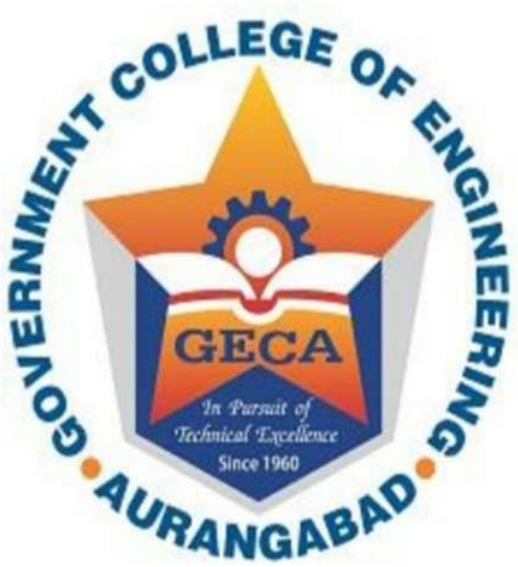

GOVERNMENT COLLEGE OF ENGINEERING AURANGABAD

(An Autonomous Institute of Govt. of Maharashtra)
Station Road, Osmanpura, Aurangabad- 431005 (M.S.)
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Department of Information Technology

Final Year IT Curriculum Structure- New CBCS (UG Program)

Approved in XXVIIIth Academic Council
Dated: 25th Jun 2024

Program Specific Outcomes (PSOs)

After successful completion of the program graduates would:

PSO I Apply core IT Knowledge to identify, formulate and solve emerging engineering problems.

PSO II Design, develop and deploy quality software products by applying knowledge of modern IT concepts and tools.

PSO III Apply the skills of IT professionals to develop novel solutions in societal and environmental contexts

Program Educational Objective(s)

After graduation and few years of graduation, the (Information Technology) graduates would

PEO I Interpret, design and analyze data for effective problem solving

PEO II Pursue advanced studies to adapt to current trends

PEO III Attain professional careers and provide services in societal and environmental context for sustainable development

PEO IV Work successfully with effective communication skills, professionalism, team work and ethical attitude

Program Outcome(s)

The program enables students to achieve by the time of graduation:

PO1 **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3 **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4 **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6 **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the

consequent responsibilities relevant to the professional engineering practice.

PO7 **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8 **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11 **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12 **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Mapping of PEOs and POs

	Programme Educational Objective(s)	**Program Outcome(s)**
PEO I	Interpret, design and analyze data for effective problem solving	1,2,3
PEO II	Pursue advanced studies to adapt to current trends	3,4,5,6,7,9
PEO III	Attain professional careers and provide services in societal and environmental context for sustainable development	4,5,6,7,8,9,10,11,12
PEO IV	Work successfully with effective communication skills, professionalism, team work and ethical attitude	6,8,10,11,12

Government College of Engineering, Aurangabad

(An Autonomous Institute)

Teaching and Evaluation Scheme from year 2021-2022

Third Year B. Tech. Program in Information Technology

Semester VII

Course				Teaching Scheme			Continuous Evaluation in terms of Marks					
Sr No	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**	**ISE I**	**ISE II**	**ISE III**	**ESE**	**Total**
1	PCC	ITPC4000	Advanced Java	1	-	-	1	15	-	10	-	25
2	PCC	ITPC4001	Computer Programming Lab III	0	0	4	2	50			-	50
3	PEC	ITPE4001-ITPE 4004	Professional Elective-IV	3	-	-	3	15	15	10	60	100
4	PEC	ITPE4011-ITPE 4013	Professional Elective-V	3	-	-	3	15	15	10	60	100
5	PCC	ITPE 4002-ITPE 4006	Lab Professional Elective-IV	-	-	2	1	25			25	50
6	HSMC	ITHS0040	HSMCIV	3	-	-	3	15	15	10	60	100
7	OEC	ITOE0040	Introduction to Machine Learning	3	-	-	3	15	15	10	60	100
8	OEC	ITOE0050	Open Elective-V	3	-	-	3	15	15	10	60	100
9	PR	ITPR4001	Project- I	-	-	12	6	50			100	50
		Total		**16**	**0**	**18**	**25**	**215**	**75**	**60**	**425**	**675**

