



**MODULE HANDBOOK DESCRIPTION**

Module designation	Advanced Mechatronics
Code	FBB0006
Semester(s) in which the module is taught	6 / third year
Person responsible for the module	Paniran, ST., MT.
Language	Indonesian
Relation to curriculum	Free elective for Electronics Engineering
Teaching methods	Lectures, small group discussion, case base method.
Workload (incl. contact hours, self-study hours)	Contact minutes every week, each week of the 16 weeks/semester: <ul style="list-style-type: none"> <li>• Lectures: 2 x 50 minutes</li> <li>• Exercises and Assignments: 2 x 60 minutes</li> <li>• Private study: 2 x 60 minutes.</li> </ul> total study hours = 5 hours 40 minutes/week
Credit points	2 SKS (~ 3.2 ECTS)
Required and recommended prerequisites for joining the module	Basic Electrical (FBS2123) Basic Electronics (FBS2125) Electric Circuits 1 (FBS1213) Basic control system (FBS2231) Mechatronics (FBB3212)

Module objectives/intended learning outcomes	<p>1. Students are able to analyse the fundamentals of time and frequency, sensor and actuator characteristics. mechatronic sensors: 1 linear and rotational sensors, 2 acceleration sensors, 3 force measurement, 4 torque and power measurement, 5 flow measurement, 6 temperature measurements, 7 distance measuring and proximity sensors, 8 light detections. Mechatronic Actuators: 1 electromechanical actuator, 2 electrical machines, 3 piezoelectric actuators, 4 hydraulic and pneumatic actuation systems. Case Contactor Controls: Jogging circuit, forward-reverse, self-holding, delay relay, layout PCB to relay controls. Case Programmable Logic Controller Controls: Running output, forward-reverse, self-holding timer, delays, counter, wiring to PLC controls.</p>	PLO3
	<p>2. Students are able to design the contactor controls: Jogging circuit, forward-reverse, self-holding delay relay, layout PCB to relay controls. Programmable Logic Controller Controls: Running output, forward-reverse, self-holding timer, delays, counter, and wiring to PLC controls.</p>	PLO4
	<p>3. Students are able to abstraction the contactor controls: jogging circuit, forward-reverse, self-holding delay relay, layout PCB to relay controls. Programmable Logic Controller Controls: Running output, forward-reverse, self-holding timer, delays, counter, wiring to PLC controls.</p>	PLO9

<p>Content</p>	<ol style="list-style-type: none"> <li>1. Mechatronic Sensors: 1 Linear and Rotational Sensors, 2 Acceleration Sensors, 3 Force Measurement, 4 Torque and Power Measurement, 5 Flow measurement, 6 Temperature Measurements, 7 Distance Measuring and Proximity Sensors, 8 Light Detection.</li> <li>2. Mechatronic Actuators: 1 Electromechanical Actuators, 2 Electrical Machines, 3 Piezoelectric Actuators, 4 Hydraulic and Pneumatic Actuation Systems.</li> <li>3. Case Contactor Controls: Jogging circuit, forward-reverse, self-holding delay relay, layout PCB to relay controls.</li> <li>4. Case Programmable Logic Controller Controls: Running output, forward-reverse, self-holding timer, delay, counter, and wiring to PLC controls.</li> </ol>
<p>Examination forms</p>	<ul style="list-style-type: none"> <li>- Written case study</li> <li>- Midterm and final test</li> </ul>
<p>Study and examination requirements</p>	<p>The final grade in the module is composed of:</p> <ol style="list-style-type: none"> <li>a. Case I &amp; II assessment: 25%</li> <li>b. Case Project assessment: 30%</li> <li>c. Midterm assessment: 20%</li> <li>d. Final assessment: 25%</li> </ol> <p>Students must have a final grade of 65% or higher to pass</p>

Reading list	<ol style="list-style-type: none"><li>1. Georg Pelz, 2003. Mechatronic Systems: Modelling and Simulation with HDLs, John Wiley &amp; Sons Ltd, England</li><li>2. Hugh Jack, 2005. Automating Manufacturing Systems with PLCs, <a href="mailto:jackh@gvsu.edu">jackh@gvsu.edu</a>.</li><li>3. James A. Rehg and Glenn J. Sartori, 2014. Programmable Logic Controllers, Pearson Education Limited.</li><li>4. JOHN RIDLEY, 2004. Mitsubishi FX Programmable Logic Controllers: Applications and Programming, First 1<sup>st</sup> edition, Elsevier.</li><li>5. John R. Hackworth and Frederick D. Hackworth, Jr, 2006. Programmable Logic Controllers: Programming Methods and Applications, BookFi.org.</li><li>6. Robert H. Binshop. 2008. Mechatronics System, Sensors, and Actuators: Fundamentals and modeling. CRC Press LLC, Printed in the United States of America.</li><li>7. Robert H. Binshop. 2008. Mechatronic System control, logic, and Acquisition. CRC Press LLC, Printed in the United States of America.</li><li>8. Robert H. Binshop. 2002. The Mechatronics Handbook. CRC Press LLC, Printed in the United States of America.</li><li>9. Sabri Cetinkunt, 2015. Mechatronics with Experiments, 2nd edition. John Wiley &amp; Sons Ltd.</li><li>10. W. Bolton, 2015. Programmable Logic Controllers, 6<sup>th</sup> sixth edition. Elsevier.</li><li>11. Mitsubishi Electric, 1999. FX Series Programmable Controllers Programming Manual.</li><li>12. W. Bolton, 2003. Mechatronics: Electronic control system in mechanical and electrical engineering, Third Edition, Printed by ashfrod colour press Ltd, Gosport England.</li></ol>
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