SYLLABUS

1. Program Information

1.1 Higher education institution	Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Automation and Computer Science
1.3 Department	Department of Automation
1.4 Field of study	Automation, Applied Informatics and Intelligent Systems
1.5 Cycle of studies	Bachelor
1.6 Study Programme/Qualification	Intelligent Automation Systems (dual, in English language)
1.7 Form of education	IF – full-time education
1.8 Course code	48.00

2. Course information

2.1 Course title	**Industrial Data Analytics**					
2.2 Course lecturer	*Sl.Dr.Ing. Cosmina Corches - cosmina.corches@aut.utcluj.ro*					
2.3 Seminar / Laboratory / Project Lecturer	*Drd.ing. Eliza Olariu (Emerson)*					
2.4 Year of study	4	2.5 Semester	1	2.6 Type of assessment		E
2.7 Course status	Formative category *(DF, DS, DC)*					DS
	Optionality *(DOB, DOP, DFac)*					DOB

3.Total estimated time

3.1 Number of hours per week	4	of which:	HEI	Lecture	2	Seminar	0	Laboratory	0	Project	0
			CO		0		0		2		0
3.2 Number of hours per semester	56	of which:	HEI	Lecture	28	Seminar	0	Laboratory	0	Project	0
			CO		0		0		28		0

3.3 Distribution of time allocation (hours per semester) for:	HEI	CO
(a) Study based on textbook, course support, bibliography, and notes	8	12
(b) Additional documentation in library, specialized electronic platforms, and fieldwork	8	12
(c) Preparation of seminars/laboratories, assignments, papers, portfolios and essays		20
(d) Tutoring	3	1
(e) Examinations	3	2
(f) Other activities:		
3.4 Total individual study hours (sum (3.3(a)... 3.3(f)))	22	47
3.5 Total hours per semester (3.2+3.4)	50	75
3.6 Number of credits per semester	2	3

(HEI = Higher Education Institution, CO = Company)

4. Prerequisites (where applicable)

4.1 Curriculum Prerequisites	N/A
4.2 Competency Prerequisites	• Fundamental Excel knowledge • Basic Database Querying (SQL) • Basic understanding of statistics

5. Conditions (where applicable)

5.1. Course Organization Conditions	• Amphitheater with appropriate equipment to support an ongoing lecture (multimedia equipment), Cluj-Napoca
5.2. Seminar / Laboratory / Project organization conditions	• Laboratory, Cluj-Napoca

6. Specific Competencies Acquired

Professional Competencies	• PC06 Define technical requirements • PC07 Demonstrate disciplinary expertise • PC08 Design automation components • PC12 Gather technical information • PC15 Manage research data • PC21 Report analysis results • PC26 Use information technology tools • PC32 Perform data analysis
Transversal Competencie	• TC01 Apply knowledge of science, technology and engineering • TC02 Think analytically

7. Learning outcomes

Knowledge:	• The student describes and explains the fundamental concepts of Business Intelligence, industrial data visualization, and key performance indicators (KPIs), as well as basic principles of data modeling, ETL processes, and dashboard design.
Skills:	• The student applies appropriate tools and techniques (e.g., Excel, Power BI) to analyze and visualize industrial datasets, selects suitable graphical representations based on data types, and interprets patterns and trends through dashboards and reports.
Responsibility and autonomy:	• The student handles data analytics tasks on industrial datasets, evaluates and justifies the use of specific visualization methods, and communicates results clearly to support operational and strategic decision-making processes.

8. Course Objectives

8.1 General objective of the course	• To provide students with knowledge and practical skills in data-driven decision-making technologies, while developing their capacity for critical thinking in identifying and solving problems, evaluating data-supported value propositions, synthesizing information logically, and applying knowledge across domains.
8.2 Specific objectives	• Analyze industrial datasets using visualization tools (e.g., Excel, Power BI) to extract meaningful insights that support decision-making. • Evaluate trends, identify key performance indicators (KPIs), and formulate data-driven recommendations for industrial applications. • Design and implement business analytics solutions using BI tools to support operational and strategic decisions in engineering contexts.

