Last update: 23-04-2019

320170 - SSE - Supervision of Electrical Systems

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 709 - EE - Department of Electrical Engineering
Academic year: 2019
Degree: BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
ECTS credits: 6 Teaching languages: Catalan, Spanish

Teaching staff

Coordinator: David Romero

Prior skills

Students may have passed the courses in Industrial Automation and Control, Advanced Industrial Control and Automation, High Voltage Electrical Installations, Low Tension Industrial Installations, Transport of Electric Power and Power Plants and Renewable Energies. T his would be optimal to maximize the knowledge of this subject, although it is not essential.

Teaching methodology

- Sessions of theoretical content.
- Language: Spanish and Catalan.
- Sessions of practical work.
- Independent work and study exercises and case studies.
- Preparation and evaluated in group activities.
- The professor will introduce the theoretical foundations of the subject, concepts, and methods illustrating them with appropriate examples to facilitate their understanding.
- Lab sessions will be useful to see the application of theoretical concepts. The professor supervises the student during the activities. Students will present a report with the results. Students must study independently to assimilate concepts.

Learning objectives of the subject

Monitoring systems practice has become essential for any production process, mainly due to its high degree of automation. This increasingly is applied to systems and electrical installations. This course wants the students to start in this field, giving an overview of the elements involved and their main characteristics. The main objective of this course is to introduce students to the field of monitoring systems, providing expertise on the elements that are part of this task, the criteria for assessing the needs of each process, as well as for choosing the best option in each case.
During the course will be exercises and case studies for a better understanding of new concepts and problems.

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Study load

Total learning time: 150h	Hours large group:	30h	20.00%
	Hours medium group:	0h	0.00%
	Hours small group:	30h	20.00%
	Guided activities:	0h	0.00%
	Self study:	90h	60.00%

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Content

TOPIC 1: Introduction to Systems supervising

Learning time: 20h

Theory classes: 8h
Self study : 12h

Description:
1.1 Introduction.
1.2 Automated Systems and supervision systems.
1.3 Structure of the system for supervision.
1.4 Automation of electrical power systems.
1.5 Historical development in the automation of electrical power systems.

Related activities:
- Understand the contributions of automated supervision.
- Understand the development of monitoring electrical systems.

TOPIC 2: Elements to acquire data, control and supervise systems

Learning time: 34h

Theory classes: 12h
Guided activities: 4h
Self study : 18h

Description:
2.1 Sensors and measurement systems.
2.2 Pre-actuators and actuators.
2.3 MTU's and RTU's.
2.4 HMI elements.

Related activities:
- Understand the elements involved in monitoring systems.
- Establish the theoretical bases about the monitoring systems structure.
- Provide criteria for the selection of the elements involved in the supervision.

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TOPIC 3: Industrial Communications	Learning time: 30h Theory classes: 12h Self study : 18h

Description:
3.1 Introduction to communications.
3.2 Standards protocols and OSI model.
3.3 Remote access to the substations.
3.4 Intelligent local elements.
3.5 DPN3, IEC-60870, IEC-61850, IEC-61400 and IEC 62271-3.
3.6 OPC technology.

Related activities:
-Establish the theoretical bases for industrial communications.
- Provide criteria for selection of communication depending on the application.
- To present the current protocols for monitoring electrical systems.

TOPIC 4. Architectures for the automation of power electric systems and SCADA systems	Learning time: 28h Theory classes: 11h Self study : 17h

Description:
4.1 Introduction to SCADA systems. Structure.
4.2 Hardware and firmware associated with SCADA.
4.3 Centralized and distributed structures
4.4 MES and ERP systems.

Related activities:
-Establish the theoretical bases for understanding the structure of SCADA systems and elements.
- Provide criteria for selection of SCADA systems.

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TOPIC 5: Industrial applications	Learning time: 20h Theory classes: 8h Self study : 12h

Description:
5.1 SCADA systems business.
5.2 Current systems for monitoring electrical power systems.
5.3 Security.
5.4 Practical considerations.
5.5 Examples

Related activities:
-To present current applications and components for monitoring electrical systems.
- Present case studies and practical solutions for monitoring.

Qualification system

- 1st Exam: 20%
- 2nd Exam: 20%
- Practices: 25%
- Activities: 25%
- Continuous Evaluation: 10%

Bibliography

Basic:

Strauss, Cobus. Practical electrical network automation and communication systems [on line]. Amsterdam: Elsevier, 2003 [Consultation: 26/09/2012]. Available on: <http://www.sciencedirect.com/science/book/9780750658010>. ISBN 0750658010.

Complementary:

Momoh, James A. Electric power distribution, automation, protection, and control. Boca Raton: CRC Press, 2008. ISBN 0849368359.

Clarke, G.; Reynders, D.; Wright, E. Practical modern SCADA protocols: DNP3, 60870.5 and related systems. Amsterdam: Newnes, 2004. ISBN ISBN-10: 0750657995..