

# Applied quantitative methods for economic analysis Syllabus

## **Basic information**

Field of study* Transition, Innovation and Sustainability Environments Specialisation -		Didactic cycle 2022/2023 Subject code UEPTISES.24B.13284.22	
Level of qualification Second-cycle programme		<b>Mandatory</b> Obligatory	
<b>Mode of study</b> Full-time		<b>Block</b> Block B	
<b>Track</b> General academic			
Person responsible for the content of the syllabus	Barbara Będowska-Sójka		
Devied	Mathed of evoluation		Number of
Semester 3	Assessment		ECTS points
	Activities and hours <ul> <li>Participation in lectures: 30</li> </ul>		

## Subject's educational aims

C1	To enable students to carry out quantitative analysis of empirical economic data.
C2	To give students modern programming tools in empirical analysis.
C3	To enable students to generate forecasts of real economic processes in modern economies.
C4	To foster the ability of students to assess real impact of economic processes and the relevance of dependencies between different variables thorough the application of machine learning.

### **UEP** goals

Code	Goal content
CS2_1.1	students will critically reflect on practical and theoretical issues
CS2_1.2	students will critically evaluate alternatives in order to arrive at an optimal solution
CS2_1.3	students will have an understanding of the most important aspects of macro- and micro-environmental influence on business decisions
CS2_2.1	students will use their team-building skill to complete group tasks
CS2_2.2	students will demonstrate leaderships skills and will work effectively in a team.
CS2_2.3	students will produce written assignments/oral presentations following academic standards
CS2_3.2	students will understand corporate social responsibility and sustainable development
CS2_3.3	students will understand and appreciate other cultures, as well as international and social diversity

# **Entry requirements**

- Basic mathematcis,
- Statistics

## Subject's learning outcomes

Code	Outcomes in terms of	Effects	Examination methods
Knowledge			
W1	Student understands and explains the principles and processes of sustainable development and resilience in social systems with special consideration of science, technology and society issues and thereby realizing the vulnerabilities	K2_W02, K2_W03, K2_W05	Individual project
W2	Student identifies assumptions underlying scientific methodologies and connected human-environment issues	K2_W02, K2_W03, K2_W05	Individual project
W3	Student ilustrates the nature of human technology interactions and human computer interactions and their implications on the individual as well as on the diverse arena of interrelations and social innovation	K2_W02, K2_W03, K2_W05	Final quiz, Presentation, Moodle quiz
Skills			
Ul	Student generates an interdisciplinary understanding of human technology interactions, technology as a driver of change, and describe its impact on society on diverse levels.	K2_U01, K2_U02, K2_U05, K2_U06	Final quiz
U2	Student initiates and applies collective problem solving and innovation strategies as well as crisis resolution strategies	K2_U01, K2_U02, K2_U05, K2_U06	Individual project, Moodle quiz
U3	Student applies research and research management skills, designs research projects in groups and individually, usees research methods (quantitative, qualitative, mixed methods, system analysis, as well as methods of transdisciplinary)	K2_U01, K2_U02, K2_U05, K2_U06	Individual project, Presentation

Code	Outcomes in terms of	Effects	Examination methods
U4	Student integrates knowledge, handles uncertainty and complexity, designs and implements innovation spaces, formulates judgements and communicates them to a wider audience.	K2_U01, K2_U02, K2_U05, K2_U06	Presentation, Moodle quiz
Social com	petences		
Кl	Student is open towards multiple perspectives of science areas and stakeholders' groups, critical, committed to knowledge-based initiatives, reflective, when implementing changes, and assessing results.	K2_K01, K2_K03, K2_K04, K2_K05, K2_K06	Individual project, Presentation
К2	Students apreciate innovators and cares for integrative, co-creative, transdisciplinary processes.	K2_K01, K2_K03, K2_K04, K2_K05, K2_K06	Presentation, Moodle quiz
К3	Students are self-confident, orineted towards professional perspectives and opportunities for action	K2_K01, K2_K03, K2_K04, K2_K05, K2_K06	Final quiz
К4	Students appreciate an evidence based independent decision-making process and care for promotion of inventions and innovations.	K2_K01, K2_K03, K2_K04, K2_K05, K2_K06	Moodle quiz
К5	Graduates are reliable and effective team members and leaders of a group, responsible supporters of professional development	K2_K01, K2_K03, K2_K04, K2_K05, K2_K06	Individual project, Presentation

