SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology
Bachelor of Technology

Year: B. Tech III (Semester VI)

Subject Name: Computer Vision **Subject Code**: BTIT14605
Type of course: Professional Elective Course
Prerequisite (if any): Programming for Problem Solving

Teaching and Examination Scheme:

Teaching Scheme				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	
3	0	2	4	60	25	15	30	20	150

CA1: Continuous Assessment (assignments / projects / open book tests / closed book tests) CA2: Sincerity in attending classes / class tests / timely submissions of assignments / self-learning attitude / solving advanced problems TEE: Term End Examination TEP: Term End Practical Exam (Performance and viva on practical skills learned in course) CA3: Regular submission of Lab work / Quality of work submitted / Active participation in lab sessions / viva on practical skills learned in course.

Content:

Sr. No.	Contents	Total Hrs
1	**Overview of computer vision and its applications**: Image Formation and Representation: Imaging geometry, radiometry, digitization, cameras and Projections, rigid and affine transformation.	**06**
2	**Machine Vision and System Components:** Machine Vision System, Machine Vision Camera: CCD and CMOS Image Sensors, TDI Sensor, Camera Type - Area Scan Cameras, Line Scan Cameras, Smart Cameras, Camera Lens Resolution, Contrast and Sharpness, Lenses and their parameters: Types of Lenses, Lens Mounts, Lens Selection Examples-Field of View Much larger than Camera sensor size or Smaller or close to Camera Sensor size, Machine Vision Lighting: Lighting: Light Sources in Machine Vision, Illumination Techniques-Backlighting, Front Lighting, Diffused Lighting, Oblique Lighting, Dark Field Lighting, Infrared and Ultraviolet Light, Filters, Machine Vision Software, Machine Vision Automation, Integration of Machine Vision Components.	**10**
3	**Feature detection:** edge detection, corner detection, line and curve detection, active Contours, SIFT and HOG descriptors, shape context descriptors, Morphologicaloperations.	**08**
4	**Segmentation:** Active contours, split & merge, watershed, region splitting, region merging, graph-based segmentation, mean shift and model finding, Normalized cut	**07**
5	**Camera calibration:** camera models, intrinsic and extrinsic parameters, radial lens	**08**

	distortion, direct parameter calibration, camera parameters from projection matrices, orthographic, weak perspective, affine, and perspective camera models.	
6	**Motion representation:** the motion field of rigid objects, motion parallax, optical flow, the image brightness constancy equation, affine flow, differential techniques, feature-based techniques, regularization and robust estimation.	**06**

Suggested Specification table with Marks (Theory): (For B. Tech only)

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
20	20	10	10	0	0

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference Books:

Sr No.	Title of book /article	Author(s)	Publisher and details like ISBN
1	Computer Vision – A Modern Approach	Forsyth and Ponce	Prentice Hall
2	A Guide for Machine Vision in Quality Control‖	Sheila Anand and Priya	Imprint CRC Press Inc

Note: Students should refer to the latest editions of books

Course Outcomes:

Sr. No.	CO statements	Marks % weightage
CO-1	Learn fundamentals of computer vision and its applications	25%
CO-2	Elaborate the components of Machine Vision Application.	30%
CO-3	Understand the analyzing and extraction of relevant features of the concerned domain problem.	25%
CO-4	Understand and apply the motion concepts and its relevance in real time applications	20%

List of Open Source Software: Open-CV, MATLAB

List of Experiments:

- Experiments to be performed are based on the classroom discussion.