Name of School/ Department: CS&IT	
Name of Program: Bachelor of Technology	**Branch/ Specialization:** Computer Science and Engineering

COURSE PLAN

Name of Course	Course Code	Semester	Credit	Contact	L	+	T	+	P	=	Total
COMPUTER VISION	CS-312	5th	4	4	3	+	1	+	0	=	4
		Name of the Faculty Member			Designation				Employee ID		
		Dr. Manisha Vashisht			Associate						
Academic Year		Email ID-			Mobile Number						
2023-2024		**manishavashisht@lingayasvidyapeeth.edu.in**			**9899762669**						

Prerequisite Course:

Knowledge of programming languages, basics of mathematics, organizing and problem-solving ability.

Teacher Centric Approach

TC1: Chalk and Talk, TC2: PPT, TC3: Video Lectures TC4: Blended learning

Learner Centric Approach:

LC1: Assignment. LC2: Mini project. LC3: Quiz/Class test. LC 4: Seminar on recent trends.

LC5: Group Task. LC6: Others

Name of School/ Department: CS&IT	
Name of Program: Bachelor of Technology	**Branch/ Specialization:** Computer Science and Engineering

VISION:

To bring forth cultured graduates meeting the expectation of national and multi-national industries exceling in the field of computing as well as in higher studies and research.

MISSION:

1. To provide strong theoretical knowledge of computer science with practical training which meets the industries expectations.
2. To train necessary skills to further higher studies and professional growth.
3. To inculcate ethical valued in graduates through various social-cultural activities.

PROGRAM OUTCOMES:

PO1- Engineering Knowledge: Apply the knowledge of mathematics, science, engineering and Application fundamentals, and an engineering and Application specialization to the solution of complex engineering problems.
PO2- Problem Analysis: Identify, formulate, 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 modelling 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 teamwork: 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.

PROGRAM SPECIFICOUTCOMES:

PSO1: To equip the students with theoretical and implementation knowledgebase in all the latest areas of Computer Science; Engineering for a Successful career in software industries, pursuing higher studies, or entrepreneurial establishments.
PSO2: To nurture the students with the critical thinking abilities for better decision making by offering them a socially acceptable solutions to real life Problems through computing paradigm.
PSO3: To nurture the students with the comprehensive analytical and design abilities by offering them techno-commercially feasible solutions of real business problems through computing.

COURSE DESCRIPTION:

An overview of data structure concepts, arrays, stack, queues, trees, and graphs. Discussion of various implementations of these data objects, programming styles, and run-time representations. Course also examines algorithms for sorting, searching and some graph algorithms.

COURSE OUTCOMES:

SNO	DESCRIPTION	PO (1..12) MAPPING	PSO (1..3) MAPPING
CO1	Identify basic concepts, terminology, theories, models and methods in the field of computer vision.	PO1, PO2	PSO1
CO2	Describe known principles of human visual system.	PO1, PO2, PO3	PSO1, PSO2
CO3	Describe basic methods of computer vision related to multi-scale	PO1, PO2, PO3, PO4,	PSO1,

	representation, edge detection and detection of other primitives, stereo, motion and object recognition.	PO5	PSO3
CO4	Suggest a design of a computer vision system for a specific problem**.**	PO1, PO2, PO3	PSO1, PSO2
COURSE OVERALL PO/PSO MAPPING:			

COURSE OUTCOMES VS POs MAPPING (DETAILED; HIGH: 3; MEDIUM: 2; LOW: 1**):**

SNO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1											2		
CO2	2	1	1										2	1	
CO3	2	2	1	1	1								2	2	1
CO4	2	1	1										2	2	
CO5	2	1	1	1	1								2	2	
CO*															

SYLLABUS:

UNIT	DETAILS	Contact Hours
1	**COMPUTER VISION: AN INTRODUCTION:** Introduction to computer vision and images, Basic image operation, Mathematical operations on images, Sunglass filter: A simple application, Bitwise operations, Image Annotation	7
2	**IMAGE FORMATION MODELS:** Monocular imaging system, Radiosity: The 'Physics' of Image Formation, Radiance, Irradiance, BRDF, colour etc, Orthographic & Perspective Projection, • Camera model and Camera calibration, Binocular imaging systems, Multiple views geometry, Structure determination, shape from shading, Photometric Stereo, Depth from Defocus, Construction of 3D model from images	6
3	**OBJECT RECOGNITION: TRADITIONAL AND DEEP LEARNING METHODS:** HoG/ SIFT features, Bayes classifiers, SVM classifiers, Image classification, object detection and semantic segmentation, adversarial attacks. Various neural network architectures, visualization techniques	6
4	**INTRODUCTION TO NEURAL NETWORKS:** Artificial neural networks, loss functions, back propagation and SGD, Batch Normalization.	11
5	**MOTION ANALYSIS AND ACTIVITY RECOGNITION:** Motion detection and tracking, Inference of human activity from image sequences	8
	Total Contact Hours	**36**

COURSE COMPLETION PLAN

Total Class room sessions	**36**
Total Quizzes	**3**
Total Test	**3**
Total Assignment	**3**

One Session = 50 Minutes

EVALUATION & GRADING

- Students will be evaluated based on the following stages.
- Internal Assessment= 40%
- End Semester Examination = 60%

