

## COURSE OUTLINE: TIME SERIES ANALYSIS

### GENERAL

|                                                                                                                                                                                                                                                                       |                                                                 |                              |                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|------------------------------|----------------|
| <b>SCHOOL</b>                                                                                                                                                                                                                                                         | ECONOMICS AND BUSINESS                                          |                              |                |
| <b>ACADEMIC UNIT</b>                                                                                                                                                                                                                                                  | ECONOMICS                                                       |                              |                |
| <b>LEVEL OF STUDIES</b>                                                                                                                                                                                                                                               | UNDERGRADUATE                                                   |                              |                |
| <b>COURSE CODE</b>                                                                                                                                                                                                                                                    | ΜΠ801                                                           | <b>SEMESTER</b>              | 7th (Major B)  |
| <b>COURSE TITLE</b>                                                                                                                                                                                                                                                   | Time Series Analysis                                            |                              |                |
| <b>INDEPENDENT TEACHING ACTIVITIES</b><br><i>if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits</i> |                                                                 | <b>WEEKLY TEACHING HOURS</b> | <b>CREDITS</b> |
|                                                                                                                                                                                                                                                                       |                                                                 | 3                            | 6              |
|                                                                                                                                                                                                                                                                       |                                                                 |                              |                |
|                                                                                                                                                                                                                                                                       |                                                                 |                              |                |
| <i>Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).</i>                                                                                                                                              |                                                                 |                              |                |
| <b>COURSE TYPE</b><br><i>general background, special background, specialized general knowledge, skills development</i>                                                                                                                                                | Finance and Banking                                             |                              |                |
| <b>PREREQUISITE COURSES:</b>                                                                                                                                                                                                                                          | YES / NO                                                        |                              |                |
| <b>LANGUAGE OF INSTRUCTION and EXAMINATIONS:</b>                                                                                                                                                                                                                      | Greek                                                           |                              |                |
| <b>IS THE COURSE OFFERED TO ERASMUS STUDENTS</b>                                                                                                                                                                                                                      | No                                                              |                              |                |
| <b>COURSE WEBSITE (URL)</b>                                                                                                                                                                                                                                           | <a href="https://www.econ.uth.gr/">https://www.econ.uth.gr/</a> |                              |                |

### LEARNING OUTCOMES

#### Learning outcomes

*The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.*

*Consult Appendix A*

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

By attending and successfully completing the course, students will ideally be able to:

- Understand and apply **time series models** based on specific cases, aiming to replicate the mechanism through which time series observations are generated.
- Specify appropriate **time series models** for different datasets.
- Estimate, test, and evaluate **time series models**.
- Analyze **case studies** and provide solutions to **time series problems**.

### General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

|                                                                                                      |                                                             |
|------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| Search for, analysis and synthesis of data and information, with the use of the necessary technology | Project planning and management                             |
| Adapting to new situations                                                                           | Respect for difference and multiculturalism                 |
| Decision-making                                                                                      | Respect for the natural environment                         |
| Working independently                                                                                | Showing social, professional and ethical responsibility and |
| Team work                                                                                            | sensitivity to gender issues                                |
| Working in an international environment                                                              | Criticism and self-criticism                                |
| Working in an interdisciplinary environment                                                          | Production of free, creative and inductive thinking         |
| Production of new research ideas                                                                     | .....                                                       |
|                                                                                                      | Others...                                                   |
|                                                                                                      | .....                                                       |

Research, analysis, and synthesis of data and information, with a critical evaluation of findings.

Independent work and self-directed learning.

Evaluation and critical analysis of modern labor markets and the factors influencing their operation.

Formulation and assessment of policy proposals related to the labor market.

Exercise of critical thinking.

Promotion of free, creative, and inductive thinking.

## SYLLABUS

### Time Series Analysis

Time series analysis involves statistical techniques for analyzing data points collected or recorded at specific time intervals. It is widely used in economics, finance, business forecasting, and various scientific fields.

#### Key Topics in Time Series Analysis:

1. **Introduction to Time Series** – Importance, characteristics, and applications.
2. **Smoothing Methods** – Moving averages, exponential smoothing, error evaluation, adaptive response rate smoothing, Brown's linear exponential smoothing, double parameter smoothing, and second-degree exponential smoothing.
3. **Decomposition Methods and Time Series Analysis** – Trend, seasonality, and irregular components.
4. **Autocorrelation and Autoregressive Models** – Autocorrelation function, partial autocorrelation coefficients, moving average models (MA), and autoregressive moving average models (ARMA).
5. **Box-Jenkins Methodology** – Model identification, estimation, diagnostic checking, and ARIMA models for forecasting seasonal and non-seasonal time series.
6. **Stationarity and Cointegration Analysis** – Unit roots, spurious regression, tests such as Dickey-Fuller, Augmented Dickey-Fuller, and Phillips-Perron, as well as Engle-Granger cointegration and error correction models.
7. **Vector Autoregressive (VAR) Models** – Multivariate time series modeling and forecasting.
8. **Business Forecasting** – Qualitative approaches to predicting economic and financial conditions.