Government College of Engineering, Aurangabad

(An Autonomous Institute)

Teaching and Evaluation Scheme from year 2021-2022

Third Year B. Tech. Program in Information Technology

Semester VIII

Course				Teaching Scheme			Continuous Evaluation in terms of Marks					
Sr. No.	**Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**	**ISE I**	**ISEII**	**ISEIII**	**ESE**	**Total**
												100
1	PR	ITPR4002 ITPR4003 ITPR4004	Project-II/ Internship / On Job Training	-	-	12	6	50			100	150
			Total	**0**	**0**	**8**	**6**	**50**			**0**	**150**

Approved in XXV IIIth Academic Council
Dated: 25th Jun 2024

ITPC4000: Advanced Java		
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**

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	2	1	1	1

3 – High 2 – Medium 1 - Low

Approved in XXVIIIth Academic Council
Dated: 25th Jun 2024

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**

ITPC4001: Lab: Advanced Java		
Teaching Scheme	**Examination Scheme**	
Lectures: 4 hrs/ week	**ISE I**	**00 Marks**
Tutorial: -	**ISE II**	**00 Marks**
Credits: 02	**ISE III**	**50 Marks**
	End Semester Examination	**00 Marks**

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:	
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**
1	Implementationof CollectionFramework: a. ListInterface b. Queue Interface c. Set Interface	S1	CO1
2	Comparable Comparator: Write a program to sort ArrayList using Comparable and Comparator?	S1	CO1
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
5	Lambda: Write a program to iterate over List with and without using Lambda expressions.	S3	CO2
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).”	S3	CO3
7	File Handling: “Discovering mismatches between two files: Write a program that discovers the mismatches between two files at the byte level.”	S3	CO3
8	Reflection: “Invoking an instance method: Write a program that invokes an instance method via reflection.	S3	CO3
9	Reflection : Getting static methods: Write a program that groups the static methods of the given class and invokes one of them via reflection.”	S3	CO3
10	Reflection: “Getting public and private fields: Write a program that fetches the public and private fields of the given class via reflection.”	S4	CO3
11	Functional Programming - Observer: “Implementing the Observer pattern: Write a program that represents an	S4	CO4

	implementation of the Observer pattern based on lambdas.”		
12	Functional Programming - Decorator: “Implementing the Decorator pattern: Write a program that represents an implementation of the Decorator pattern based on lambdas.”	S4	CO4
13	Study features of Java 17	S4	CO1 - CO4
14	Mini Project using advanced Java features and techniques. (JDBC, Spring, Hibernate, JSP, Servlets etc)	S4	CO1 - CO4

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(50 Marks)	09	03	24	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	09	00
S2	Manipulation	00	00
S3	Precision	18	00
S4	Articulation	23	00
S5	Naturalization	00	00
Total Marks		50	00

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		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

Professional Electives (IV) (3+0+1)	Professional Electives(V) (3+0+0)
ITPE4001 Advanced DBMS ITPE4002 Lab Advanced DBMS	ITPE4010 Reinforcement Learning (12 Weeks) ITPE4011 Applied Accelerated Artificial Intelligence(12 Weeks) ITPE4012 Deep Learning for Computer Vision(12 Weeks) ITPE4013 Cyber Security and Privacy(12 Weeks) ITPE4015 Social Networks(12 Weeks) ITPE4015 Getting Started with Competitive Programming (12 Weeks)
ITPE4003 Image Processing and Computer Vision ITPE4004 Lab Image Processing and Computer Vision	
ITPE4005 Cloud Computing ITPE4006 Lab Cloud Computing	

List of NPTEL* courses for Open Elective ITOE0050 Open Elective-V

1 Software Testing
2 Software Engineering
3 Operating System Fundamentals
4 Programming In Java

List of NPTEL* courses for Humanities Social Science and Management course ITHS0040 HSMC-IV

1 Ecology And Society
2 Science, Technology and Society
3 Environment And Development
4 Sociology of Development
5 Soft Skills

Approved in XXVIIIth Academic Council
Dated: 25th Jun 2024

ITPE4001 Advanced Database Management System		
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**

Prerequisites: Database Management System

Course Description: Advanced Database Management System. In short, a ADBMS is a database program. Technically speaking, it is a software system that uses a standard method of cataloging, retrieving, and running queries on data. ADBMS contain comprehensive contents on various concepts related to database systems, database design and management, broadly it discuss about parallel and distributed database systems. The students will get a detailed introduction about database administration and management. This course includes study if structured and unstructured database like MangoDB, SQL and XML of data management.

