# Syllabus

## 1. Data about the program of study

| | |
|---|---|
| 1.1 Institution | Technical University of Cluj-Napoca |
| 1.2 Faculty | Automation and Computer Science |
| 1.3 Department | Automation |
| 1.4 Field of study | Systems Engineering |
| 1.5 Cycle of study | Bachelor of Science |
| 1.6 Program of study/Qualification | Automation and Applied Informatics (English) |
| 1.7 Form of education | Full time |

## 2. Data about the subject

| | | | | | | |
|---|---|---|---|---|---|---|
| 2.1 Subject name | ***Microsystems and Data Acquisition*** | | | | Discipline code | **51.10** |
| 2.2 Course responsible/lecturer | Assoc. Prof. Eng. Moiş George, PhD – george.mois@aut.utcluj.ro<br>Assoc. Prof. Eng. Rusu-Both Roxana, PhD – roxana.both@aut.utcluj.ro | | | | | |
| 2.3 Teachers in charge of applications | Assoc. Prof. Eng. Moiş George, PhD – george.mois@aut.utcluj.ro<br>Assoc. Prof. Eng. Rusu-Both Roxana, PhD – roxana.both@aut.utcluj.ro | | | | | |
| 2.4 Year of study | 4 | 2.5 Semester | 1 | 2.6 Assessment *(E/C/V)* | | E |
| 2.7 Type of subject | *DF – fundamental, DS – specialty, DC – complementary* | | | | | DS |
| | *DOB – compulsory, DOP – elective, DFA – optional* | | | | | DOP |

## 3. Estimated total time

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 3.1 Number of hours per week | 4 | of which: | 3.2 Course | 2 | 3.3 Seminar | 0 | 3.3 Laboratory | 2 | 3.3 Project | 0 |
| 3.4 Number of hours per semester | 56 | of which: | 3.5 Course | 28 | 3.6 Seminar | 0 | 3.6 Laboratory | 28 | 3.6 Project | 0 |

| | |
|---|---|
| 3.7 Individual study | |
| (a) Manual, lecture material and notes, bibliography | 14 |
| (b) Supplementary study in the library, online and in the field | 12 |
| (c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays | 12 |
| (d) Tutoring | 3 |
| (e) Exams and tests | 3 |
| (f) Other activities: | 0 |

| | |
|---|---|
| 3.8 Total hours of individual study (sum of (3.3(a)…3.3(f))) | 44 |
| 3.9 Total hours per semester (3.2+3.4) | 100 |
| 3.10 Number of credit points | 4 |

## 4. Pre-requisites (where appropriate)

| | |
|---|---|
| 4.1 Curriculum | - |
| 4.2 Competence | Analog and digital signal acquisition system architectures, signal conditioning circuitry, signal generators, sensors and transducers, microcontrollers and industrial equipment programming |

## 5. Requirements (where appropriate)

| | |
|---|---|
| 5.1. For the course | N/A |
| 5.2. For the applications | Attendance is mandatory. It is recommended to attend at least 50% of the courses or individual study throughout the semester. |

## 6. Specific competences

| | |
|---|---|
| Professional competences | C1. Use of knowledge of mathematics, physics, measurement techniques, technical graphics, mechanical, chemical, electrical and electronic engineering in systems engineering.<br>C5. Development of applications and implementation of algorithms and automatic control structures, using project management principles, programming environments and technologies based on microcontrollers, signal processors, programmable logic controllers, embedded systems. |

| | |
|---|---|
| Cross competences | CT2. Identifying roles and responsibilities in a multidisciplinary team, making decisions and assigning tasks, applying networking techniques and effective work within the team.<br>CT3. Identifying opportunities for continuous training and effectively capitalize on learning resources and techniques for one's own development. |

