Sri Chandrasekharendra Saraswathi Viswa Mahavidyalaya

(Deemed to be University)

Enathur, Kanchipuram - 631 561.

DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

CURRICULUM AND SYLLABUS

For Hons. Course – SENSORS TECHNOLOGY

SYLLABUS

FULL TIME BE – ELECTRONICS AND INSTRUMENTATION ENGINEERING

VISION

Academic Excellence and to be in dynamic equilibrium with Contemporary Industry.

MISSION

- To develop students with strong foundation in fundamentals
- To establish a laboratory with latest technologies.
- To provide continuous help to students to develop their overall personality, skills, confidence and character.

PROGRAMME EDUCATIONAL OBJECTIVES

Graduates of this program

PEO 1 Comprises strong fundamental knowledge in solving multi-disciplinary problems

PEO 2 Possess successful technical or professional careers

PEO 3 Continue to learn and to adapt to the day to day evolving technology in the world

PEO 4 Encouraged to design industrial automation systems that are innovative and socially acceptable.

DEFINITION OF CREDIT

1 Hour Lecture / week (L)	1 credit
1 Hour Tutorial / week (T)	1 credit
1 Hour Practical / week (P)	0.5 credit

Programme Outcomes (POs):

Graduates of Mechatronics Engineering program of Sri Chandrasekharendra Saraswathi Viswa Mahavidyalaya will have the ability to

PO.1 Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

PO.2 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.

PO.3 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.

PO.4 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.

PO.5 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.

PO.6 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.

PO.7 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.

PO.8 Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO.9 Individual and Team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO.10 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.

PO.11 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 projectsand in multidisciplinary environments.

PO.12 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.

SYLLABUS

B.E / B.Tech - Hons. / Minor Degrees in Emerging Areas (Optional)

Emerging Areas	Offered as Hons., for the following Major Disciplines*	Offered as Minor Degrees for thefollowing Major Disciplines**
Artificial Intelligence and Machine Learning / Cyber Security / Internet of Things (IoT)	CSE / ECE / IT	Mechanical /Civil /ECE/ EIE/ Mechatronics
Sensors Technology	ECE / CSE / EIE / Mechatronics	Mechanical / Civil / EEE / IT
3D Printing	Mechanical / Civil	ECE / CSE / EIE / Mechatronics / EEE /IT
Electric Vehicles	Mechanical / EEE	ECE / CSE /EIE / Mechatronics /IT /Civil
Robotics	Mechanical / ECE	CSE / EIE / Mechatronics /IT / Civil /EEE

Note: The "Minor Degree or Hons. will cumulatively require additional 18 to 20 credits in the specified area in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline.

* Under Graduate Degree Courses in EMERGING AREAS shall be allowed as specialization from the same Department. The minimum additional Credits for such Courses shall be in the range of 18-20 and the same shall be mentioned in the degree, as specialization in that particular area.

** Minor specialization in EMERGING AREAS in Under Graduate Degree Courses may be allowed where a student of another Department shall take the minimum additional Credits in the range of 18-20 and get a degree with minor from another Department.

SYLLABUS

Curriculum for BE (Hons.) Course – Sensors Technology

SL.No	Course Title	Semester	Credits
1	Basics of Sensors and Actuators	3	4
2	Medical Sensors	4	4
3	Automotive Sensors	5	3
4	Micro Sensors and Micro Fluidics	6	3
5	Smart Sensor Laboratory	6	2
6	Sensor Based Design Laboratory	7	2
Total Credits			**18**

SRICHANDRASEKHARENDRASARASWATHIVISWAMAHAVIDYALAYA

Department of Electronics and Instrumentation Engineering

HONS. COURSE - SENSORS TECHNOLOGY

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Course Code	Course Name	Semester	Hour Plan			
			L	T	P	Credit
	BASICS OF SENSORS AND ACTUATORS	**3**	**3**	**1**	**-**	**4**

Pre-requisite:

- Basic Physics

Aim:

The aim of the course is to provide in-depth knowledge of the principles of operation of various sensory devices and actuators for Industrial applications.

