GENERAL COURSE STRUCTURE & THEME

A. Definition of Credit:

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
1 Hr. Practical (P) per week	0.5 Credit
2 Hours Practical (P) per week	1 Credit

B. ***Tentative Credit Distribution and*** **Second Year to Final Year curriculum structure for the completion of B.Tech. in Information Technology degree with one Minor/Honors/Research:**

Structure of B. Tech.in Information Technology with multidisciplinary minor:

Course Types/ Semester	I	II	III	IV	V	VI	VII	VIII	Total
Basic Science Course	8	8		--	--	--	--	--	16
Engineering Science Course	7	7		--	--	--	--	--	14
Programme Core Course (PCC)	--	2	15	11	11	11	--	--	50
Programme Elective Course (PEC)	--	--	--	--	8	6	6	-	20
Multidisciplinary Minor (MD M)		-	4	3	4	3			14
Open Elective (OE) Other than a particular program	--	--	3	3	2	--	--		8
Vocational and Skill Enhancement Course (VSEC)	2	2	--	2		2	--	--	8
Ability Enhancement Course (AEC -01, AEC-02)		2	--	2	--	--	--	--	4
Entrepreneurship/Economics/ Management Courses	--		2	2				--	4
Indian Knowledge System (IKS)	2			--	--	--	--	--	2
Value Education Course (VEC)	--	--	2	2	--	--	--	--	4
Research Methodology	--	--	--	--	--	--	2	--	2
Comm. Engg. Project (CEP)/Field Project (FP)	--	--	2	--	--	--		--	2
Project	--	--	--	--	--	--	6	--	6
Internship/ OJT	--	---			--	--		12	12
Co-curricular Courses (CC)	2	2		--	--	--	--	-	4
Total Credits / Semester with MDM	**21**	**23**	**28**	**25**	**25**	**22**	**14**	**12**	**170**
Total Credits / Semester with Double MDM	**21**	**23**	**32**	**28**	**29**	**25**	**13**	**12**	**183**
Honors Credits/ Semester						3	9	6	18
Total Credits / Semester with MDM +Honors	**21**	**23**	**28**	**25**	**25**	**25**	**23**	**18**	**188**
Research Credits/ Semester							**9**	**9**	**18**
Total Credits / Semester with MDM+Research	**21**	**23**	**28**	**25**	**25**	**22**	**23**	**21**	**188**

Students can opt for any of the following as per the rules and regulations given by institute:

1. **B.Tech with one Multidisciplinary Minor=Total 170Credits**
2. **B.Tech with one Multidisciplinary Minor and Honor in A.I.M.L. =Total 188 Credits**
3. **B. Tech with one Multidisciplinary Minor and Honor by Research=Total 188 Credits**
4. **B.Tech with two Multidisciplinary Minors=Total 184 Credits**

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SEMESTER- V												
Sr.No	Category	Course Code	Course Title	Hours per week			Credits	Continuous Evaluation in terms of Marks				Total
				L	T	P		ISEI	ISEII	ISEIII	ESE	
1	PCC	ITPCC3001	Artificial Intelligence	3	0	0	3	15	15	10	60	100
2	PCC	ITPCC3002	Design and Analysis of Algorithm	3	0	0	3	15	15	10	60	100
3	PCC	ITPCC3003	Cloud Computing	3	0	0	3	15	15	10	60	100
4	PCC	ITPCC3004	Lab Design and Analysis of Algorithm	0	0	2	1	-	-	25	25	50
5	PCC	ITPCC3005	Lab Cloud Computing	0	0	2	1	-	-	25	25	50
6	PEC	ITPEC3001 ITPEC3003 ITPEC3005	Professional Elective I	2	0	0	2	10	10	-	30	50
7	PEC	ITPEC3002 ITPEC3004 ITPEC3006	Lab-Professional Elective I	0	0	2	1	-	-	25	-	25
8	PEC	ITPEC3007 ITPEC3008	Professional Elective II	2	0	0	2	10	10	-	30	50
9	PEC	ITPEC3011 ITPEC3012 ITPEC3013	Professional Elective III	3	0	0	3	-	-	-	100	100
10	MDM	ITMDM5004 ITMDM6004	Java Programming Introduction to Artificial Intelligence	3	0	0	3	15	15	10	60	100
11	MDM	ITMDM5005 ITMDM6005	Lab Java Programming Lab Python Programming	0	0	2	1	-	-	25	-	25
12	OEC	ITOEC0030	Machine Learning	2	0	0	2	10	10	0	30	50
13		**ITHNC7001**	Data Analytics with Python	3	1		4	15	15	10	60	100
				24	**1**	**8**	**29**	**105**	**105**	**150**	**540**	**900**

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List of Professional Electives (I, II, III)

Professional Elective I	**Professional Elective II**	**Professional Elective III** **NPTEL/ SWAYAM MOOCs Courses (12 weeks)**
ITPEC3001:Internet of Things ITPEC3002: Lab Internet of Things	ITPEC3007:Mathematics for Machine Learning	ITPEC3011:Reinforcement Learning
ITPEC3003:Android Programming ITPEC3004:Lab Android Programming	ITPEC3008Blockchain Technologies	ITPEC3012: Deep Learning for Computer Vision
ITPEC3005:Image Processing ITPEC3006 Lab: Image Processing		ITPEC3013: Cyber Security and Privacy
		Social Networks
		Getting Started with Competitive Programming

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ITMDM5004 :Java Programming		
Teaching Scheme	**Examination Scheme**	
Lectures: 03hrs/ week	**ISE I**	**15 Marks**
Tutorial: 0	**ISE II**	**15 Marks**
Credits:03	**ISE III**	**10 Marks**
	End Semester Examination	**60 Marks**

Prerequisites: NIL

Course description: Object Oriented Programming is designed to create sophisticatedprograms to solve real-world problems using object oriented approach. The course emphasizesto improve the logical thinking of the students.