Course Outcome:

CO1 Understand the basic concepts and architecture associated with ADBMS

CO2 Interpret and explain the impact of emerging database standards

CO3 Make use of object oriented and Advanced XML queries on Database

CO4 Apply Parallel and distributed database techniques in given situation

CO5 Develop a data mart or data warehouse for any organization

Detailed Syllabus:

Unit 1 **Object and Object Relational Databases** : Concepts for Object Databases: Object Identity ,Object structure ,Type Constructors ,Encapsulation of Operations ,Methods ,Persistence, Type and Class Hierarchies Inheritance , Complex Objects ,Object Database Standards, Languages and Design: ODMG Model, ODL , OQL Object Relational and Extended – Relational Systems : Object Relational features in SQL/Oracle – Case Studies XML – Structure of XML, Document Schema, Querying and Transformation, API in XML, XML applications

Unit 2 **Parallel Databases** :Database System Architectures: Centralized and Client- Server Architectures – Server System Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism

Unit 3 **Distributed Data Base**: Distributed database concepts, distributed DBMS architecture, distributed database design, top-down and bottom design, fragmentation, fragment allocation, distributed query processing, transaction management in distributed database, distributed concurrency control, reliability issues in distributed DBMS.

Unit 4 **NO SQL**-Introduction to NoSQL Database, Types and examples of NoSQL Database- Key value store, document store, graph, Performance, Structured verses unstructured data, Distributed Database Model, CAP theorem and BASE Properties, Comparative study of SQL and NoSQL, NoSQL Data Models, Case Study-unstructured data from social media, **Introduction to MongoDB**, concepts, environment, schema design

Unit 5 **Introduction to Data Ware House**, Differences between operational data base systems and data Ware House, Data Ware House characteristics, Data Ware House Architecture and its components, Extraction-Transformation-Loading, Logical (MulitDimensional), Data Modeling, Schema Design, star and snow-Flake Schema, Fact Constellation, Fact Table, Fully Addictive, Semi-Addictive, Non-Addictive Measures; FactLess-Facts, Dimension Table characteristics; Fact-Less-Facts, Dimension Table characteristics; OLAP cube, OLAP Operations, OLAP Server Architecture-ROLAP, MOLAP and HOLAP.

Text Books & Reference Books

1. Silberschatz A., Korth H., Sudarshan S., "Database System Concepts", McGraw Hill Publishers, ISBN 0-07-120413-X, 6th edition

2. Pramod J. Sadalage and Martin Fowler, ―NoSQL Distilled‖, Addison Wesley, ISBN10:0321826620, ISBN-13: 978-0321826626
3. Paulraj Ponniah, "Data Warehousing Fundamentals, Wiley Publications
4. C J Date, ―An Introduction to Database Systems‖, Addison-Wesley
5. Kristina Chodorow, Michael Dirolf, ―MangoDB: The Definitive Guide‖ ,O'ReillyPublications, ISBN: 978-1-449-34468-9

Web Resources

https://mongodb.com/mannueal/tutorial/install-mongodb-on-windows/

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		2	2										1		
CO2	2	3	2	1									3	2	
CO3	1	2	3	1									2	3	2
CO4	1	3	3	2	1								1		2
CO5	2	2	3	3	1								2	3	3

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) Surprise test
2) Assignment
3) Quizzes
4) Power Point Presentation
5) 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	05	05	00	10
K2	Understand	10	10	05	25
K3	Apply	00	00	05	25
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

Assessment table:

Assessment Tool	**K1,K2**	**K3**
	CO1,CO2	CO3,CO4,CO5

ISE I (15 Marks)	05	10
ISE II(15 Marks)	05	10
ISE III (10 Marks)	05	05
ESE Assessment (60 Marks)	35	25
Total Marks 100		