Course Objectives

At the end of the course, the student will be able to:

1. Acquire knowledge about the principles and analysis of sensors.
2. Emphasis on characteristics and response of micro sensors.
3. Acquire adequate knowledge of different transducers and Actuators.
4. Learn about the Micro sensors and Micro actuators.
5. Selection of sensor materials for fabrication for different applications

Unit. 1. FUNDAMENTALS AND TEMPERATURE SENSORS

Difference between sensor, transducer and Actuators- Classification of sensors: Proprioceptive and Exteroceptive – Active and Passive– Contact and Non-contact, selection and characteristics: Range; resolution, Sensitivity, error, repeatability, linearity and accuracy, Primary sensing elements.

Temperature sensors: Principle of operation, construction details, characteristics and applications of Bimetallic thermometer, Resistance thermometer, Thermistor, Thermocouples and Total radiation Pyrometers

Unit. 2. STRAIN, FORCE, TORQUE AND PRESSURE SENSORS

Strain gauges, strain gauge beam force sensor, piezoelectric force sensor, load cell, torque sensor, Piezo-resistive and capacitive pressure sensor, Manometer, vacuum sensors, Pirani gauge.

Unit. 3. DISPLACEMENT, LEVEL AND FLOW SENSORS

Displacement Sensors: LVDT, RVDT, eddy current, transverse inductive, Hall Effect, magneto resistive, magnetostrictive sensors.

Liquid level sensor: Fabry Perot sensor, ultrasonic sensor, capacitive liquid level sensor.

Flow sensors: pressure gradient technique, ultrasonic, electromagnetic sensors and Hot wire anemometer. Micro flow sensor, Coriolis mass flow and drag flow sensor.

SYLLABUS

Unit. 4. MICRO MACHINING TECHNOLOGIES

Overview of silicon processes techniques, Photolithography, Ion Implantation, and Diffusion, Chemical Vapor Deposition, Physical vapor Deposition, Epitaxy, Etching, Bulk micromachining, Surface Micromachining, LIGA and other techniques.

Unit. 5. ACTUATORS

Definition, types and selection of Actuators; linear; rotary; Logical and Continuous Actuators, Pneumatic actuator, Hydraulic actuator - Control valves and cylinders

Electrical actuating systems: Solenoids, Electric Motors- D.C motors - AC motors - Three Phase Induction Motor, Stepper motors -Piezoelectric Actuator.

Course Outcome:

At the end of the course the students will be able to

CO.1. Analyze the basics and design the resistive sensors.
CO.2. Identify the materials and designing of inductive and Capacitive Sensors.
CO.3. Analyze various types of Actuators.
CO.4. Design Micro sensors and Micro Actuators for various applications.
CO.5. Implement fabrication process and technologies and compare various Micro machining processes.

References:

[1]. Robert H Bishop, "The Mechatronics Hand Book", CRC Press, 2002.
[2]. Thomas. G. Bekwith and Lewis Buck.N, "Mechanical Measurements", Oxford and IBH publishing Co. Pvt. Ltd.,
[3]. Massood Tabib and Azar, "Microactuators Electrical, Magnetic, thermal, optical, mechanical, chemical and smart structures", First edition, Kluwer academic publishers, Springer, 1999.
[4]. Manfred Kohl, Shape Memory Actuators, first edition, Springer.

Text Books:

[1]. Patranabis.D, Sensors and Transducers, Wheeler publisher, 1994.
[2]. Sergej Fatikow and Ulrich Rembold, " Microsystem Technology and Microbotics" First edition, Springer –Verlag NEwyork, Inc, 1997.
[3]. Jacob Fraden, "Hand Book of Modern Sensors: Physics, Designs and Application" Fourth edition, Springer, 2010.