Course Outcome: After completing the course, students will able to:	
CO1	Explain the necessity for Object Oriented Programming paradigm over Procedure Oriented Programming
CO2	Apply object-oriented principles to develop Java applications.
CO3	Make use of Java standard API library to integrate Java programming with database management.
CO4	Apply Multithreading and Exception handling concepts to develop efficient and error free codes.
CO5	Selectobject oriented principles and techniques to implement real world applications.

Detailed Syllabus:

Unit 1	**Introduction to Java and Object-Oriented Programming:** Java Evolution & Features: Comparison with C and C++, Java and the Internet Java Environment: JDK, Bytecode, JVM, Compilation and Execution Process Java Program Structure: Java Tokens, Comments, Statements, Console I/O Fundamentals of OOP: Comparison with Procedural Programming, Classes and Objects, Data Encapsulation, Inheritance, Polymorphism
Unit 2	**Java Programming:** Data Types & Operators: Primitive and Non-Primitive Data Types, Type Casting Control Flow: Decision-making (if-else, switch), Loops (for, while, do-while) Functions and Methods: Function Prototyping, Method Overloading, Static Methods Strings and Arrays: String Handling, StringBuffer, Single & Multi-dimensional Arrays
Unit 3	**OOP Concepts using Java:** Inheritance & Polymorphism**:** Types of Inheritance, Method Overriding, 'this' and 'super' keywords Abstract Classes & Interfaces**:** Implementing Interfaces, Multiple Inheritance in Java Packages & Access Modifiers**:** Defining Packages, Importing Packages, Access Protection
Unit 4	**Exception handling:**Exception types, Usage of Try, Catch, Throw, Throws and Finally keywords, Built-in Exceptions, Creating own Exception classes
Unit 5	**Multithreading:** Concepts of Thread, Thread life cycle, creating threads using Thread class and Runnable interface, Synchronization, Thread priorities, Inter Thread communication

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Text and Reference Books:

1. Herbert Schildt, "*The Complete Reference Java2",* 7th Edition, TMH Publications.
2. E Balguruswamy, *"Programming with Java - A Primer"*
3. Cay S. Horstmann, Gary Cornell*, "Core Java Volume II"* - Pearson Education.
4. StevenHolzner, "*Java 2 Black Book*", Dreamtech Pub.
5. Head First Java, O'rielly publications
6. T. Budd (2009), An Introduction to Object Oriented Programming, 3rd edition,PearsonEducation, India.
7. Y. Daniel Liang (2010), Introduction to Java programming, 7th edition, Pearson education,India.

Web Resources:

1. NPTEL course : Programming In Java https://onlinecourses.nptel.ac.in/noc22_cs47
2. Virtual Lab: Core Java Programming https://java-iitd.vlabs.ac.in/

Mapping of Course outcome with Program Outcomes:

Course outcome	Program Outcomes												PSO's		
	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	PS O 2	PS O 3
CO1	1														
CO2		1									1	1	1	1	
CO3														2	
CO4									1					2	
CO5	2	2	3	1	1	1		1	2	2	2	1	3	3	1

3 – High 2 – Medium 1– Low

Assessment:

ISE I: Class Test-I of Maximum Marks-15

ISE II: Class Test-II of Maximum Marks-15

ISE III: Teacher's Assessment of Maximum Marks-10

Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1) Course projects
2) Power point presentation
3) Question & answer
4) Any other activity suggested by course coordinator

ESE: End Semester Examination of Maximum Marks-60

Assessment Pattern:

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	ISE III	End Semester Examination
K1	Remember	00	00	00	00
K2	Understand	03	03	05	24
K3	Apply	12	12	05	36
K4	Analyze	00	00	00	00
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
Total Marks 100		15	15	10	60

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Assessment Table:

Assessment Tool	K2	K3
	CO1, CO2	CO3,CO4, CO5
ISE I (15 Marks)	03	12
ISE II (15 Marks)	03	12
ISE III (10 Marks)	00	10
ESE (60 Marks)	24	36

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ITMDM6004: Introduction to Artificial Intelligence		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Tutorial: 0	**ISE II**	**15 Marks**
Credits:03	**ISE III**	**10 Marks**
	End Semester Examination	**60 Marks**

Course Description: This course provides a comprehensive introduction to the fundamental concepts and techniques of Artificial Intelligence (AI). It explores the theoretical foundations and practical applications of AI, including intelligent agents, search strategies, knowledge representation, logical reasoning, and learning. Students will gain insights into various problem-solving methodologies such as heuristic and adversarial search, and delve into the design of expert systems and the handling of uncertainty.