Special Instructions if any: Nil

ITPE4002 : Lab Advanced Database Management System		
Teaching Scheme	**Examination Scheme**	
Practical: 2Hrs/Week	**ISE I* (Term Work)**	**25 Marks**
Credits:01	**End Semester Evaluation**	**25 Marks**

Course Outcomes:

After completion of this course students will be able to:

	Course Outcomes
CO1	Identify and resolve physical database design and implementation issues
CO2	Design, develop and implement a mid-scale relational database for an application domain using a commercial-grade DBMS
CO3	Demonstrate capacity to perform a self directed piece of practical work that requires the application of data warehousing techniques
CO4	Design and implement a complete problem solution using current database technology

List of the Experiments:

Sr. No.	Title of the Experiments	Skill / Knowledge Level	CO
1	**Group A:** Introduction to Databases (Study assignment)Study and design a database with suitable example using following database systems: Relational: SQL / PostgreSQL / MySQL Key-value: Riak / Redis (different database systems based on points like efficiency, scalability, characteristics and performance.)	S1,S2	CO1, CO2
2	**Group B:** Design any database with at least 3 entities and elationships between them. Apply DCL and DDL commands. Draw suitable ER/EER diagram for the system.	S2,S3	CO1, CO2
3	Design and implement a database and apply at least 10 different DML queries for the following task. For a given input string display only those records which match the given pattern or a phrase in the search string. Make use of wild characters and LIKE operator for the same. Make use of Boolean and arithmetic operators wherever necessary	S3	CO1, CO2,CO4
4	Implement nested sub queries. Perform a test for set membership (in, not in), set comparison (<some, >=some, <all etc.) and set cardinality (unique, not unique	S4	CO1, CO2
5	Write and execute suitable database triggers .Consider row level and statement level Triggers.	S3	CO1, CO2
6	**Group C:** Study of Open Source NOSQL Database: MongoDB (Installation, Basic CRUD operations, Execution)	S1	CO1, CO2, CO4
7	Design and Develop MongoDB Queries using CRUD operations. (Use CRUD operations, SAVE method, logical operators)	S2	CO1, CO2, CO4
8	Implement aggregation and indexing with suitable example using MongoDB.	S2	CO1, CO2,

			CO4
9	Design and Implement any 5 query using MongoDB	S3	CO1, CO2, CO4
10	Create simple objects and array objects using JSON	S2	CO1, CO2, CO4
11	Encode and Decode JSON Objects using Java/Perl/PHP/Python/Ruby	S2,S3	CO1, CO2,CO4
12	Implement Fact Tables	S3	CO1, CO2, CO3
13	Implement star schema	S3	CO1-CO3
14	**Group D:** Write a program to implement MogoDB database connectivity with PHP/ python/Java Implement Database navigation operations (add, delete, edit etc.) using ODBC/JDBC .	S3,S4	CO1,-CO4
15	Implement MYSQL/Oracle database connectivity with PHP/ python/Java Implement Database navigation operations (add, delete, edit,) using ODBC/JDBC	S3,S4	CO1-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

Assessment Table:

Assessment Tool	S3	S3	S1	S6
	CO1	CO2	CO3	CO4
Term work(25Marks)	06	07	06	06
Practical Examination & Viva Voce(25 Marks)	06	07	06	06

Assessment Pattern: Use the relevant table for assessment pattern.

Assessment Pattern Level No.	**Knowledge Level**	**ISE I**	**End Semester Examination**
S1	Imitation	06	06
S2	Manipulation	07	07
S3	Precision	06	06
S4	Articulation	06	06
S5	Naturalization	00	00
Total Marks		25	25

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

3 – High 2 – Medium 1 - Low

Approved in XXV IIIth Academic Council
Dated: 25th Jun 2024

ITPE4003 Image Processing and Computer Vision		
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: To learn and understand the fundamentals of digital image processing, Image Enhancement Techniques, Image restoration Techniques and methods, Image compression and Segmentation used in digital image processing

Course Outcomes

After completing the course, students will able to:

		Bloom's Level
CO1	Study of image formation models and camera models	Remember
CO2	Illustrate spatial and frequency domain techniques for enhancing images	Understand
CO3	Use morphological operations and segmentation techniques for various applications	Apply
CO4	Acquire the image compression techniques. Also, get object descriptors	Apply
CO5	Apply computer vision techniques to classify the content of an image	Apply

