UNIVERSITATEA TEHNICĂ DIN CLUJ-NAPOCA
Facultatea de Electronică, Telecomunicații și Tehnologia Informației
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SYLLABUS

1. Data about the program of study

1.1 Institution	Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Electronics, Telecommunications and Information Technology
1.3 Department	Communications
1.4 Field of study	Electronic Engineering, Telecommunications and Information Technologies
1.5 Cycle of study	Bachelor of Science
1.6 Program of study / Qualification	Telecommunications Technologies and Systems/
1.7 Form of education	Full time
1.8 Subject code	TST-E48.00a

2. Data about the subject

2.1 Subject name	Project – IoT Systems (Networking)					
2.2 Subject area	Theoretical area Methodological area Analytic area					
2.3 Course responsible	Assist. Prof. Iustin-Alexandru IVANCIU, Ph.D, Iustin.Ivanciu@com.utcluj.ro					
2.4 Teacher in charge with project	Assist. Prof. Iustin-Alexandru IVANCIU, Ph.D, Iustin.Ivanciu@com.utcluj.ro					
2.5 Year of study	4	2.6 Semester	7	2.7 Assessment	VP	2.8 Subject category	DS/DI

3. Estimated total time

3.1 Number of hours per week	1	of which: 3.2 course	0	3.3 project	1
3.4 To Total hours in the curriculum	14	of which: 3.5 course	0	3.6 laboratory	14
Distribution of time					hours
Manual, lecture material and notes, bibliography					23
Supplementary study in the library, online specialized platforms and in the field					6
Preparation for seminars / laboratories, homework, reports, portfolios and essays					4
Tutoring					0
Exams and tests					3
Other activities:					0

3.7 Total hours of individual study	36
3.8 Total hours per semester	50
3.9 Number of credit points	2

4. Pre-requisites (where appropriate)

4.1 curriculum	N. A.
4.2 competence	Programming skills (Python, Java, Matlab)

5. Requirements (where appropriate)

5.1. for the course	N/A
5.2. for the seminars / laboratories / projects	Cluj-Napoca

6. Specific competences

Professional competences	**C5. Selecting, installing, configuring and operating fixed or mobile telecommunications equipment. Equipping a site with usual telecommunications networks** C5.3 Installation, configuration and exploiting of communications networks C5.4 Use of evaluation techniques and diagnostics for communications systems and equipment C5.5 Endowment with communications means of a location with a small/ medium degree of complexity C5.6 Solving an installation and maintenance problem for a communications system with low/ medium complexity **C6. Solving specific problems of the broadband communications networks: propagation in different environment, circuits and equipment for high frequencies (microwaves and optical).** C6.2 Explaining the specific methods for implementation of the communications techniques
Transversal competences	N/A

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

7.1 General objective	Development of professional skills in the field of designing IoT applications on the Internet, with software platforms of telecommunications operators
7.2 Specific objectives	1. Understanding the basic concepts regarding the integration of IoT sensors with LoRaWAN, FIWARE, etc. platforms. 2. Development of skills and abilities necessary for configuring applications with software platforms of telecommunications operators (Orange, Vodafone) or private cloud 3. Development of skills and abilities necessary to solve minimum security requirements of IoT connectivity

8. Contents

8.2 Project	Teaching methods	Notes
1. Organizing the project teams. Presentation of subjects: • M2M / IoT applications using the MQTT protocol • Connecting to Live Objects (Orange) using mqttfx and mqttspy • NB-IoT applications on the Vodafone platform	Didactic and experimental proof, didactic exercise, team work	Use of laboratory instrumentation, experimental boards

• Site scaping applications with IoT data and database storage with XAMPP and phpMyAdmin • Applications with Libellium for intelligent transport in smart city • Truck load monitoring system using parking sensors and LoRaWAN • IoT applications with ThingSpeak for air quality • Low-code programming for event-driven applications using Node-RED	
2. Assignment of the topics and bibliographic search	
3. Presentation of results: test scenario	
4. Presentation of implementation results	
5. Presentation of experimental results	
6. Final integration; project recovery	
7. Defending of the project	

References:
1. P. Lea, IoT and Edge Computing for Architects: Implementing edge and IoT systems from sensors to clouds with communication systems, analytics, and security, 2nd Edition, Packt Publishing 2020, ISBN-13: 978-1839214806
2. G. Veneri, A. Capasso, Hands-On Industrial Internet of Things: Create a powerful Industrial IoT infrastructure using Industry 4.0, Packt Publishing 2018, ISBN-13: 978-1789537222

On-line references:
3. The Things Network, 2020, Available: https://www.thethingsnetwork.org/
4. FIWARE: The Open Source Platform for Our Smart Digital Future, FIWARE Foundation, e.V., 2020, Available: https://www.fiware.org/

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

The discipline content and the acquired skills are in agreement with the expectations of the professional Competences acquired will be used in the following COR occupations (Electronics Engineer; Telecommunications Engineer; Electronics Design Engineer; System and Computer Design Engineer; Communications Design Engineer) or in the new occupations proposed to be included in COR (Sale Support Engineer; Multimedia Applications Developer; Network Engineer; Communications Systems Test Engineer; Project Manager; Traffic Engineer; Communications Systems Consultant).

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.5 Project	The level of acquired knowledge and abilities	P1: work during the semester P2: oral and practical defending	P1, max. 5 pts. 50% P2, max. 5 pts. 50%

10.6 Minimum standard of performance

Qualitative point of view
Minimal theoretical and practical knowledge:
  ✓ Understanding the basic concepts regarding the integration of IoT sensors with LoRaWAN, FIWARE, etc. platforms.
  ✓ Development of skills and abilities necessary for configuring applications with software platforms of telecommunications operators (Orange, Vodafone) or private cloud
Minimal acquired competences:
  ✓ Ability to develop simple IoT applications
  ✓ Ability to analyze and improve the security of IoT systems

Quantitative point of view
- ✓ P=P1+P2 ≥ 5

Date of filling in: 20.06.2023		Title Surname NAME	Signature
	Applications	Assist. Prof. Iustin-Alexandru IVANCIU, Ph.D	

Date of approval in the Council of the Communications Department 11.07.2023	Head of Communications Department Prof. Virgil DOBROTA, Ph.D.
Date of approval in the Council of Faculty of Electronics, Telecommunications and Information Technology 12.07.2023	Dean Prof. Ovidiu POP, Ph.D.