Course Outcome: After completing the course, students will be able to	
CO1	Explain the fundamentals of Artificial Intelligence, history, intelligent agents, and rational behavior in diverse environments.
CO2	Apply various search algorithms to solve problems
CO3	Illustrate adversarial search techniques in game playing.
CO4	Use predicate logic, semantic networks, frames, and rules; and reason under uncertainty using probabilistic models
CO5	Evaluate the societal impact of AI technologies.

Detailed Syllabus:

Unit 1	**Introduction to Artificial Intelligence:** Overview of AI Problems, Foundations and History of Artificial Intelligence, Intelligent Agents: Agents and Environments, The Concept of Rationality, The Nature of Environments, Structure of Agents, Problem-Solving Agents, Problem Formulation
Unit 2	**Search Strategies and Game Playing:** Problem Solving by Searching Uninformed Search Strategies: Breadth-First Search, Depth-First Search, Informed (Heuristic) Search Strategies: Hill Climbing, A* Algorithm, AO* Algorithm, Problem Reduction Game Playing**:** Adversarial Search, Games and Minimax Algorithm, Optimal Decisions in Multiplayer Games, Problems in Game Playing, Alpha-Beta Pruning, Evaluation Functions
Unit 3	**Knowledge Representation and Reasoning under Uncertainty:** Knowledge Representation Issues, Predicate Logic and Logic Programming, Semantic Nets, Frames, and Inheritance, Constraint Propagation, Representing Knowledge Using Rules, Rule-Based Deduction Systems Reasoning Under Uncertainty: Probability Review, Bayesian Inference, Dempster-Shafer Theory
Unit 4	**Logical Reasoning and Machine Learning:** First-Order Logic Inference in First-Order Logic: Propositional vs First-Order Inference, Unification and Lifting, Forward and Backward Chaining, Resolution Learning from Observation: Inductive Learning, Decision Trees, Explanation-Based Learning, Statistical Learning Methods, Reinforcement Learning

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Unit 5	**Expert Systems and Advanced Topics:** Introduction to Expert Systems, Basic Concepts and Structure, Human Element in Expert Systems, How Expert Systems Work, Problem Areas Addressed by Expert Systems, Success Factors and Types of Expert Systems, Expert Systems on the Web Societal Impacts of AI Reasoning in AI: Inference with Rules and Frames, Model-Based and Case-Based Reasoning, Explanation and Meta-Knowledge, Reasoning with Uncertainty

Text Books & Reference Books

1. Stuart J. Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach" 3rd Edition. (Unit: 1,2,3,4,5)

2. Bratko, Prolog "Programming for Artificial Intelligence", 3rd ed. Harlow, UK: Addison-Wesley, 2001(Unit: 2,3)

3. Goodfellow, Y. Bengio, and A. Courville, "Deep Learning". Cambridge, MA, USA: MIT Press, 2016.

4. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", SecondEdition, Pearson Education

5. David Poole, Alan Mackworth, Randy Goebel,"Computational Intelligence: a logical approach", Oxford University Press.

6. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education.

7. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers.

Web Resources

1. https://nptel.ac.in/courses/106102220 Prof. Mausam, IIT Delhi

2. https://onlinecourses.nptel.ac.in/noc24_ge47/preview Prof. Shyamanta M. Hazarika, IIT Guwahati

3. https://onlinecourses.nptel.ac.in/noc22_cs56/preview

Mapping of Course outcome with Program Outcomes and Program Specific Outcomes

Course outcome	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
CO1	1	2	2	2	3						1	2	1	2	1
CO2	1	2	2	2	3						1	2	1	2	1
CO3	1	2	2	2	3						1	2	1	2	1
CO4	1	2	2	2	3						1	2	1	2	1
CO5	1	2	2	2	3						1	2	1	2	1

3– High 2 – Medium 1 - Low

Assessment:

ISE I / ISE II /ISE III:

In Semester Evaluation can be based on:

1. Class Test
2. PowerPoint presentation
3. Question & answer / Numerical solution
4. Surprise test
5. Any other activity suggested by course coordinator

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ESE: End Semester Examination as per guidelines

Assessment Pattern:

Assessment Pattern Level No.	**Knowledge Level**	**ISE I**	**ISE II**	**ISE III**	**End Semester Examination**
K1	Remember	5	5	2	15
K2	Understand	7	7	3	20
K3	Apply	3	3	5	15
K4	Analyze	-	-	-	10
K5	Evaluate	-	-	-	-
K6	Create	-	-	-	-
Total Marks 100		15	15	10	60

Assessment table:

Assessment Tool	**K1**	**K2**	**K3**
	CO1	**CO2,CO3**	**CO4,CO5**
ISE I (15 Marks)	6	5	4
ISE II (15 Marks)	2	6	7
ISE III (10 Marks)	2	4	4
ESE Assessment (60 Marks)	10	25	25
Total Marks 100	20	40	40

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ITMDM5005:Lab. Java Programming		
Teaching Scheme	**Examination Scheme**	
Practical: 2Hrs/Week	**ISE I* (Term Work)**	**25 Marks**
Credits:01	**End Semester Evaluation**	

Course Outcomes: After completion of this course students will be able to:	
CO1	Develop, debug, and document Java programs using core Object-Oriented Programming (OOP) concepts such as classes, objects, inheritance, and polymorphism.
CO2	Implement Java applications by effectively utilizing Object-Oriented Programming principles to solve real-world problems.
CO3	Apply structured exception handling mechanisms to build robust and error-resilient Java programs.
CO4	Design and implement multithreaded applications in Java to achieve concurrency and enhance performance.