Detailed Syllabus:

Unit 1	Introduction to Computer Vision and Image Fundamentals: Introduction to Computer Vision, Numerical representation of images, Elements of image processing, Image Formation: Geometric image formation, Photometric image formation. Human Visual System, Camera Models, Image sampling and quantization, Some Basic Relationships Between Pixels,
Unit 2	Image Enhancement: Thresholding, Spatial domain techniques – Image Negative, Contrast stretching, Gray level slicing, Bit plane slicing, histogram and histogram equalization, local enhancement technique, image subtraction and image average, low–pass spatial filters, median filtering, high-pass spatial filter, Frequency domain techniques- Ideal low-pass filter, Butterworth low-pass filter, High-pass filter, Homo-morphic filters.
Unit 3	**Image Segmentation and Morphological Processing:** Detection of discontinuities, Point, Line and Edge Detection, Thresholding. Region-Based Segmentation, Morphological operations: Dilation and Erosion, Opening and Closing, Hit-or-Miss Transformation, Basic morphological algorithms for boundary extraction, Region filling, extraction of connected components, thinning and thickening.
Unit 4	**Image Compression and Object Representation:** Introduction to image compression and its need. Types of redundancies, classification of compression techniques (Lossy and Lossless - JPEG, RLE, Huffman, Shannon Fano.), scalar & vector quantization. Introduction to object recognition, object boundary and shape representations, regional descriptors (Texture).
Unit 5	**Applications and Case Studies:** Introduction to Recognition,Artificial neural network for pattern classification, convolutional neural networks, gesture recognition, motion estimation and object tracking. Identifying road signs, locating pedestrians, etc. Case Studies and recent researches in computer vision.

Text and Reference Books

1. Rafel C Gonzalez and Richard E Woods, "Digital Image Processing'', Pearson Education, 3rd Edition, 2009.

2. Forsyth and Ponce, “Computer Vision – A Modern Approach”, Second Edition, Prentice Hall, 2011.
3. D. Forsyth, J. Ponce, Computer Vision: A Modern Approach, Pearson Education.
4. Anil Jain, “Fundamentals of Digital Image Processing”, Anil Jain PHI, 1989.
5. B. Chanda, D Dutta Majumder, “Digital Image Processing and Analysis’’, Prentice-Hall, India, 2002
6. J.G. Proakis, “Introduction to Digital Signal Processing”, PHI, 2007.
7. https://www.coursera.org/learn/image-processing

Mapping of Course outcome with Program Outcomes:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO1 0	PO11	PO1 2	PSO 1	PSO 2	PSO 3
CO1	2	3											2	3	
CO2	3	2			1								3	1	1
CO3	3	2			1								3	1	1
CO4	3		2	1									2	2	
CO5	2	2	3										2		2

1 – Low 2 – Medium 3 – High

Recommended Assessment pattern

Assessment Pattern Level No.	**Knowledge Level**	**ISE I**	**ISE II**	**ISE III**	**End Semester Examination**
K1	Remember	05	00	00	10
K2	Understand	10	05	00	20
K3	Apply	00	10	05	20
K4	Analyze	00	00	05	10
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
Total Marks 100		15	15	10	60

Teacher’s 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 a combination of a few of the following

1) Quiz
2) Question & answer / Numerical solution
3) Power-point presentation
4) Simulation
5) Mini projects
6) Virtual Lab Assignments
7) Any other activity suggested by course coordinator

ESE: End Semester Examination of Maximum Marks-60

Assessment table

Assessment Tool	**K1**	**K2**	**K3**	**K4**
	CO1, CO2	CO1, C02, CO3	CO3, CO4	CO5
ISE I (15 Marks)	10	05	00	00
ISEII (15 Marks)	10	05	00	00
ISE III (10 Marks)	00	00	05	05
ESE Assessment (60 Marks)	15	15	20	10
Total Marks 100	35	25	25	15

ITPE4004 :Lab Image Processing and Computer Vision		
Teaching Scheme	**Examination Scheme**	
Practical: 2Hrs/Week	**ISE I (Term Work)**	**25 Marks**
Credits:01	**End Semester Evaluation**	**25 Marks**

