**Module Description**

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| **Module name** | Microcontroller |
| **Module level, if applicable** | Bachelor of Science |
| **Code, if applicable** | 23H02132602 |
| **Subtitle, if applicable** | - |
| **Course, if applicable** | - |
| **Semester(s) in which the module is taught** | 6th |
| **Person responsible for the module** | Prof. Dr. Arifin, M.T. |
| **Lecturer** | 1. Prof. Dr. Arifin, M.T.<br>2. Prof. Dr. Bualkar Abdullah, M.Eng.Sc. |
| **Language** | Indonesian Language |
| **Relation to Curriculum** | Undergraduate degree program, elective, 6th semester |
| **Type of teaching, contact hours** | Teaching methods: [Focus group discussion], [~~simulation~~], [~~case study~~], [collaborative learning], [~~project-based learning~~], [~~problem-based learning~~].<br><br>Teaching forms: [lecture], [~~tutorial~~], [seminar], [~~practicum~~], [~~research~~], [~~internship~~], [~~community service~~]<br><br>CH: 08.00 - 16.00 |
| **Workload** | For this course, students are required to meet a minimum of 90.67 hours in one semester, which consist of:<br>- 26.67 hours for lecture,<br>- 32.00 hours for structured assignments,<br>- 32.00 hours for private study. |
| **Credit points** | 2 credit points (equivalent with 3.4 ECTS) |

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| **Requirements according to the examination regulations** | Students have participated in at least 80% of the learning activities (Academic Regulations, Chapter VII) |
| **Recommended prerequisites** | Physical Electronics 2 and Microprosessor |
| **Module objectives/intended learning outcomes** | After completing the course, Students are able:<br>**Intended Learning Outcomes (ILO):**<br>**ILO 1:** Students will have relatively deep understood in classical and basic quantum physics. [ILO 1] – Kn<br>**ILO 2:** Students will be able to use the fundamental principles of physics in modeling and computation to solve the complex physical problem. [ILO 2] – Kn<br>**ILO 3:** Students will be able to use the basic principles of physics in technology application. [ILO 3] – Kn<br><br>**Course Learning Objective (CLO):**<br>1. Capable of explaining the concepts and principles of microcontrollers.<br>2. Capable of understanding the architecture of microcontroller systems and their applications.<br>3. Capable of creating problem-based programs using microcontrollers.<br><br>**Sub CLO:**<br>ILO 1 ⇒ CLO-1: Explains the concept of microcontroller and the history of its development from generation to generation.<br>ILO 2 ⇒ CLO-2: Describe the microcontroller architecture.<br>ILO 2 ⇒ CLO-2: Explain the working principle of several types of microcontrollers.<br>ILO 2 ⇒ CLO-2: Explain the features used in the microcontroller.<br>ILO 2 ⇒ CLO-2: Describe the instruction set used in microcontroller systems.<br>ILO 3 ⇒ CLO-2: Explain the program design using a microcontroller.<br>ILO 2 ⇒ CLO-2: Explain the working principle of the arduino platform and the concept of the microcontroller interface with external device (2).<br>ILO 3 ⇒ CLO-3: Able to explain and operate arduino basic programing.<br>ILO 2 ⇒ CLO-2: Able to explain the working principle of seven segmen. |

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| | ILO 2 ⇒ CLO-2: Able to explain the working principle of Liquid Crystal Display and keypad. |
| **Content** | Students will learn about:<br>1. Microcontrollers and their development history<br>2. Microprocessor, Microcontroller, and Microcomputer<br>3. Microcontroller Architecture and pins on the microcontroller<br>4. Registers, ALU, Memory, EEPROM, and I/O Ports<br>5. AVR Microcontroller and Arduino Platform<br>6. Arduino and Interfaces<br>7. Applications of AVR Microcontrollers |
| **Forms of Assessment** | Assessment techniques: [~~observation~~], [~~participation~~], [~~performance~~], [written test], [~~oral test~~]<br><br>Assessment forms: [~~quiz~~], [mid examination], [final examination], [assignment], [~~report~~], [~~presentation~~]<br><br>Assignment = 40% Mid examination = 30% Final examination = 35%<br><br>CLO 1 ⇒ ILO 1: Question in Assignment 1 (10%) Mid examination number 1 (5%) Mid examination number 2 (5%) (Assignment: written text and mid examination: written text)<br>CLO 2 ⇒ ILO 2: Question in Assignment 1 (10%) Mid examination number 3 (5%) (Assignment: written text and mid examination: written text)<br>CLO 2 ⇒ ILO 2: Mid examination number 4 (5%) (mid examination: written text)<br>CLO 2 ⇒ ILO 2: Mid examination number 5 (5%) (mid examination: written text)<br>CLO 2 ⇒ ILO 2: Mid examination number 6 (5%) Final examination number 1 (5%) (mid examination: written text and final examination: written text)<br>CLO 2 ⇒ ILO 3: Final examination number 2 (5%) (final examination: written text)<br>CLO 2 ⇒ ILO 2: Question in Assignment 3 (10%) Final examination number 3 (5%) (Assignment: written text and final examination: written text)<br>CLO 3 ⇒ ILO 3: Question in Assignment 4 (10%) Final examination number 4 (5%) (Assignment: written text and final examination: written text)<br>CLO 2 ⇒ ILO 2: Final examination number 5 (5%) (Final examination: written text) |

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| | CLO 2 ⇒ ILO 2: CO-10: Final examination number 6 (5%) (Final examination: written text) |
| **Study and examination requirements and forms of examination** | **Study and examination requirements:**<br>- Students must attend 15 minutes before the class starts.<br>- Students must switch off all electronic devices.<br>- Students must inform the lecturer if they will not attend the class due to sickness, etc.<br>- Students must submit all class assignments before the deadline.<br>- Students must attend the exam to get final grade.<br>**Form of examination:**<br>Written exam: Essay |
| **Media employed** | LED, Whiteboard, Learning Management System (SIKOLA) |
| **Reading list** | **Main:**<br>1. John Crisp, Introduction Microprocessors and Microcontrollers (2nd Edition), an imprint of Elsevier, ISBN: 0-7506-5989-0.<br>2. John Boxall, (2013), Arduino Workshop, Publisher: William Pollock, ISBN-13: 978-1-59327-448-1.<br>**Support:**<br>1. Michael Margolis, (2011), Arduino Cookbook, Published by O'Reilly Media, Inc., ISBN: 978-0-596-80247-9.<br>2. Jack Purdum, (2011), Beginning C for Arduino, ISBN-13 (electronic): 978-1-4302- 4777-7. |