

Here is a **detailed lesson plan** for the **Mechatronics** course:

Mechatronics – Course Lesson Plan

 **Duration: 8 Weeks** |  **Mode: Online (Self-Paced/Instructor-Led)**

 **Certification: Yes**

Week 1: Introduction to Mechatronics

Topics Covered

- ✓ Introduction to Mechatronics: Definition & Scope
- ✓ Examples of Mechatronic Systems (Automobiles, Robotics, Consumer Electronics)
- ✓ Electric Circuits & Components (Resistors, Capacitors, Inductors)
- ✓ Semiconductor Electronics (Diodes, Transistors, ICs)
- ✓ Transistor Applications (Amplifiers, Switches, Logic Circuits)

Practical / Assignments

- ✓ Circuit simulation using software like **Multisim or Proteus**
- ✓ Basic electronic circuit assembly

Learning Outcome

- ✓ Understand the fundamentals of Mechatronics and its applications
 - ✓ Gain basic knowledge of electric circuits and semiconductor devices
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Week 2: Sensors and Transducers

Topics Covered

- ✓ Performance Terminology of Sensors (Accuracy, Sensitivity, Hysteresis)
- ✓ **Displacement, Position & Proximity Sensors (I & II)**
- ✓ **Force, Fluid Pressure, Liquid Flow Sensors**
- ✓ Temperature & Light Sensors
- ✓ Acceleration & Vibration Measurement
- ✓ Semiconductor Sensors, MEMS, SAW Technology

Practical / Assignments

- ✓ Identifying and testing different types of sensors
- ✓ Simulating sensor data acquisition in MATLAB

Learning Outcome

- ✓ Understanding sensor performance characteristics
 - ✓ Ability to select appropriate sensors for different applications
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Week 3: Actuators and Mechanisms

Topics Covered

- ✓ Mechanical Actuation Systems (Gears, Cams, Linkages)
- ✓ Hydraulic & Pneumatic Actuation Systems
- ✓ Electrical Actuation Systems – I (Stepper Motors, Servo Motors)
- ✓ Electrical Actuation Systems – II (DC & AC Motors)
- ✓ Data Presentation Systems (Displays, Alarms, Indicators)

Practical / Assignments

- ✓ Working with stepper motors & servo motors
- ✓ Implementing a pneumatic system using simulation software

Learning Outcome

- ✓ Understanding different actuation systems used in mechatronics
 - ✓ Practical knowledge of motor control and motion mechanisms
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Week 4: Signal Conditioning

Topics Covered

- ✓ Introduction to Signal Processing & Op-Amps
- ✓ Op-Amps as Signal Conditioners (Amplifiers, Filters, Comparators)
- ✓ Analog-to-Digital Conversion (ADC)
- ✓ Digital-to-Analog Conversion (DAC)
- ✓ Introduction to Artificial Intelligence in Mechatronics

Practical / Assignments

- ✓ Signal processing using **MATLAB / LabVIEW**
- ✓ Implementing ADC/DAC in microcontroller circuits

Learning Outcome

- ✓ Ability to process and condition signals from sensors
 - ✓ Understanding the role of AI in mechatronics
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Week 5: Microprocessors and Microcontrollers

Topics Covered

- ✓ Digital Circuits – I (Logic Gates, Flip-Flops, Counters)
- ✓ Digital Circuits – II (Registers, Multiplexers, Decoders)
- ✓ Microprocessors & Microcontrollers: Architecture & Features
- ✓ **Programming of Microcontrollers** (C, Assembly)

Practical / Assignments

- ✓ Writing simple programs for an **ATmega16** microcontroller
- ✓ Interfacing a microcontroller with a sensor

Learning Outcome

- ✓ Understanding microprocessor/microcontroller architecture
 - ✓ Ability to write and test basic programs for embedded systems
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Week 6: Modeling and System Response

Topics Covered

- ✓ Mechanical System Modeling
- ✓ Electrical System Modeling
- ✓ Fluid System Modeling
- ✓ **Dynamic Response of Systems** (Time & Frequency Domain)
- ✓ Transfer Functions & Frequency Response

Practical / Assignments

- ✓ Simulating mechanical & electrical system responses in MATLAB
- ✓ Frequency response analysis using Bode plots

Learning Outcome

- ✓ Ability to model and analyze mechatronic systems
- ✓ Understanding dynamic behavior of mechanical, electrical, and fluid systems

◆ Week 7: Closed-Loop Controllers

◆ Topics Covered

- ✓ **Proportional (P), Integral (I), and PID Controllers**
- ✓ Digital Controllers & their implementation
- ✓ Programmable Logic Controllers (PLC)
- ✓ Input/Output & Communication Systems in Mechatronics
- ✓ **Fault Detection & Diagnosis in Control Systems**

🔧 Practical / Assignments

- ✓ Implementing a PID Controller using Arduino/ATmega16
- ✓ PLC Programming using **Siemens TIA Portal or Codesys**

🎯 Learning Outcome

- ✓ Understand different types of controllers and their applications
- ✓ Gain practical skills in PID tuning and PLC programming

◆ Week 8: Design and Mechatronics Applications

◆ Topics Covered

- ✓ **Project using Microcontroller (ATmega16)**
- ✓ **Myoelectrically Controlled Robotic Arm**
- ✓ **Robocon – Part I (Concepts & Prototyping)**
- ✓ **Robocon – Part II (Building & Testing the Robot)**
- ✓ **Design of a Legged Robot (Simulation & Analysis)**

🔧 Practical / Assignments

- ✓ **Final Project:** Design & prototype a small **mechatronic system** (e.g., Robotic Arm, IoT-based System)
- ✓ Simulating & testing a **Legged Robot**

🎯 Learning Outcome

- ✓ Gain hands-on experience in designing & prototyping a mechatronic system
 - ✓ Apply concepts from sensors, actuators, microcontrollers, and control systems
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Course Features & Benefits

- ✓ **Self-Paced Learning** – Study anytime, anywhere
 - ✓ **Industry Expert Instructors** – Learn from professionals
 - ✓ **Hands-on Assignments & Projects** – Gain practical skills
 - ✓ **Industry-Recognized Certification** – Boost your career
 - ✓ **Access to MATLAB & Embedded System Simulations**
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Who This Course is For?

- ✓  Engineering Students (Mechanical, Electronics, Electrical, Robotics)
 - ✓  Professionals working in Automation, Robotics, IoT, and Control Systems
 - ✓  Anyone interested in Embedded Systems & Mechatronics
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Skills Covered

- ✓ Electrical, Mechanical, and Fluid System Modeling
 - ✓ Sensor & Actuator Technologies
 - ✓ Microcontrollers & Embedded Programming
 - ✓ Control Systems (PID, PLC)
 - ✓ MATLAB & Arduino for Mechatronics
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Complimentary Benefits for Students

-  **Free Simulation Tools (MATLAB, Proteus, Multisim)**
 -  **Exclusive Webinars on Industry Applications**
 -  **Resume & Career Guidance in Mechatronics**
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Top Indian Companies Hiring in Mechatronics

-  **Tata Motors, Mahindra, Bosch, Siemens, ABB**
 -  **ISRO, DRDO, L&T, Bharat Electronics Ltd**
 -  **Automotive & Industrial Automation Companies**
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Certification Advantage

- 🏆 **Industry-Recognized Certificate**
 - 🏆 **Boosts Resume & Job Prospects**
 - 🏆 **Global Recognition in Mechatronics Industry**
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This **structured lesson plan** ensures **a balance of theory and hands-on experience**, preparing learners for **exciting careers in Mechatronics & Automation**. 🚀 Let me know if you'd like any modifications!