SYLLABUS

MAPPING CO–PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√	√									
CO2	√		√			√	√	√	√	√		
CO3	√		√			√	√	√	√	√		
CO4	√	√	√	√	√	√	√		√	√	√	√
CO5	√	√	√					√	√		√	

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HONS. COURSE - SENSORS TECHNOLOGY

SYLLABUS

Course Code	Course Name	Semester	Hour Plan			
			L	T	P	Credit
	MEDICAL SENSORS	**4**	**3**	**1**	**-**	**4**

Aim:

The aim of the course is to provide in-depth knowledge of the principles of operation of various sensory devices and actuators for medical applications.

Course Objectives

At the end of the course, the student will be able to:

1. Introduction to the Fundamentals of Biomedical Engineering.
2. The study of communication mechanics in a biomedical system with few examples
3. Understanding the basic principles in imaging techniques
4. Acquiring basic knowledge in life assisting devices
5. Acquiring basic knowledge in life therapeutic devices

Unit. 1. BIOPOTENTIAL ELECTRODES AND BIO AMPLIFIERS (9 Hours)

Origin of bio potential and its propagation. Electrode-electrolyte interface, electrode–skin interface, half-cell potential, impedance, polarization effects of electrode – nonpolarizable electrodes. Types of electrodes - surface, needle and micro electrodes. Necessity for low noise pre- amplifiers – difference amplifiers – chopper amplifiers – electrical safety – grounding and isolation.

Unit. 2. ELECTRO – PHYSIOLOGICAL MEASUREMENT (9 Hours)

Bio signal characteristics – frequency and amplitude ranges, ECG – EEG – EMG – ERG – lead system and recording methods – typical waveforms.

Unit. 3. PHYSICAL SENSORS IN BIOMEDICINE (9 Hours)

Temperature measurement: core temperature, -surface temperature- invasive.Blood flow measurement: skin blood- hot film anemometer- Doppler sonography- electromagnetic sensor. Blood pressure measurement: noninvasive- hemodynamic invasive.

Unit. 4. DETECTORS IN RADIOLOGY (9 Hours)

X ray imaging with sensors, detectors in nuclear radiology, magnetic field sensors for imaging, magnetic resonance imaging. computer tomography, ultra-sonography, endoscopy

Unit. 5. ASSISTING AND THERAPEUTIC DEVICES (9 Hours)

Blood gas and pH sensor, electrochemical sensor, optical fiber sensor, mass spectrometer, optical oximetry, pulse oximetry, ear oximetry.Cardiac pacemakers, defibrillators, ventilators, diathermy, heart lung machine

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Course Outcome:

At the end of the course the students will be able to

CO.1. Understand the Fundamentals of Biomedical Engineering

CO.2. The graduate will be able to study about communication mechanics in a biomedical system With few examples

CO.3. Understands the basic principles in imaging techniques

CO.4. Acquires basic knowledge in life assisting devices

CO.5. Acquires basic knowledge in life therapeutic devices

References:

[1]. Geddes and Baker, Principles of Applied Biomedical Instrumentation, John Wiley and Sons, USA, 1975.

[2]. Well G, Biomedical Instrumentation and Measurements, Prentice Hall, New Jersey, 1980.

[3]. Koryla J., Medical and Biological Application of electro chemical devices John Wiley and Sons, Chichester, 1980.

[4]. Wise D. L., Applied Bio- sensors, Butterworth USA, 1989.

[5]. Leslie Cromwell, Fred J.Weibell, Erich A.Pfeiffer, „Bio-Medical Instrumentation and Measurements", II edition, Pearson Education, 2002 / PHI.

Text Books:

[1]. Webster J.G., "Medical Instrumentation: Application and Design", 3rd Edition, John Wiley and Son, 1999.

[2]. Khandpur R.S., "Hand book of Biomedical Instrumentation and Measurements", Tata McGraw- Hill New Delhi 1987.

[3]. Dr.M. Arumugam – "Biomedical Instrumentation", Anuradha publications, Chennai.

MAPPING CO–PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√			√			√			√	
CO2				√		√			√			√
CO3	√			√			√	√		√		
CO4	√	√			√	√					√	
CO5	√			√			√	√		√		

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HONS. COURSE - SENSORS TECHNOLOGY

SYLLABUS

Course Code	Course Name	Semester	Hour Plan			
			L	T	P	Credit
	AUTOMOTIVE SENSORS	**5**	**3**	**0**	**-**	**3**

Aim:

To provide an overview of the concepts involved automotive sensors technology.

