

**Module number:** M7**Name of the module:** Robotics/ROS programming**Responsible:** P9-RMUTTO (P11-KMUTNB)

ID	Didactic modules (Teaching materials)	Comments	THEO (D3.4)	PRAC (D3.5)	THEO hours	PRAC hours	Total of Hours	LEADER	Contributor	Interested
M7	Robotics/ROS programming		9	8				P9-RMUTTO	P11-KMUTNB	

Total number of hours: 17h (Theory: 9h, Practice: 8h)**Aims:**

The goal of the module is to give theoretical and practical information about programming, industrial communications, and industrial robotics. The students also will have the chance to program simple control exercises with the ETAT Smart Lab (Robotic station).

Programme:**Lecture:** (9h)

- (1h 30min) Introduction: Embedded systems, Machine vision and Robotics Control.
- (1h) Problem and disadvantage of Industrial 3.0
- (1h 30min) Use case in real work of smart factory in the world and Thailand.
- (1h 30min) Specifics and how to choose of Embedded systems, Machine vision and Robotics.
- (1h 30min) How to solves with Embedded systems, Machine vision and Robotics.
- (30min) Introduction to ROS.
- (1h 30 min) Advantage and use case of ROS.

Practice: (8h)

- (30min) Getting Started of Machine vision.
- (1h) Basic of Halcon Software.
- (2h 30min) How to use Machine learning in Halcon Software with case study.
- (1h) Basic of Robotics Control.
- (3h) How to use ROS for control the robot with case study.

Assessment method:

- Questionnaire for learning contents and using ETAT Smart Labs
- Results of theoretical pre-/post test
- Results of practical work

Prerequisites:

- Fundamentals of electric circuits
- Fundamentals of computer programming

Expected Learning Outcomes (ELOs):

- Knowing technology of Robotics in Smart Factory.
- Can configuring of machine vision and connection of robotics in the important functions
- Design and implementation of real-world practice

Name of the module: Embedded Systems

Total number of hours: 18h

Theory: 6h

Practice: 12h

Aims:

The goal of the module is to give theoretical and practical information about programming, industrial communications, and industrial robotics. The students also will have the chance to program simple control exercises with the ETAT Smart Lab (Robotic station)

Programme:

Lecture:

- Introduction to Embedded Systems
- Basic of programming
- Ethernet/IP and configuration
- Wireless technology
- Smart Industrial

Practice:

- C programming, Java programming, and Web programming
- Platform Technology
- Node-Red and configuration
- Modbus protocol and MQTT protocol
- Exercises

Assessment method: Can used Robotic station application

Prerequisites:

- Programming fundamentals

Name of the module: Machine Vision

Total number of hours: 24h

Theory: 6h

Practice: 18h

Aims:

The goal of the module is to give theoretical and practical information about programming, industrial communications, industrial robotics, and machine vision. The students also will have the chance to program simple control of machine vision with the ETAT Smart Lab (Robotic station)

Programme:

Lecture:

- Introduction to PLC
- Industrial communications (Ethernet/IP)
- Smart Industrial
- Industrial Robotics
- Machine vision

Practice:

- PLC configuration
- HMI configuration
- Programming (Python for machine vision)
- Programming (C/C++/C#)
- Matlab/Simulink (Control system)
- Industrial communications (Modbus TCP, PROFINET, IO-Link)
- IoT communication protocols (MQTT Protocol)
- Exercises

Assessment method: Can use machine vision technology in real work

Prerequisites:

- Programming fundamentals

Name of the module: Robotics Control

Total number of hours: 18h

Theory: 6h

Practice: 12h

Aims:

The goal of the module is to give theoretical and practical information about programming, industrial communications, industrial robotics, and robotics control. The students also will have the chance to program simple robotics control with the ETAT Smart Lab (Robotic station)

Programme:

Lecture:

- Industrial Robotics
- Smart Industrial
- Advanced PLC Programming
- Feedback Control Technology
- Smart Industrial

Practice:

- Advanced PLC programming
- HMI design and application
- Python for vision
- Control system
- Industrial communications (Ethernet/IP and configuration, IO-Link)
- MQTT protocol
- Machine vision
- Feedback Control Technology
- Exercises

Assessment method: Can used Robotic station application

Prerequisites:

- Programming fundamentals