**MODULE/ COURSE FORM**

1. **general information**

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| To be completed by Course Team | Module name :  **Embedded systems and microprocessors** | | | | | | | | | Module code:  M15 | | | | | |
| Course name:  **Embedded systems and microprocessors** | | | | | | | | | Course code: | | | | | |
| Faculty:  **INSTITUTE OF APPLIED INFORMATICS** | | | | | | | | | | | | | | |
| Field of study:  **INFORMATICS** | | | | | | Level of education:  **first** | | | | | | | | |
| Mode of study :  **Full-time** | | | Learning profile:  **Practical** | | | Speciality:: | | | | | | | | |
| Year/ semester:  **2/4** | | | Module/ course status::  **Obliga tory** | | | | | Module/ course language:  **Polish/English** | | | | | | |
| Type of classes | | lecture | | | lessons | | lab | project | | Tutorial | | | | other (please specify) |
| Course load | | **30** | | |  | | **30** |  | |  | | | |  |
| Module/ course objectives | | | | | Learning the basics of microprogramming.  Familiarize yourself with the design and operation of embedded systems and the principles of increasing the performance of the processor. | | | | | | | | | | |
| Entry requirements | | | | | Basic knowledge of digital technology, programming fundamentals | | | | | | | | | | |
| **LEARNING OUTCOME** | | | | | | | | | | | | | | | |
| Nr | | LEARNING OUTCOME DESCRIPTION | | | | | | | | | | | Learning outcome reference | | |
| 01 | | knowing the basics principles of the central processing unit (CPU) | | | | | | | | | | | K\_W03, K\_W05 | | |
| 02 | | knowing the basics of microcontroller programming | | | | | | | | | | | K\_W07, K\_W15 | | |
| 03 | | understanding the principle of executing a program instructions in a microprocessor | | | | | | | | | | | K\_W10 | | |
| 04 | | writing simple programs that control the microprocessor's internal blocks | | | | | | | | | | | K\_U03, K\_U04, K\_U08, K\_U15 | | |
| 05 | | performing in the program simple procedures for internal microcontroller peripheral control | | | | | | | | | | | K\_U03, K\_U04, K\_U08, K\_U15 | | |
| 06 | | designing a simple system based on a microcontroller | | | | | | | | | | | K\_U03, K\_U04, K\_U06, K\_U08, K\_U15 | | |
| 07 | | knowing the significance of embedded systems In consumer electronic | | | | | | | | | | | K\_K01, K\_K02 | | |
| **Assessment method** | | | | | | | | | | | | | | Learning outcome number | |
| Exam in a written form with a theoretical and practical part | | | | | | | | | | | | | | 1 - 3 | |
| Written quizes | | | | | | | | | | | | | | 1 - 6 | |
| Practical tasks and Project | | | | | | | | | | | | | | 4 - 6 | |
| **STUDENT WORKLOAD** | | | | | | | | | | | | | | | |
|  | | | | | | | | | Number of hours | | | | | | |
| In all | | | including practical | | | |
| Participation in lectures | | | | | | | | | 30 | | | 30 | | | |
| Independent study of lecture topics | | | | | | | | | 15 | | | 15 | | | |
| Participation in tutorials, labs, projects and seminars | | | | | | | | | 30 | | | 30 | | | |
| Independent preparation for tutorials\* | | | | | | | | | 30 | | | 30 | | | |
| Preparation of projects/essays/etc. \* | | | | | | | | | 30 | | | 30 | | | |
| Preparation/ independent study for exams | | | | | | | | | 10 | | | 10 | | | |
| Participation during consultation hours | | | | | | | | | 5 | | | 5 | | | |
| Other | | | | | | | | | 2 | | |  | | | |
| **TOTAL student workload in hours** | | | | | | | | | 152 | | | 150 | | | |
| **Number of ECTS credit per course unit** | | | | | | | | | **6 ECTS** | | | | | | |
| Number of ECTS credit associated with practical classes | | | | | | | | | **6 ECTS** | | | | | | |
| Number of ECTS for classes that require direct participation of professors | | | | | | | | | **2,6 ECTS** | | | | | | |

1. **details information**

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| To be completed by Course Team | Module name :  **Embedded systems and microprocessors** | | | | | | | | | Module code: | | |
| Course name:  **Embedded systems and microprocessors** | | | | | | | | | Course code: | | |
| Faculty:  **Institute of Applied Informatics** | | | | | | | | | | | |
| Field of study:  **INFORMATICS** | | | | | | Level of education:  **first** | | | | | |
| Mode of study :  **Full-time** | | Learning profile:  **Practical** | | | | Speciality:: | | | | | |
| Year/ semester:  **2/4** | | Module/ course status::  **obligatory** | | | | | | Module/ course language:  **Polish/English** | | | |
| Type of classes | lecture | | | | lessons | | lab | project | | Tutorial | other (please specify) |
| Course load |  | | | |  | |  |  | |  |  |
| Module/ course coordinator | | | | | **dr inż. Robert Smyk , dr hab. inż. Zenon Ulman** | | | | | | | |
| Lecturer | | | | | **dr inż. Robert Smyk , dr hab. inż. Zenon Ulman** | | | | | | | |
| **CURRICULUM CONTENTS** | | | | | | | | | | | | |
| **Lecture** | | | | | | | | | | | | |
| Microprocessors and microcontrollers. Modules of microcontrollers. Examples of construction and organization. Microprocessor programming languages. The role of operational programs, their functions and role in control. Types of operational programs. Interoperability with driver modules. Secure data processing. Ways to improve the reliability and security of information.  Including content related to practical vocational training: [100%] | | | | | | | | | | | | |
| **laboratory** | | | | | | | | | | | | |
| Laboratory exercises include practical learning about embedded devices and how to use them.  Getting familiar with the IDE for embedded software development, learn the basics of assembly language, learn the structure and behavior of typical CPUs based on the analysis of simple assembler examples, the basics of programming embedded systems in high-level languages, the rules for using development libraries dedicated to embedded systems, programming elementary CPU I / O on selected examples (for ex. keyboard, 7-segment display, text / graphic display), programming of internal CPU blocks / registers, examples of simple programming selected communication interfaces (UART, SPI, I2C), interrupts.  Including content related to practical vocational training: [100%] | | | | | | | | | | | | |
| **Project (other)** | | | | | | | | | | | | |
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| Basic literature | | | | 1. R. Pałka: Mikroprocesory, WNT 2. M. M. Mano, Ch. R. Kima: Podstawy projektowania układów logicznych i komputerów, WNT 3. W. Stallings. Organizacja i architektura systemu komputerowego, WNT | | | | | | | | |
| Additional literature | | | |  | | | | | | | | |
| Teaching methods | | | | Lecture  Laboratory | | | | | | | | |
| Form and terms of an exam | | | | Assessment based on 2 colloquy and written exam on the subject in the examination session. | | | | | | | | |