SYLLABUS

1. Data about the program of study

1.1 Institution	The Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Automation and Computer Science
1.3 Department	Computer Science
1.4 Field of study	Computer Science and Information Technology
1.5 Cycle of study	Masters
1.6 Program of study/Qualification	Artificial Intelligence and Vision / Masters
1.7 Form of education	Full time

2. Data about the subject

2.1 Subject name	***Industrial Informatics***			Subject code	**6**
2.2 Course responsible / lecturer	Prof. dr. eng. Sebestyen Gheorghe - Gheorghe.Sebestyen@cs.utcluj.ro				
2.3 Teachers in charge of seminars / Laboratory / project	Prof. dr. eng. Sebestyen Gheorghe - Gheorghe.Sebestyen@cs.utcluj.ro				
2.4 Year of study	I	2.5 Semester	2	2.6 Type of assessment (E - exam, C - colloquium, V – verification)	E
2.7 Subject category	Formative category: DF – fundamental, DS – speciality, DC – complementary				DF
	Optionality: DOB – mandatory, DOP – optional (alternative), DFA – optional (free choice)				DOP

3. Estimated total time

3.1 Number of hours per week	3	of which	Course	2	Seminar	1	Laborator	-	Proiect	-
3.2 Total hours in the curriculum	42	of which	Course	28	Seminar	14	Laborator	-	Proiect	-
3.3 Individual study:										
(a) Manual, lecture material and notes, bibliography										30
(b) Supplementary study in the library, online and in the field										15
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										11
(d) Tutoring										-
(e) Exams and tests										2
(f) Other activities										-

3.4 Total hours of individual study (summ (3.7(a)…3.7(f)))	58
3.5 Total hours per semester (3.4+3.8)	100
3.6 Number of credit points	4

4. Pre-requisites (where appropriate)

4.1 Curriculum	Microprocessor systems
4.2 Competence	Design of Microprocessor systems

5. Requirements (where appropriate)

5.1 For the course	Projector, blackboard, computer
5.2 For the applications seminarului / laboratorului / proiectului	Projector, blackboard, computer

6. Specific competences

Professional competences	• Applies ICT systems theory • Uses data processing techniques Builds predictive models • Utilizes machine learning • Develops a computer vision system Applies statistical analysis techniques Integrates system components Designs the information system Analyzes software specifications • Defines technical requirements Defines software architecture • Uses software libraries • Uses software design patterns Oversees software development • Analyzes network bandwidth requirements Implements ICT security policies • Designs a computer network • Maintains internet protocol configurations Implements network diagnostic tools Plans ICT capacity • Creates software Integrates ICT data • Proposes ICT solutions for business problems • Designs the database schema
Cross competences	• develop an analytical approach • taking a proactive approach • developing strategies to solve problems • being open minded • coordinate engineering teams

7. Expected Learning Outcomes

Knowledge	The student has knowledge of: • Methods for analyzing business requirements and software specifications • Techniques for data modeling and process representation using diagrams • Principles for developing software prototypes and applications for industrial systems • System architectures and ways to align software with them • Concepts for integrating system components and designing user interfaces • Query languages, markup languages, and object-oriented programming • ICT security policies and risk management strategies • Computer-aided software engineering tools (CASE tools) • Data processing techniques and building predictive models • Script-based programming and use of software libraries • Structure and functioning of ICT systems, including testing processes Methods for generating creative ICT solutions for industrial problems
Skills	The student is able to: • Analyze business requirements and software specifications • Create data models and process diagrams relevant for industrial applications • Develop software prototypes and functional applications for industrial systems • Align software with existing system architectures • Integrate system components and design intuitive user interfaces • Use query languages, markup languages, and object-oriented programming in application development • Implement ICT security policies and manage associated risks • Efficiently use CASE tools and other software engineering technologies • Apply data processing techniques and develop predictive models for process optimization • Write scripts and use software libraries to automate tasks • Manage ICT systems and perform system testing to ensure quality Propose innovative and creative ICT solutions for challenges in industrial environments

Responsibilities and autonomy	The student has the ability to work independently in order to: • develop an analytical approach • take a proactive approach • develop strategies to solve problems • be open minded coordinate engineering teams

8. Discipline objectives (as results from the *key competences gained*)

8.1 General objective	Development of competencies and skills for designing and implementing control systems based on digital technologies
8.2 Specific objectives	Acquiring knowledge and skills for: - design of dedicated and encapsulated microprocessor systems (embedded) - digital signal processing - design of means of communication specific to the industrial environment - designing simple, hierarchical and distributed control systems

9. Contents

9.1 Lectures	Hours	Teaching methods	Notes
Introduction to industrial informatics – short history, basic concepts	2	Lecture, Discussing Specific Concepts.	
Internet of Things (IoT), Internet of Industrial Objects (IioT), cyber-physical systems	2		
Computational models for control systems: IoT, fog and edge computing	2		
Communication in control systems – standards, protocols, design problems	2		
Sensory networks – examples of implementation, routing algorithms, information fusion	2		
Distributed control systems – design principles, examples of experimental models, model based on distributed services	2		
Real-time control of processes – planning strategies and algorithms, techniques for evaluating the response time in the most unfavourable case	2		
Dedicated and encapsulated computing systems	2		
Building automation	2		
Industrial information systems	2		
Digital signal processing – basic, transformed concepts	2		
Digital Signal Processing – Transformed into Z	2		
Numerical filters – design and implementation	2		
Conclusions regarding the use of the calculation technique in the tracking and control of processes	2		

Bibliography *(minimum bibliography of the subject containing at least one reference bibliographic work of the subject, which exists at the disposal of students in an appropriate number of copies)*

1. G. Sebestyen "Informatica industriala", Ed. Albastra, Cluj-Napoca, 2006
2. D. Gorgan, G. Sebestyen, "Designing computers", Blue Publishing House, 2005

9.2 Applications - Seminars/Laboratory/Project	Hours	Teaching methods	Notes
Sensor networks	2	Presentations, Specific experiments, Discussion	
Building automation	2		
Real-time systems	2		
Quality control and traceability	2		

Industrial networks	2		
Adaptive regulators	2		
Bibliography *(minimum bibliography of the subject containing at least one reference bibliographic work of the subject, which exists at the disposal of students in an appropriate number of copies)* 1. G. Sebestyen "Informatica industriala", Ed. Albastra, Cluj-Napoca, 2006 2. D. Gorgan, G. Sebestyen, "Designing computers", Blue Publishing House, 2005			

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

The course is in line with the latest design methodologies used in the profile companies.

11. Evaluation

Activity type	Assessment criteria	Assessment methods	Weight in the final grade
Course	Evaluation of theoretical knowledge	Written exam	70%
Seminars /Laboratory/Project	Evaluation of practical skills (at seminar presentations)	Evaluation of seminar presentations	30%
Minimum standard of performance			
Minimum 5 at written exam and evakuation of seminar presentation			

Date of filling in: 29.04.2026	**Responsible**	**Title First name Last name**	**Signature**
	Course	Prof. dr. eng. Gheorghe SEBESTYEN	
	Applications	Prof. dr. eng. Gheorghe SEBESTYEN	

Date of approval in the department	Head of department, Prof.dr.eng. Rodica Potolea
Date of approval in the Faculty Council	Dean, Prof.dr.eng. Vlad Mureșan