Importing and Exporting data

Web References

1. https://www.analyticsvidhya.com/blog/2021/11/a-comprehensive-guide-on-microsoftexcel-for-data-analysis/
2. https://www.academia.edu/34282340/Excel_data_analysis_tutorial
3. https://www.datacamp.com/courses/data-analysis-in-excel?
4. https://www.myexcelonline.com/blog/connect-slicers-to-multiple-excel-pivot-tables/
5. https://www.geeksforgeeks.org/data-analysis-with-python/
6. https://mrcet.com/downloads/digital_notes/CSIT/CSIT_R22_DATA%20VISUALIZATION.pdf

Pedagogy

Demonstration, Peer learning and Individual learning

Course Designer

Ms. S. Saranya