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# From Automation and Control Training to the Overall Roll-Out of Industry 4.0 Across South-East Asian Nations

# (ASEAN FACTORI 4.0)

**PROJECT No. 609854-EPP-1-2019-1-FR-EPPKA2-CBHE-JP**

**INSTRUMENTATION IN CHEMICAL PROCESS COURSE SYLLABUS**

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CHULALONGKORN UNIVERSITY

**COURSE SYLLABUS**

1. **Course Number** 2105676
2. **English Abbreviation of Course Title** INSTR CHEM PROC
3. **Course Title** INSTRUMENTATION IN CHEMICAL PROCESS
4. **Credit** 3.0 ( 3.0 – 0.0 – 6.0 )
5. **Responsible Section**

5.1. Faculty/Equivalent:  FACULTY OF ENGINEERING

5.2. Department: DEPARTMENT OF CHEMICAL ENGINEERING

5.3. Section: Field of Study of Chemical Engineering

1. **Method of Measurement** Letter Grade (A B+ B C+ C D+ D F)
2. **Type of Course** Semester Course
3. **Semester** 2nd semester
4. **Academic Year** 2022
5. **Teaching Management**

|  |  |
| --- | --- |
| Instructor | Evaluation Period |
| Prof. Paisan Kittisupakorn  Office: 11th Floor, Engineering 4 Building | 30-03-2023 to 31-05-2023 |

1. **Condition** –
2. **Program that uses this course**

25550011104805 Chemical Engineering

1. **Level** Master of Engineering
2. **Venue of Class:**
3. **Course Description**

The types and fundamental concepts of instrumentation in chemical process and related industry; sensors and actuators used in process industries; signal conditioning and transmission analog and digital controllers; programmable logic controller.

**16. Course Outline**

**16.1 Behavioral Objectives**

|  |  |
| --- | --- |
| # | Behavioral Objectives |
| 1 | Select the appropriate instrumentation.  Learning outcomes: • 01.5 Gain specialized knowledge of engineering • 02.4 An ability to apply specialized knowledge of engineering • 06.1 An ability to choose proper and modern instrument, technique, and resources.  **Teaching/Development Method:** • Lecture  **Evaluation Method:** • Written examination |
| 2 | Categorize types of instrumentation.  Learning outcomes: • 01.5 Gain specialized knowledge of engineering • 02.4 An ability to apply specialized knowledge of engineering • 06.1 An ability to choose proper and modern instrument, technique, and resources.  **Teaching/Development Method:** • Lecture  **Evaluation Method:** • Written examination |
| 3 | Explain the operating principle of instrumentation.  Learning outcomes: • 01.5 Gain specialized knowledge of engineering • 02.4 An ability to apply specialized knowledge of engineering • 06.1 An ability to choose proper and modern instrument, technique, and resources.  **Teaching/Development Method:** • Lecture  **Evaluation Method:** • Written examination |
| 4 | Explain symbol and letter in piping and instrumentation diagram (P&ID).  Learning outcomes: • 01.5 Gain specialized knowledge of engineering • 02.4 An ability to apply specialized knowledge of engineering • 06.1 An ability to choose proper and modern instrument, technique, and resources.  **Teaching/Development Method:** • Lecture  **Evaluation Method:** • Written examination |
| 5 | Explain piping & instrumentation diagram.  Learning outcomes: • 01.5 Gain specialized knowledge of engineering • 02.4 An ability to apply specialized knowledge of engineering • 06.1 An ability to choose proper and modern instrument, technique, and resources.  **Teaching/Development Method:** • Lecture  **Evaluation Method:** • Written examination |
| 6 | Introduction to PLC and hand-on practices.  Learning outcomes: • 01.5 Gain specialized knowledge of engineering • 02.4 An ability to apply specialized knowledge of engineering • 06.1 An ability to choose proper and modern instrument, technique, and resources.  **Teaching/Development Method:** • Lecture and Lab  **Evaluation Method:** • Written examination |

**16.2 Teaching Plan**

|  |  |
| --- | --- |
| Week | Topics |
| 1 | Introduction to process instrumentation and how to select instrumentations. |
| 2 | Definitions and terms, Symbol and Letter |
| 3 | Temperature Measurement |
| 4 | Pressure Measurement |
| 5 | Flow Measurement |
| 6 | Level Measurement |
| 7 | Piping and Instruments Diagram |
| 8 | Midterm Exam |
| 9 | Valves |
| 10 | Calibration |
| 11\* | Programmable Logic Controller Lecture 1 |
| 12\* | Programmable Logic Controller Lecture 2 |
| 13\* | Programmable Logic Controller Lecture 3 |
| 14\* | Programmable Logic Controller Lab 1 |
| 15\* | Programmable Logic Controller Lab 2 |
| 16 | Final Exam |

**Remark:** \* means modified topics.The modified curriculum has been meticulously crafted in collaboration with the Factori 4.0 Erasmus+ project 609854-EPP-1-2019-1-FR-EPPKA2-CBHE-JP.

* Introduction to Programmable Logic Controllers (PLC): Prof. Paisan Kittisupakorn
* Applications of Programmable Logic Controllers: Prof. David Banjerdpongchai
* Ladder Diagram, Function Block Diagram, Sequential Function Chart Using CODESYS, Visualization: Sirikanya Singcuna and team
* PLC Benchmark, HMI GALILEO: Sirikanya Singcuna and team

**16.3 Teaching Media:** Writing on board, Powerpoint media, Electronic Media, Benchmark

**16.5 Communication with students through social network**

16.5.1 Form and Usage: Email

16.5.2 Learning Management System: CourseVille

**16.6 Student Consultation:** 2 hours per week

**16.7 Assessment Criteria**

|  |  |  |
| --- | --- | --- |
| No. | Activity | Percent |
| 1 | Midterm | 30 |
| 2 | Final | 30 |
| 3 | Presentation- Exercises-Group participation | 20 |
| 4 | Report-Homework-Project | 20 |

**17. Reading List**

**17.1 Required Text**

Kittisupakorn, P. Instrumentation in Chemical Process, Dept. of Chemical Engineering, Faculty of Engineering, Chulalongkorn University, 2010.

**17.2 Supplementary Texts**

**17.3 Related electronic media and websites**

**18. Teaching Evaluation**

**18.1 Evaluation** CU CAS [www.cas.chula.ac.th](http://www.cas.chula.ac.th)

**18.2 Changes made in accordance with previous year**

Add vdo-based instruction, encourage team work collaboration and independent study, and use courseville and benchmark