Course Outcomes

As an outcome of completing the Laboratory course, students will able to:

		Bloom's Level
CO1	Make use of point processing techniques, thresholding, contrast stretching, and histogram equalization	Imitation
CO2	Perform high pass and low pass filtering in spatial and frequency domain	Manipulation
CO3	Use edge detection with Prewitt, Sobel and Laplacian masks	Manipulation
CO4	Apply morphological operations and compression techniques on images	Precision
CO5	Classify images based on its descriptors	Precision

List of Experiments

Sr. No.	Details
1.	Perform Point processing in spatial domain a. Negation of an image b. Thresholding of an image c. Contrast Stretching of an image
2.	Perform experiments for histogram equalization
3.	Implement Filtering in spatial domain a. Low Pass Filtering b. High Pass Filtering c. Median filtering
4.	Implement Filtering in frequency domain a. Low pass filter b. High pass filter
5.	Implement edge detection using derivative filter mask a. Prewitt b. Sobel c. Laplacian
6.	Implement boundary extraction algorithm
7.	Implement different morphological operations
8.	Implement data compression using Huffman coding
9.	Write a program to extract image features using different techniques
10.	To classify image using convolutional neural network

Implementation of the programs is to be done using MATLAB/Python platform.

Text and Reference Books

1. Handbook of Image and Video Processing by Alan C. Bovik, Academic Press, 2000.
2. Rafel C Gonzalez and Richard E Woods, "Digital Image Processing Using MATLAB", Pearson Education, 3rd Edition, 2009.
3. Python 3 Image Processing, Ashwin Pajankar, BPB Publication, 2019.
4. J. Solem, Programming Computer Vision with Python: Tools and Algorithms for Analyzing Images, O'Reilly.
5. https://nptel.ac.in/courses/117105135

6. https://in.coursera.org/learn/introduction-image-processing
7. https://in.coursera.org/learn/introduction-computer-vision-watson-opencv

Mapping of Course outcome with Program Outcomes

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO 12	PS O1	PS O2	PS O3
CO1	3	2											3	2	
CO2	2	3	3											2	3
CO3	3	2			1									2	3
CO4			2	1	3								1	2	3

1 –Low 2 – Medium 3 – High

Assessment Table

Assessment Tool	S1	S2	S2	S3	S3
	CO1	CO2	CO3	CO4	CO5
Term Work (25 Marks)	05	06	05	05	04
Practical Examination & Viva Voce (25 Marks)	05	06	05	05	04

Recommended Assessment pattern

Assessment Pattern Level No.	**Skill Level**	**Term Work**	**End Semester Examination**
S1	Imitation	05	05
S2	Manipulation	11	11
S3	Precision	09	09
S4	Articulation	00	00
S5	Naturalization	00	00
Total		25	25

ITPE4005:Cloud Computing		
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 Outcomes: After completing the course, students will able to:	
CO1	*Recall and summarize* the basic concepts of cloud computingand architecture.
CO2	Classify cloud services and to use in the development of applications.
CO3	Outline the virtualization technology anddetermine their uses.
CO4	Analyze basic threats and security mechanisms in cloud.
CO5	Create cloud applications by using cloud available platforms.

Detailed Syllabus:

Unit 1	**Introduction:** Introduction of Cloud Computing, model architecture and computing environments**,** Cloud deployment models, Cloud characteristics, challenges, and risks. Service oriented architecture (SOA) and Cloud Computing Reference Architecture byIBM
Unit 2	**Cloud Services :** Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) Software-as-a-Service(SaaS),Business-Process-as-a-service (BPaaS),Identity-as- aservice (IDaaS), Communication-as-a-service (CaaS), Monitoring-as-a-service (MaaS), Storage as a service:Traditional storage versus storage cloud, Cloud Service providers: Infrastructure as service: Amazon EC2, Platform as Service: Google App Engine, Force.com.
Unit 3	**Virtualization:** Introduction to virtualization, types of virtualization, Full and para virtualization, techniques of virtualization, Case studies on Vmware, Virtual box, Xen, and KVM-QEMU hypervisor .Memory virtualisation , I/O Virtualisation , OS virtualisation ,Comparative analysis of hypervisors,Web services: SOAP and REST
Unit 4	**Security in Cloud Computing:** Cloud security challenges, Infrastructure Security Network,HostandApplicationlevel,DatasecurityandStorage,SecurityManagement in the cloud, Data Privacy, Jurisdictional issues raised by data location ,Identity and access management, Access control trust, reputation, risk authentication in cloud computing ,Client access in cloud, Cloud contracting model ,Commercial and business considerations.
Unit 5	**Cloud Applications** : Using Google web service exploring Google application, Big Data on Cloud, AWS DevOps .Index Search dark web, Aggregation and intermediation, productivity application and services .Case study-DropBox,Amazon, Google AppEngine