List of the Experiments:

The student shall perform minimum ten experiments of the following using Java

Sr. No.	**Title of the Experiments**	**Skill / Knowledge Level**	**CO**	**Marks for ISE**
Level: Basic (all) **Implement programs on Fundamentals of Java Programming**				
1	Write a Java program to convert time in seconds to hours, minutes and seconds and display the output in format HH:MM:SS	S1	CO1	02
2	Write a Java program to rearrange all the elements of a given array of integers so that all the odd numbers come before all the even numbers.	S2	CO2	02
3	Write a Java program that accepts three integers from the user and return true if two or more of them (integers) have the same rightmost digit. The integers are non- negative.	S2	CO2	02
4	Create a Java class called Complex with the following details as member variables within it. (i) Real (ii) Imaginary. Develop a Java program to perform addition and subtraction of two complex numbers by using the method add() and subtract( ) respectively, by passing object as parameter and display result using method display(). Initialize the real and imaginary values of the complex number using parameterized constructor. Also demonstrate overloading constructors and methods.	S2	CO2	02
5	Design an Address class with member variables Street num, city, state and country and appropriate constructor. Design a Student class with constructor (Student (String USN, String Name, Stringaddr)), College class with constructor (College (String Name, String addr)) and Employee class with constructor (Employee (String EmpID, String Name, Stringaddr)). Write a Java program to create 'n' Student objects, College Objects andEmployee objects and print the student, college and employee addresses respectively and demonstrate passing of object as a parameter to the constructor.	S2	CO2	02
Level: Moderate				

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6	**Abstract classes, Inheritance& polymorphism:** Write a java program to create an abstract class named shape that contains two integers and an empty method named printArea(). Create three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class shape. Each one of the class contains only the method printArea() that print the area of the given shape	S3	CO2	03
7	**Exception Handling:** Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw Number Format Exception. If Num2 were Zero, the program would throwan Arithmetic Exception. Display the exception in a message dialog box.	S3	CO4	03
8	**Multithreading:** Write a Java program that implements a multithreaded program with three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd the third thread will print the value of cube of the number.	S3	CO4	03
Level: Complex				
9	Write a Java program for the following: i) Create a doubly linked list of elements. ii) Delete a given element from the above list. iii) Display the contents of the list after deletion	S3	CO4	03
10	Write a Java program that implements Quick sort algorithm for sorting a list of names in ascending order.	S3	CO4	03

Assessment:

ISE I (Term Work): In-Semester Evaluation of 25 marks each will be based on practical assignments completed and timely submission

End Semester Evaluation:The ESE will be based on oral / practical performance of the students

Assessment Table:

Assessment Tool	**S1**	**S2**	**S3**
	CO1	CO2, CO3	CO4
ISE I (Term Work)	00	10	15
End Semester Evaluation(Practical Examination &Viva Voce)	00	10	15

Assessment Pattern:

Assessment Pattern Level No.	**Knowledge Level**	**ISE I**	**End Semester Examination**
S1	Imitation	05	05
S2	Manipulation	10	10
S3	Precision	10	10
S4	Articulation	00	00
S5	Naturalization	00	00
Total Marks		25	25

Mapping of Course outcome with Program Outcomes and Program Speci

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Course Outcome	Program Outcomes												PSO's		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1		1	2	1								1	1	1
CO2			2	1	1								1	1	1
CO3					2		1		1		2	2	1	1	1
CO4							2		3		2	3			

3 – High 2 – Medium 1 – Low

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ITMDM6005 Lab :- Python Programming		
Teaching Scheme	Examination Scheme	
Practical: 2Hrs/Week	ISE I (Term Work)	25 Marks
Credits:01	End Semester Evaluation	

Course Outcome: After completing the course, students will be able to	
CO1	To Understand python environment and implement codes with object oriented concepts
CO2	To Understand Strings, Lists, Tuples and Dictionaries in Python
CO3	To Develop the application specific codes using python
CO4	To Verify programs using modular approach, file I/O, Python standard library

List of the Experiments:
The student shall perform minimum ten experiments of the following using Python

Sr. No.	Title of the Experiments	Skill / Knowledge Level	CO
1	Python Basics & Control Flow 1. Write a Python program to accept user input and print a formatted greeting. 2. Create a calculator using if-else statements and user input. 3. Check whether a number is even or odd, positive or negative. 4. Print a multiplication table using a for loop.	S1	CO1
2	Strings and Basic Operations 1. Perform various string operations: slicing, indexing, and formatting. 2. Count the number of vowels in a given string. 3. Reverse a string without using built-in functions. 4. Check if a string is a palindrome	S1	CO2
3	Lists, Tuples, Sets 1. Create a shopping list program using lists. 2. Find the largest and smallest number in a list. 3. Convert a list to a tuple and back. 4. Perform union, intersection, and difference on two sets.	S2	CO2
4	Dictionary Operations 1. Create a phonebook using a dictionary. 2. Count frequency of each word in a sentence. 3. Merge two dictionaries. 4. Remove duplicate values from a dictionary	S2	CO3