DETAILED SESSION PLAN

Lecture session/ Number	Topics to be covered	Planned Date	Execution Date	Teacher Centric Approach	Learner Centric Approach	References	Relevance with POs and PSOs
1	Introduction to computer vision, Application of computer vision, Benefits of Computer vision	24/01/2024		TC1, TC2	LC1, LC3	T1/T2/R1	1
2	Basic Image operations, Mathematical operations on images	25/01/2024		TC1, TC2	LC1, LC3	T1/T2/T3/R1	1
3	Sunglass filter: Representation of image, Creation of image	26/01/2024		TC1, TC2	LC1, LC3	T1/T2/R1/R2	2
4	Bitwise operation	31/01/2024		TC1, TC2	LC1, LC3, LC4	T1/T2/T3/R1/R2	2
5	Image Annotation and its types and techniques	01/02/2024		TC1, TC2	LC1, LC3	T1/T2/T3/R1/R2	2
6	Image Formation and Models	07/02/2024		TC1, TC2	LC1, LC3	T1/T2/R1/R2/R3	1
7	Molecular imaging system	08/02/2024		TC1, TC2	LC1, LC3, LC4	T1/T2/T3/R1/R2	2

8	Radiosity: 'Physics' of image formation Radiance, Irradiance	14/02/2024		TC1, TC2	LC1, LC3, LC4	T1/T2/T3/R1/R2	2
9	BRDF, color, Orthographic & Prospective projection	15/02/2024		TC1, TC2	LC1, LC3, LC4	T1/T2/T3/R1/R2	2
10	Camera model and calibration	21/02/2024		TC1, TC2	LC1, LC3	T1/T2/T3/R1/R2	2
11	Binocular imaging system, Multiple Views geometry, Structure Determination	22/02/2024		TC1, TC2	LC1, LC3, LC2	T1/T2/T3/R1/R3	1
12	Shape from shading, photometric studio, Depth and Defocus	28/02/2024		TC1, TC2	LC1, LC3, LC2	T1/T2/R1/R3	2
13	Construction of 3d model from images	01/03/2024		TC1, TC2	LC1, LC3, LC2	T1/T2/R1/R3	2
14	Assignment	06/03/2024		TC1, TC2	LC1, LC3	T1/T2/R1/R3	1
15	QUIZ-1	06/03/2024		TC1, TC2	LC1, LC3	T1/T2/T3/R1/R2	2
16	Object Recognition	14/03/2024		TC1, TC2	LC1, LC3	T1/T2/T3/R1/R3	2

17	HoG/SIFT features	15/03/2024		TC1, TC2	LC1, LC3	T1/T2/T3/R1/R3	2
18	Bayes Classifiers	21/03/2024		TC1, TC2	LC1, LC3	T1/T2/R1/R2	2
19	SVM Classifiers	22/03/2024		TC1, TC2	LC1, LC3	T1/T2/R1/R2	
20	Image classification, object detection and semantic segmentation,	28/03/2024		TC1, TC2	LC1, LC3	T1/T2/R1/R2	1
21	Adversarial attacks, visualization techniques	29/03/2024		TC1, TC2	LC1, LC3	T1/T2/T3/R1/R3	2
22	Various neural network architectures,	22/03/2024		TC1, TC2	LC1, LC3	T1/T2/T3/R1/R3	2
23	ASSIGNMENT	23/03/2024		TC1, TC2	LC1, LC3, LC4	T1/T2/T3/R1/R2	2
24	QUIZ-2	28/03/2024		TC1, TC2	LC1, LC3	T1/T2/T3/R1/R2	2
25	Introduction to Artificial neural network	29/03/2024		TC1, TC2	LC1, LC3	T1/T2/T3/R1/R2	2
24	loss functions	29/03/2024		TC1, TC2	LC1, LC3	T1/T2/R1/R2	2

25	back propagation and SGD, Batch Normalization.	30/03/2024		TC1, TC2	LC1, LC3	T1/T2/T3/R1/R2	2
26	MOTION ANALYSIS AND ACTIVITY RECOGNITION	04/04/2024		TC1, TC2	LC1, LC3	T1/T2/R1/R3	1
27	Implementations and applications.	05/04/2024		TC1, TC2	LC1, LC3, LC5	T1/T2/R1/R3	1
28	Motion detection and tracking,	02/05/2024		TC1, TC2	LC1, LC3, LC5	T1/T2/R1/R2	
29	Inference of human activity from image sequences	03/05/2024		TC1, TC2	LC1, LC3, LC5	T1/T2/R1/R2	1
30	QUIZ-3	10/05/2024		TC1, TC2	LC1, LC3, LC5	T1/T2/R1/R2	2
31	ASSIGNMENT-3	15/05/2024		TC1, TC2	LC1, LC3	T1/T2/R2/R3	2
32	REVISION	18/05/2024		TC1, TC2	LC1, LC3	T2/T3/R1/R2	2
33	Final Assessment	26/05/2024		--	--	--	
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REFERENCES:

Text Book	T1	**Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill.**
	T2	Introductory Techniques for 3D Computer Vision, by E. Trucco and A. Verri, Publisher: Prentice Hall.
Reference Book	**R1**	E. R. Davies, Computer & Machine Vision, Fourth Edition, Academic Press, 2012
	R2	Simon J. D. Prince, Computer Vision: Models, Learning, and Inference, Cambridge University Press, 2012
Web based materials	**W1**	Geeksforgeeks
	W2	www.coursera.com
	W3	www.simplilearn.com

Faculty **HOD**

Dr. Manisha Vashisht **Dr. Ritu Sindhu**