Course Objectives

At the end of the course, the student will be able to:

1. Acquaint with the basic automotive parts and the need for sensor integration in different automotive systems
2. Discuss the basics of various Power train sensors and chassis management associated systems for proper vehicle dynamics and stability in automotive systems.
3. Comprehend various sensors for vehicle body management and discuss various sensors.
4. Recent technologies for passenger convenience, safety and security systems.
5. Acquaint various communication standards and protocols followed within the automotive systems.

Unit. 1. INTRODUCTION TO AUTOMOTIVE ENGINEERING, AUTOMOTIVE MANAGEMENT SYSTEMS

Automotive fundamentals and Modern Automotive systems - Power-train, Combustion Engines, Transmission, Differential Gear, Braking Systems, Application areas of electronics in the automobiles, Possibilities and challenges in the automotive industry.

Unit. 2. POWER TRAIN SENSORS AND CHASSIS MANAGEMENT

Engine combustion sensing, exhaust temperature sensor, NOx sensor, fuel quality sensor, level sensor, torque sensor, mass flow sensor, manifold pressure sensor.Wheel speed sensors/direction sensors, steering position sensor, acceleration sensor, brake pneumatic pressure sensor, ABS sensor, electronic stability sensor.

Unit. 3. SENSORS FOR VEHICLE BODY MANAGEMENT, SENSORS FOR AUTOMOTIVE VEHICLE CONVENIENCE AND SECURITY SYSTEMS

Gas sensors (CO2), air bag sensor, key less entering sensor. Tire pressure monitoring systems, Two wheeler and Four wheeler security systems, parking guide systems, anti-lock braking system, Safety and Reliability, Traction Control, Vehicle dynamics control, Accelerators & tilt sensors for sensing skidding & anti-collision.

Unit. 4. AIR BAG, SEAT BELT PRE TENSIONER SYSTEMS AND PASSENGER CONVENIENCE SYSTEMS

Principal Sensor Functions, Distributed Front Air Bag sensing systems, Single-Point Sensing systems, Side-Impact Sensing. Electromechanical Seat, Steering Wheel, and Mirror Adjustments, Central Locking Systems.

SYLLABUS

Unit. 5. MODERN TRENDS AND TECHNICAL SOLUTIONS

Enabling Connectivity by Networking:-In vehicle communication standards (CAN & LIN), Telematic solutions, Portable or embedded connectivity- Endorsing Dependability in Drive-by-wire systems:- Terminology and concepts , Why by-wire, FLEXRAY.

Course Outcome:

At the end of the course the students will be able to

- **CO.1.** Identify and understand the basic automotive parts and the requirement of sensors and their integration in different automotive systems
- **CO.2.** Discus and identify the basics of various Power train sensors
- **CO.3.** Comprehend and analyze various systems like ABS, ESP, TCS, etc for understanding vehicle dynamics and stability.
- **CO.4.** Comprehend the various sensors for vehicle body management, convenience & security systems.
- **CO.5.** Identify various technologies developed for passenger convenience, Air Bag deployment and Seat Belt Tensioner System, etc with the students
- **CO.6.** Recognize various communication standards and protocols followed within the automotive systems.

References:

[1]. G Automotive Sensors Handbook, 8th Edition, 2011, BOSCH.
[2]. Jiri Marek, Hans-Peter Trah, Yasutoshi Suzuki, Iwao Yokomori, Sensors for Automotive Technology, 2010, 4th Edition, Wiley, New York.
[3]. Ernest O. Doebelin, “Measurement Systems – Application and Design”, 2017, 6th Edition, McGraw-Hill, New Delhi.
[4]. Walter E, Billiet and Leslie .F, Goings, ‘Automotive Electric Systems’, American Technical Society,Chicago, 1971.
[5]. Judge.A.W, ‘Modern Electric Equipments for Automobiles’, Chapman and Hall, London, 1975.