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5	Comprehensions and Nested Structures 1. Generate a list of squares from 1 to 10 using list comprehension. 2. Create a dictionary mapping numbers to their cubes. 3. Flatten a nested list using list comprehension.	S2	CO1
6	Functions & Recursion 1. Create a function to calculate the factorial of a number using recursion. 2. Write a function that takes variable-length arguments and returns their sum. 3. Implement a function that checks whether a number is prime	S3	CO1/CO3
7	Lambda, Map, Filter, Reduce 1. Use map() to square a list of numbers 2. Use filter() to extract even numbers from a list. 3. - Use reduce() to compute the product of a list of numbers 4. Combine zip() and map() to add two lists element-wise	S3	CO3
8	OOP in Python 1. Create a class Student with attributes and methods 2. Implement inheritance with a Vehicle and Car class 3. Demonstrate encapsulation using private variables 4. Use polymorphism with a Shape base class and two derived classes	S3	CO1
9	File Handling and Exception Management 1. Read from a text file and count the number of lines and words. 2. Write and append data to a file. 3. Create a program that handles file not found exception gracefully 4. Create a custom exception for age validation.	S3	CO4
10	Flask Mini Web App 1. Create a basic Flask app with home and about routes. 2. Build a simple form to collect user data (e.g., contact form). 3. Store submitted form data into a file or SQLite database 4. Display submitted data on another route.	S4	CO3/CO4

Assessment:

ISE I (Term Work) : In-Semester Evaluation of 25 marks each will be based on practical assignments completed and timely submission

End Semester Evaluation: The ESE will be based on oral / practical performance of the students

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Assessment Tool	S1	S2	S3/S4
	CO1	CO2, CO3	CO4
ISE I (Term Work)	10	7	8

Assessment Pattern:

Assessment Pattern Level No.	Knowledge Level	ISE I
S1	Imitation	05
S2	Manipulation	7
S3	Precision	8
S4	Articulation	05
S5	Naturalization	00
Total Marks		25

Mapping of Course outcome with Program Outcomes and Program Specific Outcomes:

Course outcome	Program Outcomes												PSO's		
	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
CO1	1	2											3	3	2
CO2		2											2	3	2
CO3		2	1										2	3	3
CO4		2	2	3	2								1	3	2

3 – High 2 – Medium 1 – Low

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ITOEC0030 : Machine Learning		
Teaching Scheme	Examination Scheme	
Lectures: 02 hrs/ week	ISE I	10 Marks
Tutorial: 0	ISE II	10 Marks
Credits:02	End Semester Examination	30 Marks

Course Description:

Course Outcome: After completing the course, students will be able to	
CO1	Understand fundamental concepts of Machine Learning and its applications.
CO2	Apply supervised learning algorithms to classification and regression problems.
CO3	Implement unsupervised learning methods including clustering and dimensionality reduction.
CO4	Evaluate model performance using appropriate metrics and techniques.

Detailed Syllabus:

Unit 1	Introduction to Machine Learning: Basics of Machine Learning, Applications, Types: Supervised, Unsupervised, Reinforcement Learning, Steps in a Machine Learning project, Data preprocessing: handling missing values, normalization, standardization, Feature selection and engineering
Unit 2	Supervised Learning – Regression: Linear Regression: simple and multiple, Polynomial Regression, Evaluation metrics: MSE, Implementation using Python (e.g., Scikit-learn)
Unit 3	Supervised Learning – Classification: Decision Trees, k-Nearest Neighbors, Support Vector Machines, Evaluation metrics: Confusion matrix, Precision, Recall, F1 Score, Unsupervised Learning: Clustering: k-Means, Hierarchical clustering,

Text Books & Reference Books

Tom M. Mitchell, “Machine Learning”, McGraw Hill
Aurélien Géron, “Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow”, O’Reilly
Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press.

Mapping of Course outcome with Program Outcomes and Program Specific Outcomes

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	0	0	0	0	0	0	3	0	2	1	3	1
CO2	2	2	3	0	0	0	0	0	0	0	0	1	2	3	1
CO3	3	2	1	0	0	3	0	2	0	0	0	3			

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CO4	1	3	3	0	0	0	1	0	0	1	0	2	2	0	2

3– High 2 – Medium 1 - Low

Assessment:

ISE I / ISE II :

In Semester Evaluation can be based on:

Class Test

Power point presentation

Question & answer / Numerical solution

Surprise test

Any other activity suggested by course coordinator

ESE: End Semester Examination as per guidelines

Assessment Pattern:

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	End Semester Examination
K1	Remember	02	02	05
K2	Understand	04	04	15
K3	Apply	04	04	10
K4	Analyze	00	00	00
K5	Evaluate	00	00	00
K6	Create	00	00	00
Total Marks 50		10	10	30

Assessment table:

Assessment Tool	K1	K2	K3
	CO1	CO2,CO3	CO4
ISE I (10 Marks)	02	04	04
ISE II (10 Marks)	02	04	04
ESE Assessment (30 Marks)	05	15	10
Total Marks 50	09	23	18