### **Study content**

No.	Course content	Subject's educational goals	Subject's learning outcomes
1.	Simple and multiple regression analysis	C1, C2, C3, C4	W1, W3, U1, K4
2.	Logit regression	C1	W2, U2, U4, K3, K5
3.	Time-series analysis	С3	U3, K1
4.	Panel data	C1	U2, K2
5.	Neural networks	C2	W3, U3
6.	Machine learning algorithms (random forests)	C4	W2, U2, K5

### **Bibliography**

#### Obligatory

- 1. Wooldridge J.M., Introductory Econometrics. A modern approach, Cengage Learning 2016.
- 2. Gábor Békés, Gábor Kézdi, Data Analysis for Business, Economics, and Policy, Cambridge University Press 2021.
- 3. Greene W.H., Econometric Analysis, Pearson, 2018.

#### Recommended

- 1. Ciaburro G., Venkateswaran B., Neural networks with R, Packt Publishing, 2017.
- 2. David Ruppert, David S. Matteson, Statistics and Data Analysis for Financial Engineering with R examples, Springer Texts in Statistics, 2015.
- 3. Chiu Yu-Wei, Machine Learning with R Cookbook, Packt Publishing, 2015.

### **Course advanced**

#### **Teaching methods:**

Project method, Lecture with multimedia presentation, Discussion, Case study, Exercises, Laboratories

Teaching methods	Method of evaluation	Credit conditions
Lectures	Final quiz, Individual project, Presentation, Moodle quiz	>50% of overall points

## **Calculation of ECTS points**

Activity form Activity hours*		
Participation in lectures 30		)
Project preparation	40	)
Empirical research	10	)
Consultations with teacher	20	)
Student workload	Hours 100	<b>ECTS</b> 4.0
Workload involving teacher	Hours 50	<b>ECTS</b> 2.0
Practical workload	Hours 50	<b>ECTS</b> 2.0

\* one hour of classes = 45 minutes

# Effects

Code	Content
K2_K01	graduates are professionals, open to multiple perspectives of science areas and stakeholders' groups, critical, committed to knowledge-based initiatives, reflective, when implementing changes, and assessing results
K2_K03	graduates are motivated innovators and promoters of integrative, co-creative, transdisciplinary processes
K2_K04	graduates are self-confident, realistically recognize professional perspectives and opportunities for action
K2_K05	graduates are capable of evidence based independent decision-making and responsible promoters of inventions and innovations
K2_K06	graduates are reliable and effective team members and leaders of a group, responsible supporters of professional development
K2_U01	graduates possess developed ability to generate an interdisciplinary understanding of human technology interactions, technology as a driver of change, and describe its impact on society on diverse levels
K2_U02	graduates possess developed ability to initiate and apply collective problem solving and innovation strategies as well as crisis resolution strategies
K2_U05	graduates possess developed ability to use research and research management skills, design research projects in groups and individually, use research methods (quantitative, qualitative, mixed methods, system analysis, as well as methods of transdisciplinary)
K2_U06	graduates possess developed ability to integrate knowledge, handle uncertainty and complexity, design and implement innovation spaces, formulate judgements and communicate them to a wider audience
K2_W02	graduates have deep understanding of the principles and processes of sustainable development and resilience in social systems with special consideration of science, technology and society issues and thereby realizing the vulnerabilities (chances and risks) induced
K2_W03	graduates have deep understanding of the identification and specification underlying scientific methodologies and connected human-environment issues
K2_W05	graduates have deep understanding of the nature of human technology interactions and human computer interactions and their implications on the individual as well as on the diverse arena of interrelations and social innovation