**7. Expected learning outcomes**

| | |
|---|---|
| Knowledge | The student identifies and describes basic concepts, principles and methods in mathematics, physics and computer science; explains and interprets theoretical and experimental results in mathematics, physics and computer science; describes, identifies, summarizes concepts and methods related to systems in general, as well as to measurement techniques, electronics and their application in concrete problems, using specific mathematical and physical tools; describes, identifies and summarizes fundamental concepts in automatic systems, embedded and intelligent systems, computer science and information technology and their application in concrete problems; describes, identifies and summarizes fundamental concepts of automation and process analysis and their application in concrete problems; designs, implements, tests, uses general-purpose and dedicated equipment, IoT, for automation and applied computer science applications; develops applications and implements automatic control algorithms, using programming environments and technologies based on microcontrollers, programmable logic controllers, embedded systems; |
| Skills | The student operates with basic concepts, principles and methods in mathematics, physics and computer science; solves mathematics and physics problems with applicability in engineering and validates the solution obtained; performs engineering and economic calculations of medium complexity and associates them with graphical representations or specific computer-aided design; acquires and processes data, interprets theoretical and experimental results; explains the topics to be solved, argues for solutions in systems engineering based on the principles of mathematics and the laws of physics and uses the basic components in the field and the measurement techniques of electrical and non-electrical quantities; uses programming languages, environments and technologies and specific tools (algorithms, schemes, models, protocols, etc.) in solving well-defined problems in systems engineering; models at the system level and creates numerical control systems, interfaces and systems based on microcontrollers and microprocessors, using integrated hardware - software design (codesign) and programming engineering; chooses equipment and puts related structures into operation, applies the principles of mathematics and physics to solve problems using measurement and analysis techniques; models, simulates and experimentally analyzes processes using mathematical foundations; collects and processes data, using appropriate sensors, signal processing and data filtering techniques; designs, simulates and tests digital systems and microcontroller-based applications; designs and programs embedded systems for control; designs and implements conventional and real-time software applications; uses intermediate and high-level programming languages, including languages used for implementing intelligent systems; |
| Responsibilities and autonomy | The student applies the values of ethics and deontology of the engineering profession; practices logical reasoning, evaluation and self-evaluation in decision-making.<br>The student works effectively as a team member or leader; shows initiative and action to update professional, economic and organizational culture knowledge; has honorable, responsible, ethical behavior, in the spirit of the law to ensure the reputation of the profession; contributes constructively in multidisciplinary teams, assuming various roles and clearly communicating engineering concepts, progress and results to technical and non-technical audiences; tracks personal progress in learning, seeks feedback and adopts strategies for continuous professional and personal development; responsibly applies engineering tools and platforms, ensuring system integrity and security, respecting good practices in configuration, testing and implementation; plans, executes and manages tasks autonomously, from problem definition to solution, demonstrating initiative in adopting new tools, methods and technologies. |

**8. Course objectives**

| | |
|---|---|
| General objective | Understand the concept of virtual instrumentation, of analog and digital signal acquisition systems |
| Specific objectives | Knowledge of LabVIEW specific programming techniques; Implementing programs using graphical programming; Accomplishment of analog and digital signal acquisition from sensors; Implementing control structures using LabVIEW, with industrial equipment or instruments. |

## 9. Contents

| 9.1 Lecture | No. hours | Teaching methods | Notes |
|---|---|---|---|
| Introduction to the LabVIEW™ Environment | 2 | Projector presentations, or Microsoft Teams platform discussions | - |
| Signal Acquisition. USB6009 User Guide and Specifications | 2 | | |
| Implementing a program in LabVIEW™ (Virtual Instruments - VIs) | 2 | | |
| Data Types: Vectors, Clusters, etc. Troubleshooting and Debugging VIs | 2 | | |
| Developing Modular Applications. Storing Measurement Data in Files | 2 | | |
| Communicating Between Multiple Loops running in parallel on a computing system | 2 | | |
| Programming technique’s introduction for myRIO™ embedded system. Presentation of the real-time system and programming using LabVIEW™ FPGA | 2 | | |
| Industrial Instrument Control from LabVIEW™ | 2 | | |
| Controlling the User Interface | 2 | | |
| Improving an Existing VI | 2 | | |
| Hardware-in-the-Loop Simulation. Statechart. MathScript. Industrial applications of the technologies presented. | 2 | | |
| LabVIEW™ and Simulink Interfacing. Process Identification. Control and simulation | 2 | | |
| Programming Arduino Devices from LabVIEW™ | 2 | | |
| SistemLink™ presentation | 2 | | |