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SEMESTER- VI												
				Hours per week				Continuous Evaluation in terms of Marks				
Sr.No	Category	Course Code	Course Title	L	T	P	Credits	ISEI	ISEII	ISE III	ESE	Total
1	PCC	ITPCC3010	Cryptography and Network Security	3	0	0	3	15	15	10	60	100
2	PCC	ITPCC3011	Machine Learning	3	0	0	3	15	15	10	60	100
3	PCC	ITPCC3012	Software Engineering	3	0	0	3	15	15	10	60	100
4	PCC	ITPCC3013	Lab Cryptography and Network Security	0	0	2	1			25	25	50
5	PCC	ITPCC3014	Lab Machine Learning	0	0	2	1			25	25	50
6	PEC	ITPEC3021 ITPEC3023 ITPEC3025	Professional Elective IV and V	2	0	0	2	10	10	-	30	50
7	PEC	ITPEC3022 ITPEC3024 ITPEC3026	Labs Professional Elective IV and V	0	0	2	1			25	-	25
8	MDM	ITMDM5006 ITMDM6006	Python Programming Introduction to Machine Learning	3	0	0	3	15	15	10	60	100
9	VSEC-3	ITVSE2001	Advanced Java Programming	1	0	0	1	15	0	10	0	25
10	VSEC-3	ITVSE2002	Lab Advanced Java Programming	0	0	2	1	-	-	25	25	50
Total Credits with MDM				17	0	10	22	195	80	75	375	675
11		ITHNC7001	Applied Accelerated Artificial Intelligence	3	0	0	3				100	100
Total Credits with MDM + Honors				20	0	10	25	195	80	75	475	775

List of Professional Electives (Theory+Lab)

Professional Elective IV and V
ITPEC3021Advanced DBMS ITPEC3022Lab Advanced DBMS
ITPEC3023Deep Learning ITPEC3024 Lab Deep Learning
ITPEC3025Datawarehousing and Data Mining ITPEC3026Lab Data warehousing and Data Mining

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ITMDM5006 : Python Programming		
Teaching Scheme	Examination Scheme	
Lectures: 03 hrs/ week	ISE I	15 Marks
Tutorial: 0	ISE II	15 Marks
Credits:03	ISE III	10 Marks
	End Semester Examination	60 Marks

Course Description:

Course Outcome: After completing the course, students will be able to	
CO1	Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements. Understand
CO2	Express proficiency in the handling of strings and functions.
CO3	Determine the methods to create and manipulate Python programs by utilizing the data structures like lists, dictionaries, tuples and sets
CO4	Identify the commonly used operations involving file systems and regular expressions.
CO5	Articulate the Object-Oriented Programming concepts such as encapsulation, inheritance and polymorphism as used in Python.

Detailed Syllabus:

Unit 1	Introduction to Python: What is Python and where it's used,Installing Python and IDEs (VS Code / PyCharm / Jupyter), First Python program,Print, comments, indentation, Numbers, strings, booleans, Type conversion, Input/output functions, Arithmetic, comparison, logical, Assignment, membership, identity operators
Unit 2	Control Structures & Strings Conditional statements, Nested conditions, Real-world examples ,Iterating through sequences Loop patterns, break, continue, pass, Practical exercises, String operations and slicing Useful string methods,f-strings and formatting
Unit 3	Data Structures: List Creating and updating lists, Indexing, slicing, List methods (append, insert, remove, etc.), Immutable sequences , Tuple unpacking, Tuple vs List comparison, Key-value pairs, Dictionary methods (get, update, pop), - Looping through dictionaries, Set operations (union, intersection), Use-cases, Set methods, Comprehensions - List, dict, and set comprehensions, Nested comprehensions, Use cases , Functions- Syntax, calling functions, Return values, Practical use, Default, keyword, variable-length (*args, **kwargs), Argument unpacking, Lambda and Built-in Functions

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Unit 4	Object-Oriented Programming: Introduction to OOP, basics concepts of OOP, variables and methods, Inheritance and its types , Polymorphism and its types,
Unit 5	Files and Exceptions: File Handling – Reading/ open /close, file opening modes, Exception Handling : Try, except, else, finally, - Raising exceptions, - Custom exception examples

Text Books & Reference Books

1. Mark Lutz, Learning Python: A Powerful Object-Oriented Programming.
2. John M. Zelle, Python Programming: Introduction to Computer Science. 2.
3. Eric Matthes, Python Crash Course, 2nd Edition"

Web Resources

1. https://www.geeksforgeeks.org/creating-a-pandas-series/
2. https://www.udemy.com/course/100-days-of-code/?couponCode=IND21PM

Course outcome	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
CO1	3	2	1										3	2	1
CO2	2	2											2	2	2
CO3		2	3										2	3	2
CO4			3	2									2	2	2
CO5	2	3	2										3	2	3

Mapping of Course outcome with Program Outcomes and Program Specific Outcomes

3– High 2 – Medium 1 - Low

Assessment:
ISE I: Class Test-I of Maximum Marks-15
ISE II: Class Test-II of Maximum Marks-15
ISE III: Teacher's Assessment of Maximum Marks-10
Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1) Power point presentation
2) Question & answer / Numerical solution
3) Surprise test
4) Any other activity suggested by course coordinator