Text Books:

[1]. Automotive Electrics, Automotive Electronics: Systems & Components, 2014, 5th Edition, BOSCH.
[2]. John Turner, Automotive Sensors, 2010, 1st Edition, Momentum Press, New York.
[3]. William B. Ribbens, “Understanding Automotive Electronics”, Sixth Edition, Newnes , Elsevier Science, ISBN 0-7506-7599-3.
[4]. J. Marek, H.-P. Trah, Y. Suzuki, I. Yokomori, “Sensors for Automotive Applications”, Volume 4, WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim ISBN: 3-527-29553-4.
[5]. Vipul Jain • Payam Heydari, “Automotive Radar Sensors in Silicon Technologies”, Springer New York Heidelberg Dordrecht London, ISBN 978-1-4419-6774-9.

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MAPPING CO–PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√		√			√				√		
CO2	√	√	√	√	√		√			√		√
CO3	√				√		√			√		√
CO4	√		√		√	√	√					
CO5	√		√			√				√		

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Department of Electronics and Instrumentation Engineering

HONS. COURSE - SENSORS TECHNOLOGY

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Course Code	Course Name	Semester	Hour Plan			
			L	T	P	Credit
	MICRO SENSORS AND MICRO FLUIDICS	**6**	**3**	**0**	**-**	**3**

Pre-requisite:

- Basics of Sensors and Actuators

Aim:

The aim of the course is to provide in-depth knowledge of the principles of operation of various micro sensors and micro fluids for Industrial applications.

Course Objectives

At the end of the course, the student will be able to:

1. It covers fundamentals of micro-scale flows and micro fabrication.
2. The course also includes design of micro fluidic components and few applications of micro fluidic systems.
3. The fundamentals of fluid flows at micro-scale including intermolecular forces, low Re flows, slip theory, capillary flows and electro kinetics are discussed.
4. The principles of micro fabrication with silicon and polymer substrates are illustrated. Theory and design of various micro fluidic components including micro pumps, micro mixers, micro valves etc is discussed.

Unit. 1. MICRO SENSORS

Principles and examples, Force and pressure micro sensors, position and speed micro sensors, acceleration micro sensors, chemical sensors, biosensors, temperature micro sensors and flow micro sensors.

Unit. 2. MICRO ACTUATORS

Actuation principle, shape memory effects – one way, two way and pseudo elasticity. Types of micro actuators- Electrostatic, Magnetic, Fluidic, Inverse piezo effect, other principles.

Unit. 3. FABRICATION AND CHARACTERIZATION OF MICRO DEVICES

Patterning, Photolithography, Micromachining, Micromolding, Soft lithography, PDMS properties, Fabrication of micro fluidics channels.

Clean room Protocols, clean room Equipments – Micro manipulator, Stereo microscope, metallurgical microscope, Inverted microscope, Incubator, Static incubator, oven, Autoclave, Sonicator

SYLLABUS

Unit. 4. FUNDAMENTALS FOR MICROSCALE FLOW

Fluids and nonfluids, properties of fluids, classification of fluids, Newtonian and Non-Newtonian fluids, pressure driven flow, Reynolds number, Electro kinetic phenomena, Electric double layer, Debye length, coupling species transport and fluid mechanics, Micro channel Resistance, Shear stress, capillary flow, flow through porous media, Diffusion, surface tension, contact angle and Wetting. .

Unit. 5. MICRO FLUIDIC DEVICES

Droplet Microfluids, Active Flow control, Microvalves, electrically actuated microvalves, Micromixers, Combinational Mixers, Elastomeric Micromixers, and Introduction to COMSOL Multiphysics.

Course Outcome:

At the end of the course the students will be able to

- **CO.1.** Identify and understand the basic principles of various micro sensors.
- **CO.2.** Discuss and identify the basics principles of micro actuators. Understand about shape memory effect and pseudo elasticity
- **CO.3.** Understand the various fabrication methods. Comprehend the clean room and itsprotocols.
- **CO.4.** Comprehend the fundamentals of fluid flows at micro-scale and electro kinetics.
- **CO.5.** Analyze and discuss various micro fluidic devices. Study about COSMOL multiphysics.