Bibliography
Ddd


1. National Instruments, „NI LabVIEW™ for Academia Course”, Course Software Version 2024, December 2024 Edition, 480 pg.
2. Robert H. Bishop, National Instruments, “LabVIEW 2009 Student Edition”, Prentice Hall, 2009, TUC-N Lib. 536.027.
3. John Essick, “Hands-On Introduction to LabVIEW for Scientists and Engineers”, Oxford University Press, 2008, TUC-N Lib. 536.028.
4. Peter A. Blume, „The LabVIEW Style Book”, Prentice Hall, 2007, TUC-N Lib. 541.283.
5. Ronald Larsen, LabVIEW for Engineers", Prentice Hall, 2010, TUC-N Lib. 541.295.
6. Stephen Philip Tubbs, “LabVIEW for Electrical Engineers and Technologists”, Stephen Philip Tubbs, 2011, TUC-N Lib. 535.886.


| 9.2 Applications (seminar/laboratory/project/practical work) | No. hours | Teaching methods | Notes |
|---|---|---|---|
| Introduction. Signal Acquisition with Express VIs | 4 | Practical activities on the equipment, the development of software applications, supplementary explanations using presentations related to applications, or Microsoft Teams platform discussions | - |
| Signal Acquisition with NI DAQmx Drivers. Signal filtering | 4 | | |
| Signal Generators. Modular applications with SubVIs | 4 | | |
| Serial Data Transmission. Storing Measurement Data | 4 | | |
| Designing a Control System in LabVIEW™ | 4 | | |
| Signal Acquisition with myRIO™ | 4 | | |
| Practical exam | 4 | | |

Bibliography


1. Silviu Folea, „Microsystems and Data Acquisition using LabVIEW™”, practical applications, UTPRESS, Cluj-Napoca, 2024, 106 pg., ISBN 978-606-737-709-5, online: https://biblioteca.utcluj.ro/files/carti-online-cu-coperta/709-5.pdf.
2. Ed Doering, „NI myRIO Project Essentials Guide”, 2013 National Technology and Science Press, download the latest version at http://www.ni.com/myrio/project-guide.

**10. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field**

| |
|---|
| The topics presented at this course are specialized ones; they are included in other universities' curricula. The LabVIEW$^{TM}$ graphical programming environment is used in industrial testing, measurement and control applications. |

**11. Evaluation**

| Activity type | 11.1 Assessment criteria | 11.2 Assessment methods | 11.3 Weight in the final grade |
|---|---|---|---|
| 11.4 Course | Acquired knowledge | Presentations and written exam | 50% |
| 11.5 seminar/ laboratory/ project/ practical work | Acquired practical skills | Evaluation of the laboratory reports and practical exam using computers | 50% |
| 11.6 Minimum performance standard<br>Final exam >= 5, Lab grade >= 5 mandatory to be able to take the final exam, 50% Final exam + 50% Lab Grade > 5 | | | |

| Date of filling in: | | Title Firstname NAME | Signature |
|---|---|---|---|
| 10.07.2026 | Course | Assoc. Prof. Eng. George MOIȘ, PhD | |
| | | Assoc. Prof. Eng. Roxana RUSU-BOTH, PhD | |
| | Applications | Assoc. Prof. Eng. George MOIȘ, PhD | |
| | | Assoc. Prof. Eng. Roxana RUSU-BOTH, PhD | |

| | |
|---|---|
| Date of approval by the Department Board | Head of Departament<br>Prof. Eng. Honoriu VĂLEAN, PhD |
| Date of approval by the Faculty Council | Dean<br>Prof. Eng. Vlad MUREȘAN, PhD |