Text and Reference Books

1. Cloudcomputing BiblebyBarrieSosinsky,WileyIndiaPvtLtd(2011)
2. Enterprise Cloud Computing: Technology, Architecture, Applications by GautamShroff, Cambridge University Press.
3. Cloud Computing Implementation, Management, and Security By John W. Rittinghouse,James F. Ransome , CRC Press.
4. MasteringCloudComputingRajkumarBuyya,ChristianVecchiola,S.ThamaraiSelvi
5. Dr.KumarSaurabh,"CloudComputing",WileyPublication
6. BorkoFurht,"HandbookofCloudComputing",Springer
7. VenkataJosyula,"Cloudcomputing–Automatedvirtualizeddatacenter",CISCOPress
8. GregSchulr,"Cloudandvirtualdatastoragenetworking",CRCPress
9. MarkCarlson,"Clouddatamanagementandstorage",McGrawhill
10. LizheWang,"CloudComputing:Methodology,SystemandApplications",CRCPress
11. Cloudcomputing:DataIntensiveComputingandSchedulingbyChapmanHall/CRC
12. Christopher M. Moyer, Building Applications in the Cloud: Concepts, Patterns, and Projects
13. IBMsmartstoragecloudRedpaperbyLarryCoyneMarkBagleyGauravChhaunker
14. GoogleAppsbyScottGranneman,Pearson
15. CloudSecurity&PrivacybyTimMalhar,S.Kumaraswammy,S.Latif(SPD,O'REILLY)
16. CloudComputing:APracticalApproach,AntohyTVelte,et.alMcGrawHill,
17. Stefano Ferretti et.al.,‖QoS–aware Clouds", 2010 IEEE 3rd International Conference on Cloud Computing

Web Resources

1. https://onlinecourses.nptel.ac.in/noc21_cs14/preview

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	2												1	1	
CO2		3										2	1	1	
CO3									2	2		2		3	3
CO4		3				2	2					3		3	3
CO5					3	2	2	1			2	3		3	3

1 – Low 2 – Medium 3 – High

Assessment:

ISE I-Maximum Marks-15
ISE II- Class Test of Maximum Marks-15
ISE III-Teacher's Assessment of Maximum Marks-10
ISE I and ISE III -May be based on one of the / or combination of few of following

1. Class Test/ Surprise test/ MCQ Test
2. Assignment
3. Quizzes

4. Attendance
5. 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	5	5	2	10
K2	Understand	7	7	3	20
K3	Apply	3	3	5	20
K4	Analyze	-	-	-	10
K5	Evaluate	-	-	-	-
K6	Create	-	-	-	-
Total Marks 100		15	15	10	60

Assessment table:

Assessment Tool	K2	K2	K3	K2	K4
	CO1	CO2	CO3	CO4	CO5
ISEI(15 Marks)	4	4	2	2	3
ISEII(15 Marks)	2	2	4	4	3
ISEIII (10 Marks)	2	2	2	2	2
ESE Assessment (60 Marks)	10	10	20	10	10
Total Marks 100	20	20	30	20	10

ITPE4006 : Lab-Cloud Computing		
Teaching Scheme	**Examination Scheme**	
Practical: 2Hrs/Week	**ISE I (Term Work)**	**25 Marks**
Credits:01	**End Semester Evaluation**	**25 Marks**

Course Outcomes After completion of this course students will be able to:	
CO1	Create web applications to deploy the monaCloud.
CO2	Apply virtualization techniques for various applications.
CO3	Analyze Platform as a Service, Infrastructure as a Service and Software as a Service
CO4	Installation of Google app Engine
CO5	Develop advanced applications using cloud services.

