BMEE317L	Mechatronic Systems Design	L	T	P	C
		3	0	0	3
Pre-requisite	**BMEE210L, BMEE210P**	**Syllabus version**			
		1.0			

Course Objectives

1. To emphasize an understanding of multi-disciplinary study dealing with the integration of elements, mechanical devices, actuators, sensors, electronics, and intelligent controllers.
2. To impart knowledge of mechatronics device integration, conceptual design, analysis, modelling, synthesis, prototyping, validation, installation, and testing.
3. To raise an awareness and provide pertinent engineering methodologies and generate a know-how core in the integration of complex automation.

Course Outcome

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

1. Demonstrate the knowledge of basic concepts, applications, and elements of mechatronic systems.
2. Develop on integration of different hardware components of mechatronic systems.
3. Recommend to design the software that interacts with the hardware elements.
4. Familiarize with data acquisition and human machine interfaces.
5. Analyse the model-based design of mechatronics system.
6. Design mechatronics systems to solve real-world problems.

Module:1	**Introduction to Mechatronics**	**5 hours**

Introduction to Mechatronics system, Key elements, Mechatronics system design process, Types of design, Comparison between Traditional and Mechatronics approach.

Module:2	**Elements of Mechatronics Systems**	**7 hours**

Hardware Components in Mechatronics systems, Mechanisms, Sensors, Actuators, Controllers – Power and Data transfer, signal conditioning and processing, Issues with interfacing and Troubleshooting.

Module:3	**Software Integration**	**6 hours**

Software for Mechatronics, Needs and implementation, Control and Intelligence through Software integration for embedded controllers, Issues with software design and Troubleshooting.

Module:4	**Realtime System Interfacing**	**6 hours**

Introduction to data acquisition- Interface and communication standards, User interfaces in automation, Real time interfacing, Human Machine Interfaces, Fundamentals of graphical programming, DAQ Interfacing and Control systems design.

Module:5	**Model based design and development**	**5 hours**

Modelling and Simulation, Model based Design techniques, Hardware-in-loop Simulations – Code Implementation and Automatic Code generation – Validation and Verification - Installation and testing.

Module:6	**Case Studies- I**	**7 hours**

Case studies in design and integration of components in mechatronics systems such as industrial robot, motion control systems, Embedded vehicle control system, 3D printers, micro-robot, mechatronic control in automated manufacturing, machine tool control systems, automated dispensing systems.

Module:7	**Case Studies- II**	**7 hours**

Cyber-Physical Systems- home security using IoT, ADAS systems, electronic stability control, Online surface measurement using image processing, automated testing and inspection systems, bio mechatronics, bionic arm, waste management, precision agriculture-crop monitoring and analysis.

Module:8	**Contemporary issues**	**2 hours**
	Total Lecture hours:	**45 hours**

Text Books

1. Bolton W., Mechatronics – Electronic Control Systems in Mechanical and Electrical

	Engineering, 2018, 7th Edition, Pearson Education.		
2.	Robert H. Bishop, The Mechatronics Handbook, 2017, CRC Press.		
Reference Books			
1.	Nitaigour Premchand Mahalik, Mechatronics Principles, Concepts and Applications, 2015, McGraw Hill Education, New Delhi.		
2	Peter Hehenberger, David Bradley, Mechatronic Futures: Challenges and Solutions for Mechatronic Systems and their Designers, 2016, Springer International.		
3.	Andy Judge, Mechatronics and Dynamic System Design, 2019, 3rd Edition.		
4.	Devadas Shetty, Richard A.Kolk, Mechatronics System Design, 2012, PWS Publishing Company.		
Mode of Evaluation: CAT, Written assignment, Quiz, FAT			
Recommended by Board of Studies	09-03-2022		
Approved by Academic Council	No. 65	Date	17-03-2022