References:

[1]. Nguyen, N. T., Werely,S. T., Fundamentals and applications of Microfluidics, Artech house Inc., 2002.
[2]. Bruus, H., Theoretical Microfluidics, Oxford University Press Inc., 2008.
[3]. Madou, M. J., Fundamentals of Microfabrication, CRC press, 2002.
[4]. Tabeling,P., Introduction to microfluidics, Oxford University Press Inc., 2005.
[5]. Kirby,B.J., Micro- and Nanoscale Fluid Mechanics: Transport in Microfluidic Devices, Cambridge University Press, 2010.
[6]. Colin,S., Microfluidics, John Wiley & Sons, 2009.

Text Books:

[1]. Tai Ran Hsu, “MEMS and Microsystems design and manufacture”, Tata McGraw Hill Publishing Company, New Delhi, 2002.
[2]. Wanjun Wang, Stephen A. Soper, ”Bio MEMs: Technologies and Applications”, CRC Press, New York, 2007.

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MAPPING CO–PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√		√			√				√		
CO2	√	√	√	√	√		√			√		√
CO3	√				√		√			√		√
CO4	√		√		√	√	√					
CO5	√		√			√				√		

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Course Code	Course Name	Semester	Hour Plan			
			L	T	P	Credit
	SMART SENSOR LABORATORY	**6**	**-**	**-**	**3**	**2**

Pre-requisite:

- LabVIEW Programming, Control Systems, Basics of Sensors and its applications

Course Objectives

Acquire knowledge on various types of sensors and its interfacing

LIST OF EXPERIMENTS

1. Design and Interfacing of Temperature based control system
2. Design and Interfacing Digital Sensor in LabVIEW
3. Design and Interfacing of Inductive sensor in LabVIEW
4. Design and Interfacing Photo resistive sensor in LabVIEW
5. Design of signal conditioning circuits.
6. Design a Hardware model of Automatic Car Washing System

Course Outcome:

CO: 1. Able to understand the importance of Virtual Instrumentation in Industries.
CO: 2. Able to program VI for different Industrial Applications.
CO: 3. Able to interface different field elements and final control elements.
CO: 4. Gains hands on knowledge on interfacing sensors and transmitters.
CO: 5. Able to build a suitable automation technology for the given application.

MAPPING CO–PO

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	√	√	√	√	√	√	√					
CO2	√	√	√	√	√	√	√					
CO3	√	√	√	√	√	√	√					
CO4	√	√	√	√	√	√	√					
CO5	√	√	√	√	√	√	√					

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Course Code	Course Name	Semester	Hour Plan			
			L	T	P	Credit
	SENSOR BASED DESIGN LABORATORY	**7**	**-**	**-**	**3**	**2**

Pre-requisite:

- PLC Programming, Control Systems, Basics of Sensors and its applications

Course Objectives

1. Acquire knowledge on real time implementation on various Industrial Application
2. Acquire knowledge on various types of sensors in real time application

LIST OF EXPERIMENTS

1. Design a Hardware model of Automatic Vending Machine
2. Design a Hardware based Line Follower Robot
3. Design a Hardware model of Automatic Bottle Filling System
4. Design a Hardware based Home Automation System
5. Design a Hardware based Automatic multilevel Car Parking System
6. Design a Hardware based Automatic alarm systems in Industrial Application

Course Outcome:

CO: 1. Able to understand the importance of PLC in Industries.
CO: 2. Able to program PLC for different Industrial Applications.
CO: 3. Able to interface different field elements and final control elements.
CO: 4. Gains hands on knowledge on interfacing sensors and transmitters.
CO: 5. Able to build a suitable automation technology for the given application.

MAPPING CO–PO

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	√	√	√	√	√	√	√					
CO2	√	√	√	√	√	√	√					
CO3	√	√	√	√	√	√	√					
CO4	√	√	√	√	√	√	√					
CO5	√	√	√	√	√	√	√					