Nirma University

Institute of Technology

B. Tech (Instrumentation and Control Engineering)

Semester: V/VI

L	T	P	C
3	0	0	3

(Open Elective for all)

Course Code	2ICOE02
Course Title	Machine Vision

Course Outcomes (COs):
At the end of the course, students will be able to –

1. explain the basic concepts of machine vision techniques and domains of application
2. evaluate basic machine vision systems
3. select hardware components and processing algorithm for applications
4. design small scale machine vision systems for a variety of application domains

Syllabus   **Teaching Hours**

UNIT 1: Introduction to machine vision and its applications   03

Fundamentals of machine vision, components of a machine vision system,
basic problem of vision: four approaches, brief history, application examples

UNIT 2: Image Formation and Acquisition   09

Sampling and quantization of image signals, digital image formation, image
format and types, image sensors, camera and its types, lenses and optics,
lights and colour, pixels and image filters, image acquisition techniques,
communication technologies

UNIT 3: Algorithms for machine vision part 1   06

Basic image pre-processing operations, filters, intensity operations, threshold
techniques, edge detection

UNIT 4: Algorithms for machine vision part 2   08

Line fitting, circle detection, curve fitting, segmentation methods, hough
transform, pattern matching algorithms, contour analysis, and neural networks

UNIT 5: Vision system integration

05

Sensors, actuators, selection of vision system components, hardware software integration, mechanical assembly and mounting, rejection hardware, computing requirements

UNIT 6: Applications

08

Surface defects detection, 1D/2D barcodes decoding and verification, optical character recognition and verification, label inspection, object presence detection, object recognition, location and position identification of objects and object dimensions measurement

UNIT 7: Case studies and advances

06

Blister inspection system in pharmaceutical industry, surface defect detection in manufacturing industry, object sorting in production industry, foreign particle detection in food and beverages industry, advances in machine vision, 3-D machine vision, artificial intelligence in machine vision

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. Davis, E. R. Machine Vision. San Diego, California: Academic Press.

2. Bruce G. Batchelor. Machine Vision Handbook. Springer.

3. Ramesh Jain, Rangachar Kasturi and Brain G. Schunck. Machine Vision. New York: McGraw-Hill, Inc.

4. Shapiro, L. G. and G. C. Stockman. Computer Vision. Upper Saddle River, New Jersey: Prentice-Hall, Inc.

L= Lecture, T= Tutorial, P= Practical, C = Credit