

GANPAT UNIVERSITY									
FACULTY OF ENGINEERING & TECHNOLOGY									
Programme		Diploma Engineering				Branch			
Semester		IV				Version		1.0.0.0	
Effective from Academic Year			2018-19			Effective for the batch Admitted in			June 2018
Subject code		1MC2401		Subject Name		SENSORS AND CONTROL			
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	5	Theory	40	60	100
Hours	3	0	2	0	7	Practical	30	20	50

Pre-requisites:
Students must have knowledge of basic electrical and electronics. Students must aware with fundamental mechanical engineering.

Course Learning Outcomes:
The course content should be taught and implemented with an aim to develop different skills leading to the achievement of the following competencies and course learning outcomes: CO1. To understand the types of systems and their components. CO2. To apply use of signal processing for control system. CO3. To develop understanding of construction and working of different types of sensors. CO4. To implement use of actuators in mechatronics system. CO5. To design mechatronics system and working of it. The practical should be carried out in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate course learning outcomes.

Course Content				
Name of UNIT	Unit Content	Unit Learning Outcomes	Marks	Hrs
UNIT – 1 INTRODUCTION	1.1 Control devices-Meaning, need and application. 1.2. Open loop control 1.3. Closed loop control 1.4. Sinking and sourcing concept	1a. Compare open loop and close loop system. 1b. Identify sinking and sourcing device.	06	03
UNIT – 2 SIGNAL PROCESSING	2.1 Signal processing- Need and meaning 2.2 Data acquisition 2.3 Sampling 2.4 Digitized signal 2.5 Sampling rate, Nyquist frequency and Aliasing 2.6 Analog to digital signal conversion 2.7 Digital to analog signal conversion	2a. Explain Signal processing procedure and filtration. 2b. Convert signals 2c. Distinguish between Analog and digital Signal.	06	03

<p>UNIT – 3 SENSOR</p>	<p>3.1 Sensors- Need and classification. 3.2 Important parameters (such as sensitivity, linearity, range, response time, accuracy, repeatability, Resolution, threshold value etc.) Its definitions and Importance in sensor Selection. 3.3 Working and application of sensing technique for following parameter. i. Position and speed. ii. Stress, strain. iii. Temperature. iv. Pressure. v. Flow and level. vi. Vibration vii. Acoustic viii. Optical ix. Object detection x. Humidity xi. Distance xii. Velocity xiii. Acceleration 3.4 Selection criteria for sensors 3.5 Common troubles and remedies in sensor operations</p>	<p>3a. List out different types of sensor for control system. 3b. Select proper sensor for application. 3c. Make the connection of sensors. Explain working of different type of sensors.</p>	<p>18</p>	<p>16</p>
<p>UNIT – 4 ACTUATORS</p>	<p>4.1 Definition, need, working, applications. 4.2 Electrical actuator (working and application). I. DC motors – series, shunt and compound. II. Ac Single-phase motor III. AC poly phase motor. IV. Servo Motors V. Stepper motors. 4.3 Hydraulic & Pneumatic actuators (working and application) I. Types of Cylinder. II. Direction control valve. 4.4. Precautions in handling / operating actuators. 4.5. Selection criteria. 4.6. Common troubles and remedies.</p>	<p>4a. Identify different types of actuator. 4b. Make the connections with actuators. 4c. Describe different types of electrical motors used in Build</p>	<p>18</p>	<p>16</p>
<p>UNIT – 5 MECHATRONIC SYSTEMS</p>	<p>5.1 Introduction. 5.2. Design steps and considerations 5.3. Various mechatronics systems. I. Being used in day-to-day life. II. Expected use in future. 5.4. Working elements, its</p>	<p>5a. Explain working and function of elements used in Mechatronics systems. 5b. Identify those areas where mechatronics can apply.</p>	<p>12</p>	<p>04</p>