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ESE: End Semester Examination of Maximum Marks-60

Assessment Pattern:

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	ISE III	End Semester Examination
K1	Remember	5		4	15
K2	Understand	10	10	2	20
K3	Apply		5	4	25
K4	Analyze				
K5	Evaluate				
K6	Create				
Total Marks 100		15	15	10	60

Assessment table:

Assessment Tool	K1	K2	K3
	CO1	CO2,CO3	CO4,CO5
ISE I (15 Marks)	7	8	
ISE II (15 Marks)		10	5
ISE III (10 Marks)	4	2	4
ESE Assessment (60 Marks)	15	20	25
Total Marks 100			

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ITMDM6006 : Introduction to Machine Learning		
Teaching Scheme	Examination Scheme	
Lectures: 03 hrs/ week	ISE I	15 Marks
Tutorial: 0	ISE II	15 Marks
	ISE III	10 Marks
Credits:03	End Semester Examination	60 Marks

Course Description:

Course Outcome: After completing the course, students will be able to	
CO1	Understand fundamental concepts of Machine Learning and its applications.
CO2	Apply supervised learning algorithms to classification and regression problems.
CO3	Implement unsupervised learning methods including clustering and dimensionality reduction.
CO4	Evaluate model performance using appropriate metrics and techniques.

Detailed Syllabus:

Unit 1	Introduction to Machine Learning: Basics of Machine Learning, Applications, Types: Supervised, Unsupervised, Reinforcement Learning, Steps in a Machine Learning project, Data preprocessing: handling missing values, normalization, standardization, Feature selection and engineering
Unit 2	Supervised Learning – Regression: Linear Regression: simple and multiple, Polynomial Regression, Evaluation metrics: MSE, Implementation using Python (e.g., Scikit-learn)
Unit 3	Supervised Learning – Classification: Decision Trees, k-Nearest Neighbors, Support Vector Machines, Evaluation metrics: Confusion matrix, Precision, Recall, F1 Score
Unit 4	Unsupervised Learning: Clustering: k-Means, Hierarchical clustering, Dimensionality Reduction, Applications in customer segmentation, anomaly detection, Visualization techniques, Bagging: Random Forest
Unit 5	Ensemble Learning and Model Deployment: Bagging: Random Forest, Boosting: AdaBoost, Gradient Boosting, Basics of model interpretability, Introduction to model deployment and tools (e.g., Flask, Streamlit overview), Case studies and mini project guidance

Text Books & Reference Books

Tom M. Mitchell, “Machine Learning”, McGraw Hill
Aurélien Géron, “Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow”, O’Reilly
Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press.

Mapping of Course outcome with Program Outcomes and Program Specific Outcomes

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	0	0	0	0	0	0	3	0	2			

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CO2	2	2	3	0	0	0	0	0	0	0	0	1	2	3	1
CO3	3	2	1	0	0	3	0	2	0	0	0	3	0	2	3
CO4	1	3	3	0	0	0	1	0	0	1	0	2	2	0	2

3– High 2 – Medium 1 - Low

Assessment:

ISE I / ISE II :

In Semester Evaluation can be based on:

Class Test

Power point presentation

Question & answer / Numerical solution

Surprise test

Any other activity suggested by course coordinator

ESE: End Semester Examination as per guidelines

Assessment Pattern:

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	End Semester Examination
K1	Remember	02	02	05
K2	Understand	04	04	15
K3	Apply	04	04	10
K4	Analyze	00	00	00
K5	Evaluate	00	00	00
K6	Create	00	00	00
Total Marks 50		10	10	30

Assessment table:

Assessment Tool	K1	K2	K3
	CO1	CO2,CO3	CO4
ISE I (10 Marks)	02	04	04
ISE II (10 Marks)	02	04	04
ESE Assessment (30 Marks)	05	15	10
Total Marks 50	09	23	18

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ITVSE2001: Advanced Java programming		
Teaching Scheme	**Examination Scheme**	
Lectures: 01 hrs/ week	**ISE I**	**15 Marks**
Tutorial: -	**ISE II**	**00 Marks**
Credits: 01	**ISE III**	**10 Marks**
	End Semester Examination	**00 Marks**

Prerequisites: - ITPCC2003Object Oriented Programming

Course Description:
This course covers mechanisms and techniques used to build an applications using Collection, Streams, Functional Programming using Lambdas, Observer and Decorator patterns.

Course Outcomes: After completing the course, students will able to:	
CO1	Implement Collection framework and streams.
CO2	Demonstrate functional programming using lambda.
CO3	Implement Functional Programming, Observer and Decorator to manage projects.