## TEACHING and LEARNING METHODS - EVALUATION

| <b>DELIVERY</b><br><i>Face-to-face, Distance learning, etc.</i>                                                                                                                                                                                                     | Face-to-face                                                                                                                                                                                                                                                                                  |  |          |                   |          |    |                                    |    |               |    |  |  |              |            |
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| <b>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</b><br><i>Use of ICT in teaching, laboratory education, communication with students</i>                                                                                                                         | Use of the e-class electronic platform for posting:<br>(a) lecture materials, (b) announcements, (c) exercises, case studies, and relevant articles.<br>- Utilization of electronic media for lecture presentations (PowerPoint).                                                             |  |          |                   |          |    |                                    |    |               |    |  |  |              |            |
| <b>TEACHING METHODS</b><br><i>The manner and methods of teaching are described in detail. Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching.</i> | <table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>39</td></tr><tr><td>Study and analysis of bibliography</td><td>61</td></tr><tr><td>Essay writing</td><td>80</td></tr><tr><td></td><td></td></tr><tr><td>Course total</td><td><b>180</b></td></tr></table> |  | Activity | Semester workload | Lectures | 39 | Study and analysis of bibliography | 61 | Essay writing | 80 |  |  | Course total | <b>180</b> |
| Activity                                                                                                                                                                                                                                                            | Semester workload                                                                                                                                                                                                                                                                             |  |          |                   |          |    |                                    |    |               |    |  |  |              |            |
| Lectures                                                                                                                                                                                                                                                            | 39                                                                                                                                                                                                                                                                                            |  |          |                   |          |    |                                    |    |               |    |  |  |              |            |
| Study and analysis of bibliography                                                                                                                                                                                                                                  | 61                                                                                                                                                                                                                                                                                            |  |          |                   |          |    |                                    |    |               |    |  |  |              |            |
| Essay writing                                                                                                                                                                                                                                                       | 80                                                                                                                                                                                                                                                                                            |  |          |                   |          |    |                                    |    |               |    |  |  |              |            |
|                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                               |  |          |                   |          |    |                                    |    |               |    |  |  |              |            |
| Course total                                                                                                                                                                                                                                                        | <b>180</b>                                                                                                                                                                                                                                                                                    |  |          |                   |          |    |                                    |    |               |    |  |  |              |            |
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| <p><i>educational visits, project, essay writing, artistic creativity, etc. The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS</i></p>                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                    |                   |                   |                     |     |                     |     |                     |     |              |             |
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| <p><b>STUDENT PERFORMANCE EVALUATION</b><br/> <i>Description of the evaluation procedure</i></p> <p><i>Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other. Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></p> | <p>The final grade will be determined as follows:</p> <table> <tr> <th><b>Assessment</b></th><th><b>Weight (%)</b></th></tr> <tr> <td><b>Assignment 1</b></td><td>20%</td></tr> <tr> <td><b>Assignment 2</b></td><td>40%</td></tr> <tr> <td><b>Assignment 3</b></td><td>40%</td></tr> <tr> <td><b>Total</b></td><td><b>100%</b></td></tr> </table> | <b>Assessment</b> | <b>Weight (%)</b> | <b>Assignment 1</b> | 20% | <b>Assignment 2</b> | 40% | <b>Assignment 3</b> | 40% | <b>Total</b> | <b>100%</b> |
| <b>Assessment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Weight (%)</b>                                                                                                                                                                                                                                                                                                                                  |                   |                   |                     |     |                     |     |                     |     |              |             |
| <b>Assignment 1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 20%                                                                                                                                                                                                                                                                                                                                                |                   |                   |                     |     |                     |     |                     |     |              |             |
| <b>Assignment 2</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 40%                                                                                                                                                                                                                                                                                                                                                |                   |                   |                     |     |                     |     |                     |     |              |             |
| <b>Assignment 3</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 40%                                                                                                                                                                                                                                                                                                                                                |                   |                   |                     |     |                     |     |                     |     |              |             |
| <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>100%</b>                                                                                                                                                                                                                                                                                                                                        |                   |                   |                     |     |                     |     |                     |     |              |             |

#### ATTACHED BIBLIOGRAPHY

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Core Textbooks for the Course</b></p> <ul style="list-style-type: none"> <li>• <b>Anagnostou, A.</b> (2024). <i>Classical &amp; Modern Time Series Models [Undergraduate textbook]</i>. Kallipos, Open Academic Editions. <u>DOI: 10.57713/kallipos-319</u></li> <li>• <b>Anagnostou, A.</b> (2024). <i>Classical &amp; Modern Time Series Models – Volume B [Undergraduate textbook]</i>. Kallipos, Open Academic Editions. <u>DOI: 10.57713/kallipos-1015</u></li> <li>• <b>Dimeleli, Sofia.</b> <i>Modern Methods of Time Series Analysis.</i></li> <li>• <b>Syriopoulos, Kostas.</b> <i>Analysis and Tests of Univariate Financial Time Series.</i></li> </ul> |
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