9. Contents

9.1 Lectures	No. of hours	Teaching methods	Obs.

1. Introduction to Data/Analytics (Analysis versus Analytics). History and taxonomy	2	Presentation, discussions	Laptop, projector
2. Statistical Methods for Data Science	2		
3. Business Analytics Tools	2		
4. Data Preparation (Cleaning, Processing, Formatting, Append etc.)	2		
5. Data Preparation (Continue)	2		
6. Data Preparation (Continue)	2		
7. Introduction to Power BI for Data Analysis and Visualization	2		
8. Introduction to Power BI for Data Analysis and Visualization (Continue)	2		
9. Introduction to Power BI for Data Analysis and Visualization (Continue)	2		
10. Power BI Performing Computations	2		
11. Power BI Performing Computations (Continue)	2		
12. Advanced Power BI	2		
13. Advanced Power BI (Continue)	2		
14. Business Analytics as profession	2		

Bibliography

1.J. M. Moreira, A. C. P. L. F. de Carvalho, and T. Horváth, A General Introduction to Data Analytics. Hoboken, NJ, USA: John Wiley & Sons, 2019. ISBN: 978-1-119-29624-9.
2. D. Kusleika, Data Visualization with Excel Dashboards and Reports. Hoboken, NJ, USA: Wiley, 2021. ISBN: 978-1-119-69872-2.
3. B. Vallelunga, Mastering Microsoft Power BI. Birmingham, UK: Packt Publishing, 2018. ISBN: 978-1-78829-723-3.
4. V. Sharma, C. Maheshkar, and J. Poulose, Eds., Analytics Enabled Decision Making. Singapore: Palgrave Macmillan, 2023. ISBN: 978-981-19-9657-3.
5. R. P. Machado and H. Russa, Analytics Engineering with SQL and dbt. Sebastopol, CA, USA: O'Reilly Media, 2023. ISBN: 978-1-098-14238-4.
6. R. Hill and S. Berry, Guide to Industrial Analytics: Solving Data Science Problems for Manufacturing and the Internet of Things, 1st ed. Springer Nature Switzerland AG, 2021, ISBN: 978-3-030-79103-2.

9.2 Seminar / laboratory / project	Hours HEI	Hours CO	Teaching methods	Obs.
1. Advanced Excel (Data Cleaning and Processing)		2	Presentation and practical exercises	Laptop, Microsoft Office 365 Suite, Microsoft Windows 11, Power BI
2. Advanced Excel (Basic Charts and Advanced Charts)		2		
3. Introduction to Power BI		2		
4. Creating Power BI Reports, Auto Filters		2		
5. Report Visualization and Proprieties		2		
6. Chart and Map Report Proprieties		2		
7. Hierarchies and DrillDown Reports		2		
8. Power Query		2		
9. Power Query (Continue)		2		
10. Dax Expressions		2		
11. Dax Expressions (Continue)		2		
12. Dax Expressions (Continue)		2		
13. Improving Power BI Reports		2		
14. PowerBI Integration Elements (Power BI KPIs)		2		

10. Correlation of course content with the expectations of the epistemic community representatives, professional associations, and major employers in the field related to the program

The discipline content provides students with essential knowledge and practical skills in industrial data analytics to support data-driven decision-making. The acquired skills and competencies align with the expectations of professional organizations and employers in the field, where students carry out internship stages and/or occupy positions such as Data Analysts, Business Analysts, or roles in the analytics industry, and the expectations of the national organization for quality assurance (ARACIS).

11. Evaluation

Activity Type	**Evaluation criteria**	**Evaluation methods**	**Weight in final grade**
11.1 Lecture	The level of acquired theoretical knowledge and practical skills	Written exam onsite	50%
11.2 Seminar/ Laboratory/Project	Application of practical skills in industrial data analytics	Oral presentation of a project	50%

11.3 Minimum Performance Standard

Quality level:

Minimal knowledge:

- *Knowledge of fundamental concepts of Business Intelligence and data analytics in industrial environments.*
- *Knowledge of key data visualization types and their appropriate use cases.*
- *Understanding of the role of KPIs in monitoring industrial processes.*
- *Knowledge of data transformation processes, including basic ETL steps (Extract, Transform, Load).*
- *Familiarity with tools used for data analytics and visualization (e.g., Excel, Power BI).*

Minimal competences:

- *Can perform basic data analytics tasks using Excel and/or Power BI.*
- *Can select appropriate types of visualizations based on data characteristics and context.*
- *Can create and configure simple dashboards with interactive elements.*
- *Can interpret the results of a dashboard and explain trends or anomalies relevant to industrial decision-making.*

Quantitative level:

- *To attend every laboratory session*
- *The exam and laboratory marks must be at least 5*

*The final mark for the subject is calculated with the relation: 0.5 * Exam mark + 0.5 * Project mark*

Date of completion:	Lecturers	Title First Name LAST NAME	Signature
15.09.2025	Course	Sl.Dr.Ing. Corcheș Cosmina	

Date of approval by the Department of Automation Council 24.11.2025 Date of approval by the Faculty of Automation and Computer Science Council 28.11.2025	Director of the Department of Automation Prof.dr.ing. Honoriu VĂLEAN Dean Prof.dr.ing. Vlad MUREȘAN