Detailed Syllabus:

Unit 1	Collections & Streams: Iterators, Sets, Maps, Streams, Stream Creations, filter map&flatmap methods, Parallel Streams
Unit 2	Lambdas & Functional Programming: Syntax of Lambdas Expressions, Functional Interfaces
Unit 3	Observer and Decorator pattern: Introduction and application of Observer and Decorator Patterns

Text Books & Reference Books

1. Effective Java by Joshua Bloch
2. Head First Design Patterns by Eric Freeman
3. Thinking in Java by Bruce Eckel
4. Core Java for the Impatient by Cay Horstmann

Web Resources

- https://www.baeldung.com/
- https://javaranch.com/
- https://leetcode.com

Mapping of Course outcomes with Program Outcomes and Program Specific Outcomes

Course outcomes	Program Outcomes												Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1		1	2	1								1	1	1
CO2			2	1	1								1	1	1
CO3					2		1		1		2				

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3 – High 2 – Medium 1 - Low

Assessment:

ISE I-Class Test-I of Maximum Marks-15

ISE II-Class Test-II of Maximum Marks-00

ISE III-Teacher's Assessment of Maximum Marks-10

Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1) Surprise test
2) Assignment
3) Quizzes
4) Any other activity suggested by course coordinator

ESE-End Semester Examination of Maximum Marks-00

Assessment Pattern:

Assessment Pattern Level No.	**Knowledge Level**	**ISE I**	**ISE II**	**ISE III**	**End Semester Examination**
K1	Remember	00	00	00	00
K2	Understand	05	00	02	00
K3	Apply	10	00	08	00
K4	Analyze	00	00	00	00
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
Total Marks 100		**15**	**00**	**10**	**00**

Assessment table:

Assessment Tool	**K2**	**K3**
	CO1	CO2,CO3
ISE I(15 Marks)	05	10
ISEII(00 Marks)	00	00
ISEIII (10 Marks)	02	08
ESE Assessment (00 Marks)	00	00
Total Marks 25	**07**	**18**

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ITVSE2002:Lab Advanced Java Programming		
Teaching Scheme	**Examination Scheme**	
Lectures: 2hrs/ week	**ISE I**	**00 Marks**
Tutorial: -	**ISE II**	**00 Marks**
Credits: 01	**ISE III**	**25 Marks**
	End Semester Examination	**25 Marks**

Prerequisites: - ITPCC2003 Object Oriented Programming

Course Description:
This course covers mechanisms and techniques used to build an applications using Collection, Streams, Functional Programming using Lambdas, Observer and Decorator patterns.

Course Outcomes:
After completion of this course students will be able to:

	Course Outcomes
CO1	Make use of Collection framework and streams.
CO2	Demonstrate functional programming using lambda.
CO3	Demonstrate file handling &Reflection.
CO4	Implement Functional Programming, Observer and Decorator to manage projects.

List of the Experiments:

Sr. No.	Title of the Experiments	Skill / Knowledge Level	CO	Marks for ISE
Level: Basic				
1	Implementationof CollectionFramework: a. ListInterface b. Queue Interface c. Set Interface	S1	CO1	2
2	Comparable Comparator: Write a program to sort ArrayList using Comparable and Comparator?	S1	CO1	2
3	Stream: a. Given a list of integers, find out all the even numbers exist in the list using Stream functions? b. How to find duplicate elements in a given integers list in java using Stream functions?	S1	CO1	2
Λεωελ: Μοδερατε				
5	Lambda: Write a program to iterate over List with and without using Lambda expressions.	S3	CO2	3
6	File Handling: "Reading a JSON/CSV file as an object: Write a program that reads the given JSON/CSV file as an object (POJO)." OR "Discovering mismatches between two files: Write a program that discovers the mismatches between two files at	S3	CO3	3

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	the byte level."			
Level: Complex				
9	Reflection : Getting static methods: Write a program that groups the static methods of the given class and invokes one of them via reflection." OR "Getting public and private fields: Write a program that fetches the public and private fields of the given class via reflection."	S4	CO3	3
11	Functional Programming - Observer: "Implementing the Observer pattern: Write a program that represents an implementation of the Observer pattern based on lambdas." OR "Implementing the Decorator pattern: Write a program that represents an implementation of the Decorator pattern based on lambdas."	S4	CO4	3
13	Study features of Java 17	S4	CO1, CO2, CO3,CO4	02
14	Mini Project using advanced Java features and techniques. (JDBC, Spring, Hibernate, JSP, Servlets etc)	S4	CO1, CO2, CO3,CO4	05

Text Books & Reference Books

5. Effective Java by Joshua Bloch
6. Head First Design Patterns by Eric Freeman
7. Thinking in Java by Bruce Eckel
8. Core Java for the Impatient by Cay Horstmann

Web Resources

- https://www.baeldung.com/
- https://javaranch.com/
- https://leetcode.com

Assessment Table:

Assessment Tool	K1	K2	K3	K3
	CO1	CO2	CO3	CO4
Term work(25Marks)	06	03	06	10
Practical Examination & Viva Voce(00 Marks)	00	00	00	00

Assessment Pattern:

Assessment Pattern Level No.	**Knowledge Level**	**ISE I**	**End Semester Examination**
S1	Imitation	03	00

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S2	Manipulation	00	00
S3	Precision	10	00
S4	Articulation	12	00
S5	Naturalization	00	00
Total Marks		25	00

Mapping of Course outcome with Program Outcomes and Program Specific Outcomes
3 – High 2 – Medium 1 - Low

Course outcome	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
CO1	1		1	2	1								1	1	1
CO2			2	1	1								1	1	1
CO3					2		1		1		2	2	1	1	1
CO4							2		3		2	3			

After third year: Candidate should complete the internship of two months for 8 credits or the candidate should pass the following two courses of 8 credits to qualify B.Voc. Degree.
Any two from the list of electives, except registered earlier

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