

SYLLABUS

1. **Course name:** Data Acquisition System and SCADA

2. **Course code:** SCDA420946

3. **Credits:** 2 (2/0/4)

Duration: 15 weeks (30h main course and 60h self-study)

4. **Instructors:**

1- Truong Dinh Nhon, PhD

2- Ngo Van Thuyen, PhD

3- Quach Thanh Hai, PhD

4- Ta Van Phuong, MEng

5. **Course conditions**

Prerequisites: Digital systems, Electric Circuit

Corequisites: Digital systems, Microprocessor.

6. **Course description**

This course provides students the knowledge of the structure, classification, and application of the data acquisition system and control. The processing and operating principle of the signal processing unit, the practical signal processing units and the programming technics to collect the data in real systems.

Besides, students are introduced the knowledge of the SCADA system and some specific software to design the SCADA system.

7. **Course Goals**

| Goals | Goal description (This course provides students:) | ELOs |
|-------|--|--------|
| G1 | The structure of the data acquisition system for measurement and control systems | 01 (H) |
| G2 | The structure of OPC and the data exchange of the OPC | 02 (M) |
| G3 | An ability to design and program the SCADA for the industrial systems. | 11 (H) |
| G4 | An ability to use documents in English | 06 (H) |
| G5 | An ability to use methods in designing system using the SCADA | 07 (M) |

* Note: High: H; Medium: M; Low: L

8. **Course Learning Outcomes (CLOs)**

| CLOs | Description (After completing this course, students can have:) | Outcome |
|------|--|----------|
| G1.1 | The ability to analyse the structure and function of the basic units of the DAQ systems. | 01 07 |
| G1.2 | The ability to program for the DAQ systems. | 11 |

| | | | |
|-----------|------|---|----------|
| G2 | G2.1 | The ability to analyse the structure of the OPC systems. | 02 |
| | G2.2 | The ability to select the suitable OPC systems. | 01 11 |
| | G3.1 | The ability to present the structure of the SCADA systems, the basic requirements of the SCADA systems. | 01 02 |
| | G3.2 | The ability to select the suitable SCADA software of the industrial systems and program for the selected systems. | 01 11 |
| G4 | G4.1 | The ability to communicate in English and work effectively as a member and leader in teams. | 06 |

9. Study materials

- Textbooks:

- [1] *Data Acquisition and Control Handbook*, A guide to Hardware and Software for Computer-based Measurement and Control, Keithley.

- References:

- [2] *Practical Data Acquisition for Instrumentation and Control System*, John Park and Steve Mackay, 2003.

10. Student Assessments

- Grading points: 10

- Planning for students assessment is followed:

| Type | Contents | Linetime | Assessment techniques | CLOs | Rates (%) |
|-------------------|--|----------|--------------------------------------|------------------------------------|-----------|
| Midterms | | | | | 50 |
| Exam01 | The structure of the DAQ systems | Weeks 4 | Individual paper assessment in class | G1.1, G2.1, | 10 |
| Exam02 | Design of DAQ systems using microcontrollers | Week 8 | Working in groups | G1.1, G1.2, G4.1 | 20 |
| Exam03 | Design of SCADA systems for the specific industrial requirements | Week 12 | Working in groups | G3.1, G3.2, G4.1 | 20 |
| Final exam | | | | | 50 |
| Final Exam | <ul style="list-style-type: none"> - The project covers all contents related to the expected learning outcomes of the course. - Students are required to design a specific SCADA system by themselves. | | Working in groups | G1.2, G2.1, G2.2, G3.1, G3.2, G4.1 | |

11. Course details:

| Weeks | Contents | CLOs |
|-------|---|------|
| | <i>Chapter 1: <INTRODUCTION OF THE DAQ AND CONTROL</i> | |

| | | |
|--|---|----------------------|
| | SYSTEM> (4/0/8) | |
| | A/ Contents and teaching methods: (4) Contents: <ul style="list-style-type: none"> 1.1 Introduction to the DAQ and Control systems 1.2 Structure and function of the basic units of the DAQ and control system 1.3 Classification, selection and estimation of the DAQ and control systems. Teaching methods: <ul style="list-style-type: none"> + Presentation + Group discussion | G1.1 G4.1 |
| | B/ Self-study contents: (8) + The units of the real DAQ systems | G1.1 |
| | Chapter 2: < SIGNAL PROCESSING > (6/0/12) | |
| | A/ Contents and teaching methods: (6) Contents: <ul style="list-style-type: none"> 2.1 Sensors and processing units 2.2 ADC and DAC systems 2.3 The structure of the real DAQ systems 2.4 The SCADA software Teaching methods: <ul style="list-style-type: none"> + Theoretical lectures + Presentation + Group discussion | G1.1 G1.2 G4.1 |
| | B/ Self-study contents: (12) + The factors that effective to the accuracy of the ADC and DAC systems + Exercises | G1.1 G1.2 G4.1 |
| | Chapter 3: < SCADA SYSTEMS > (4/0/8) | |
| | A/ Contents and teaching methods: (4) Contents: <ul style="list-style-type: none"> 3.1 Introduction to SCADA systems 3.2 The structure of the SCADA systems 3.3 Some basic SCADA systems Teaching methods: <ul style="list-style-type: none"> + Theoretical lectures + Group discussion + Questions | G3.1 G3.2 G4.1 |
| | B/ Self- study contents: (8) + Find some real SCADA systems on the internet + List some basic specifications of these SCADA systems | G3.1 G3.2 G4.1 |
| | Chapter 4: < DAQ SOFTWARE > (6/0/12) | |

| | | |
|--|--|--------------------------------------|
| | A/ Contents and teaching methods: (6) Contents: 4.1 Specifications of the DAQ software 4.3 Introduction to OPC 4.3 Specifications of the OPC Server 4.4 Some OPC using in industry: Rslinx, KeepServer, I/O Server, SimaticNet, OPC Link, Factory Suite Gateway. Teaching methods: + Theoretical lectures + Group discussion + Group project | G1.1 G3.1 G3.2 G4.1 |
| | B/ Self- study contents: (12) + Data transfer between PLC and SCADA systems + Expansion inputs/outputs for multiplexers and demultiplexers. + Exercises | G3.2 G4.1 |
| | Chapter 5: < DESIGN SCADA SYSTEMS > (10/0/20) | |
| | A/ Contents and teaching methods: (10) Contents: 5.1 Some requirements for designing SCADA systems 5.2 Step for designing SCADA systems 5.3 Designing SCADA systems using WinCC, Factory Talk, Intouch, Labview software Teaching methods: + Theoretical lectures + Demo for students + Group discussion | G1.2 G2.1 G2.2 G3.2 G4.1 |
| | B/ Self- study contents: (20) + Exercises + Design SCADA systems for the specific requirements from industry | G2.2 G3.2 G4.1 |

12. Learning ethics:

- Home assignments and projects must be done by the students themselves. Plagiarism found in the assessments will get zero point for midterm and final scores

13. First approved date: August 01 2012

14. Approval level:

Dean

Department

Instructor

Nguyen Minh Tam, PhD

Nguyen Thanh Hai, PhD

Truong Dinh Nhon, PhD

15. Syllabus updated process

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|---|--------------------|
| 1st time: Updated content dated | Instructors |
| 2st time: Updated content dated | Head of department |