Gautam Buddha University; Greater Noida

School of Engineering (Mechanical Engineering)

Degree	Course Name	Course Code	Marks:100
M. Tech. Design	Mechatronics System Design	MED506	SM+MT+ET 25+25+50
Semester	**Credits**	**L-T-P**	**Exam.**
II	3	3-0-0	3 Hours

Unit – I

Introduction: Introduction to Mechatronics system; Evolution; Scope and components of Mechatronics systems; Elements of measurement system; Control system and modes of control; Traditional design and Mechatronics design. **(05 Hours)**

Unit – II

Transducers and Transduction Principles: Hydraulic; Pneumatic and electrical actuators and their system modeling; Performance terminology; System modeling of sensors; Displacement; Position and proximity sensors; Velocity and acceleration sensors; Flow sensors; Force sensors; Temperature sensors; Ultrasonic and fiber-optic sensors; Selection of sensor; Piezo-electric sensors. **(08 Hours)**

Unit – III

Hardwares: Number systems in Mechatronics; Binary logic; Karnaugh map minimization; Transducer signal conditioning process; Principals of analogue and digital signal conditioning; Protection; filtering; Operational and instrumentation amplifiers and their gains; Analogue to digital and digital to analogue conversion; Multiplexers; Pulse modulation.

(07 Hours)

Unit – IV

Programmable Logic Controller: Review of logic gates; Basic structure; Features; Input/output processing; Programming; Functional block diagram (FBD); Ladder diagram; Logic functions; Latching; Sequencing; Jumps; Internal relays; Counters; Shift registers; Master and jump control; Data

handling; Data movement; data comparison; Arithmetic operations; Code conversion; Analog input and output; Applications for automation; Diagnostics and condition monitoring. **(08 Hours)**

Unit – V

Microcontroller: Comparison between microprocessor and microcontroller; Organization of microcontroller system; Architecture of MCS 51 controller; Pin diagram of 8051; Addressing modes; Programming of 8051; Interfacing input and output devices; Interfacing D/A converters and A/D converters; Various applications for automation and control purpose. **(06 Hours)**

Unit – VI

Real-Time Interfacing: Introduction; Elements of Data Acquisition and Control System; Overview of I/O Process; Installation of the I/O Card and Software; Installation of the application Software; Examples; Over framing.

Use of MATLAB and SIMULNK in Mechatronics Applications: Mechatronics control in automated manufacturing; Artificial Intelligence in mechatronics; Fuzzy Logic application in Mechatronics; Micro-sensors in Mechatronics; Case studies of Mechatronics systems. Design of a Mechatronics product using available software CAD packages. MATLAB and SIMULINK. **(11 Hours)**

Recommended Books:

1. Mechatronics; Dan Necsulescu (Pearson Education); 2002.
2. The 8051 Microcontroller: Architecture; Programming and Applications; 2nd Edition; J. Kenneth; 1991.
3. Mechatronics: Principles; Concepts and Applications; N. P. Mahalik Tata McGraw Hill; 2003.
4. Introduction to Mechatronics & Measurement Systems; David G. Alciatore & Michael B. Histand (TMH); 2005.
5. Process Control & Instrumentation Technology; Critis D. Johnson; Pearson Education; 2002.
6. Mechatronics System Design; Devdas Shetty; Richard A. Kolk (Thomson); 1998.
7. Computer Control of Manufacturing Systems; Yoram Koren; McGraw Hill; 1983.
8. Automated Manufacturing Systems: Sensors; Actuators; S. Brain Morriss; McGraw Hill; 1994.