List of the Experiments:

The student shall perform minimum ten experiments of the following using Net beans, Java and web.

Sr. No.	Title of the Experiments	Skill / Knowledge Level	CO	Marks for ISE
Level: Basic (all)				

1	Introduction to cloudcomputing using web services.	S1	CO1	02
2	Implementation of SOAP and Restful Web services in Java# and oracle.	S2	CO1,CO2	02
3	Implementation of Para-Virtualization using VMWare's Workstation/Oracle's Virtual Box and Install a C compiler in the virtual machine created using virtual box and execute Simple Programs.	S2	CO1,CO2	02
Level: Moderate (Any Four)				
4	Find a procedure to transfer the files from one virtual machine to another virtual machine.	S2, S3	CO2,CO3	02
5	Install Google App Engine. Create hello world app and other simple web applications using python/java.	S2, S3	CO4	03
6	Use GAE launcher to launch the web applications.	S2, S3	CO4,CO5	02
7	Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.	S2, S4	CO2,CO3, CO4CO5	03
8	Install Open Stack and use it as Infrastructure as a Service and use technology own Cloud.	S2, S3, S4	CO2,CO3, CO4	02
Level: Complex				
9	Installing and using security feature of own Cloud.	S2	CO4	02
10	Case Study: Amazon Web Services	S4,S5	CO2,CO3, CO4CO5	03
11	Case study on Microsoft azure	S4,S5	CO2,CO3, CO4CO5	02

Assessment Table:

Assessment Tool	**S1**	**S2**	**S3**
	CO1	CO2, CO3	CO4,CO5
ISE I (Term Work)	00	15	10
End Semester Evaluation (Practical Examination & Viva Voce)	05	10	10

Assessment Pattern:

Assessment Pattern Level No.	**Knowledge Level**	**ISE I**	**End Semester Examination**
S1	Imitation	00	05
S2	Manipulation	15	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 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			2		3								1	2	
CO2	3		2	1		3		2					3		3
CO3		3					2						3	1	3
CO4									3	2				3	1
CO5											3	2	3	1	1

3 – High 2 – Medium 1 – Low

Approved in XXV IIIth Academic Council
Dated: 25th Jun 2024

ITPR4001 : Project-I		
Teaching Scheme	**Examination Scheme**	
Practical: 12 Hrs/Week	**ISE I* (Term Work)**	**50 Marks**
Credits:06	**End Semester Evaluation**	**100 Marks**

ITPR4002 : Project-II		
Teaching Scheme	**Examination Scheme**	
Practical: 12 Hrs/Week	**ISE I* (Term Work)**	**50 Marks**
Credits:06	**End Semester Evaluation**	**100 Marks**

ITPR4003: Internship		
Teaching Scheme	**Examination Scheme**	
Practical: 12 Hrs/Week	**ISE I* (Term Work)**	**50 Marks**
Credits:06	**End Semester Evaluation**	**100 Marks**

ITPR4004 : On Job Training		
Teaching Scheme	**Examination Scheme**	
Practical: 12 Hrs/Week	**ISE I* (Term Work)**	**50 Marks**
Credits:06	**End Semester Evaluation**	**100 Marks**

ACTIVITY- BASED PERSONALITY DEVELOPMENT

These are non-credit mandatory activities; a student should engage himself/ herself for his /her personality development. A student shall complete at least two activities (with at least one from each group listed below), before the end of seventh semester.

Activity 1: Co-curricular activities ,which includes but not limited to activities like organizing and/or participating in activities of student chapters and association, paper presentation, Lab development, participation in national level competitions like Hackathon, BAJA, ROBOCON, etc.

Activity 2: Extracurricular and outreach activities this includes but not limited to activities like NCC, NSS, social work, health care services, activities of association, participation and/or organizing cultural and sports activities, activities of various clubs, etc. The student is encouraged to participate in as many activities as possible. However he/ she will choose two activities (one from each group) to be presented before the committee formed by the concerned HOD at the end of seventh semester. The HOD will provide the list of student who has completed the activities satisfactorily to the examination section for inclusion in the grade card of seventh semester.