	<p>functions and applications of following system.</p> <p>I. Hydraulic robot arm.</p> <p>II. DC motor based bottle filling.</p> <p>III. Temperature sensing system.</p> <p>IV. Plastic bag manufacturing</p> <p>V. Automobile Engine control system</p> <p>5.5. Mechatronics systems, which are in recent trend</p>			
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List of Practical		
No.	Unit	Name of Practical
1	1	To demonstrate different types of measuring instruments and its use.
2	2	To convert and measure given Analog signal into Digital signal.
3	2	To convert and measure given Digital signal into Analog signal.
4	3	To measure the different parameter like Accuracy, Repeatability and Resolution for Thermocouple and RTD for temperature measurement.
5	3	To measure the different parameter like Accuracy, Repeatability and Resolution for Strain Gauge.
6	3	To measure the different parameter like Accuracy, Repeatability and Resolution for L.V.D.T.
7	4	To Plot various characteristic of Single Phase and Three Phase A.C. Motor.
8	4	To control the speed of DC motor by PWM Method.
9	4	To demonstrate Hydraulic actuator and its working
10	4	To demonstrate Pneumatic actuator and its working
11	5	To construct mini project and presentation on any one of the working of Mechatronics System used in: Household applications, Packaging systems, Material handling/ transfer systems, Automobile systems, Security systems etc.

List of Instruments/Equipment/Trainer Board	
1	Trainer kit of Analog and Digital convertor
2	Temperature measurement kit
3	Distance ,speed measurement kit
4	Different electrical motor cut-out and their speed control kit
5	Electronic lab for project work.

List of Reference Books			
No	Title of Reference Books	Authors	Publication
1	Mechatronics	M.D.Singh	PHI
2	A Text book of Mechatronics	R.K.Rajput	S.Chand
3	A course in Electrical and Electronic Measurements	A K.Sawhney	Dhanpat Rai & Sons
4	Fundamentals of Industrial Instrumentation and Process Control	William Dunn	McGraw-Hill
5	Analog and Digital Circuits for Electronic Control System Applications	Jerry Luecke	Newnes

Link of Learning Web Resource	
1	www.nationalinstruments.com
2	www.controldevices.com
3	www.youtube.com
4	www.sensors-research.com
5	www.sensormag.com
6	www.honeywell.com

CO'S AND PO'S MAPPING

PO'S/CO'S		CO1	CO2	CO3	CO4	CO5
PO1	Proficiently applies concepts, theories and techniques of the relevant natural, physical sciences and knowledge in mathematics.	SLI	SUB	MED	SLI	MED
PO2	Use basic principles of statics, dynamics, fluid mechanics, and engineering materials, strength of materials engineering standards and manufacturing processes to aid in the design, characterization, and analysis and troubleshooting of mechanical system.	SLI	SUB	SUB	SUB	SUB
PO3	Apply their engineering knowledge, critical thinking and problem solving skills in professional engineering practice or in non engineering fields, such as law, medicine or business.	MED	MED	MED	MED	MED
PO4	Continue their intellectual development, through, for example, graduate education or professional development courses.	SLI	MED	MED	SLI	MED
PO5	Use of appropriate computer languages, modern tool and application software that pertain to Mechanical engineering technology systems.	SLI	SLI	SLI	MED	MED
PO6	Ability to identify problems, conducts experiments, gather data, analyze data and produce results.	SLI	MED	MED	MED	SUB
PO7	Retain the intellectual curiosity that motivates lifelong learning and allows for a flexible response to the rapidly evolving challenges of the 21st century	NONE	MED	MED	MED	SUB
PO8	Design a system component or process to meet desired need within realistic constraints, such as economic, environmental and social.	MED	MED	MED	MED	SUB
PO9	Values the need for, and demonstrates, ethical conduct and professional accountability.	NONE	NONE	NONE	NONE	NONE
PO10	Demonstrates effective communication to professional and wider audiences.	SLI	SLI	SLI	SLI	SLI
PO11	Appreciates entrepreneurial approaches to engineering practice.	SLI	SLI	MED	MED	SUB
PO12	Apply commitment to quality, timeliness, and continuous improvement.	SLI	SLI	MED	MED	MED