

# Syllabus

## 1. Programme information

1.1. Institution	THE BUCHAREST UNIVERSITY OF ECONOMIC STUDIES
1.2. Faculty	Business Administration in Foreign Languages
1.3. Departments	Department of Economic Informatics and Cybernetics
1.4. Field of study	Business Administration
1.5. Cycle of studies	Master Studies
1.6. Education type	Full-time
1.7. Study programme	Digital business and innovation
1.8. Language of study	English
1.9. Academic year	2023-2024

## 2. Information on the discipline

2.1. Name	<b>Artificial Intelligence</b>								
2.2. Code	<b>23.0295IF2.1-0005</b>								
2.3. Year of study	<b>2</b>	2.4. Semester	<b>1</b>	2.5. Type of assessment	<b>Exam</b>	2.6. Status of the discipline	<b>O</b>	2.7. Number of ECTS credits	<b>6</b>
2.8. Leaders	C(C)	<b>prof.univ.dr. COCIANU Catalina Lucia</b>					Catalina.Cocianu@ie.ase.ro		
	S(S)	<b>prof.univ.dr. COCIANU Catalina Lucia</b>					Catalina.Cocianu@ie.ase.ro		

## 3. Estimated Total Time

3.1. Number of weeks	14.00
3.2. Number of hours per week	3.00 of which
	C(C) 1.00
	S(S) 2.00
3.3. Total hours from curriculum	42.00 of which
	C(C) 14.00
	S(S) 28.00
3.4. Total hours of study per semester (ECTS*25)	150.00
3.5. Total hours of individual study	108.00
<i>Distribution of time for individual study</i>	
Study by the textbook, lecture notes, bibliography and student's own notes	50.00
Additional documentation in the library, on specialized online platforms and in the field	10.00
Preparation of seminars, labs, assignments, portfolios and essays	46.00
Tutorials	
Examinations	2.00
Other activities	

## 4. Prerequisites

4.1. of curriculum	IT Systems for Virtual Enterprises Machine Learning
4.2. of competences	

## 5. Conditions

for the C(C)	Lectures will take place in rooms with Internet connection and teaching equipment for teaching and or online through videoconferencing system
for the S(S)	Seminars will take place in computer labs with Internet connection and teaching equipment for teaching and or online through videoconferencing system

## 6. Acquired specific competences

PREFESIONAL	C4	
PREFESIONAL	C6	

## 7. Objectives of the discipline

7.1. General objective	Acquiring knowledge and skills to use Artificial Intelligence tools within enterprises
7.2. Specific objectives	Acquiring knowledge regarding Artificial Intelligence methods: Casual Machine Learning, Casual Random Forest, Double Machine Learning, Deep Learning, NAR and NARX forecasting models, Evolutionary DL

## 8. Contents

8.1. C(C)		Teaching/Work methods	Recommendations for students
1	Financial data analysis and forecasting – background. Fundamental and technical analysis. Technical indicators.	Online presentation with PowerPoint support and practical exemplification by videoconference	
2	Preprocessing. Variable selection and feature selection. Smoothing	Idem	
3	Forecasting models. One-step ahead and multi-step ahead prediction	Idem	
4	NAR and NARX models. Performance evaluation	Idem	
5	ANN-based forecasting. NAR-ANN and NARX-ANN	Idem	
6	LSTM-based forecasting	Idem	
7	Evolutionary DL for data forecasting	Idem	

### ***Bibliography***

- Stephen Satchell, Forecasting Expected Returns in the Financial Markets, Academic Press, Massachusetts, 2007, Statele Unite ale Americii
- Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, Massachusetts, 2016, Statele Unite ale Americii
- Fouzi Harrou, Ying Sun, Amanda S. Hering, Muddu Madakyaru, Abdelkader Dairi, Statistical Process Monitoring Using Advanced Data-Driven and Deep Learning Approaches, Elsevier Science, 2020
- Jannes Klaas, Machine Learning for Finance: Principles and practice for financial insiders, Packt Publishing, 2019, Marea Britanie
- Materiale online, online.ase.ro

8.2. S(S)		Teaching/Work methods	Recommendations for students
1	Review of Machine Learning Techniques	Online presentation with PowerPoint support and practical exemplification by videoconference	
2	Preprocessing. Technical indicators. Normalization, selection and smoothing	Idem	
3	ANNs for forecasting	Idem	
4	Case studies. Exchange rates forecasting. DIJA index forecasting	Idem	
5	Casual Machine Learning	Idem	
6	Double Machine Learning	Idem	
7	Casual Random Forest	Idem	
8	Generic Machine Learning	Idem	

### ***Bibliography***

- Jannes Klaas, Machine Learning for Finance: Principles and practice for financial insiders, Packt Publishing, 2019, Marea Britanie
- Chernozhukov, V., Chetverikov, D., Demirer, M., Duflo, E., Hansen, C., and Newey, W. , Double/debiased/Neyman machine learning of treatment effect, American Economic Review, 2017, Statele Unite ale Americii
- Wager, S. and Athey, S. , Estimation and inference of heterogeneous treatment effects using random forests, Journal of the American Statistical Association, 2018, Statele Unite ale Americii
- Chernozhukov, V., Demirer, M., Duflo, E., and Fernandez-Val, I., Generic machine learning inference on heterogenous treatment effects in randomized experiments. Working Paper, National Bureau of Economic Research, 2018
- Marteriale online, online.ase.ro

## **9. Corroboration of the contents of the discipline with the expectations of the representatives of the epistemic community, of the professional associations and representative employers in the field associated with the programme**

The content of the discipline is corroborated with the requirements of the labor market, given that all large companies have large amounts of data that they want to use efficiently in management and decision-making processes.

## **10. Assessment**

Type of activity	Assessment criteria	Assessment methods	Percentage in the final grade
10.1. S(S)	Knowledge of presented notions and methods	Attendance and active participation at seminar classes	30.00
10.2. Final assessment	Evaluation of answers	Written exam with multiple choice questions having one or more correct answers	70.00
10.3. Modality of grading	Whole notes 1-10		
10.4. Minimum standard of performance	Knowledge and understanding of the methods and techniques approached, correct identification of their use scenarios		

Date of listing,  
04/26/2024

Signature of the discipline leaders,

Date of approval in the  
department

Signature of the Department Director,