

## DESCRIPTION OF THE COURSE

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| Name of the course:<br><b>Network Communications<br/>in Process Control Systems</b> | Code: BIE68-1                                | Semester: 8          |
| Type of teaching:<br>Lectures and laboratory work                                   | Lessons per week:<br>L-2 hours; LW-1.5 hours | Number of credits: 4 |

**COURSE STATUS IN THE CURRICULUM:** Optional for the students in the Industrial Engineering BEng programme of the English Language Faculty of Engineering.

**AIMS AND OBJECTIVES OF THE COURSE:** Introduce the modern concepts of network communications within industrial process control systems. To give knowledge about the methods and practice of implementing intelligent control- and end-devices for process control in open-system architectures.

**DESCRIPTION OF THE COURSE:** The main topics include: signals and data transfer methods - digital signals transmissions; principles of network communications - structures, protocols, standards; specifics of network communications in process control systems - hierarchy, real-time operation, open systems architecture; comparative analysis of modern process control networks at field level - Fieldbus, LonWorks, DeviceNet, Profibus, ControlNet, Ethernet/IP et. al.; object-oriented models of control systems networks; software and hardware design - case studies; intelligent end devices in modern distributed process control systems - sensors, actuators, valves, position controllers, AC/DC drive systems; control systems with wireless communication in industrial environment; design of reliable and fault-tolerant process control systems based on network communications.

**PREREQUISITES:** Control Theory, Elements of Industrial Automation, Electronics, Computing, Industrial Electronic and Electrical Drives.

**TEACHING METHODS:** Lectures with slides, case studies, laboratory work with laboratory manual, work in teams, protocols preparation and defence.

**METHOD OF ASSESSMENT:** One three-hour examination at the end of semester (80%) plus laboratories (20%).

**INSTRUCTIONAL LANGUAGE:** English.

### **BIBLIOGRAPHY:**

1. Bender, K., (editor), Profibus - the Fieldbus for Industrial Automation., Prentice Hall, 1992;
2. BOSCH CAN Specification - Version 2.0, Part A,B., 1991, Robert Bosch, Munchen;
3. CIP implementation in DeviceNet, ControlNet and Ethernet/IP, Open DeviceNet Vendor Association, USA, 2000;
4. DeviceNet Specification, Open DeviceNet Vendor Association, Inc., Volume I, II, 2.03, 1997;
5. Djiev S., Models of Intelligent Sensors in a Deterministic Industrial Network, Intl. Conference "Automation and Informatics'1999", Proceedings, ISBN 954-90020-2-0;
6. Popovic, D., Distributed Computer Control for Industrial Automation, Marcel Dekker, 1990.