**SYLLABUS TO THE SUBJECT/SYLABUS DO PRZEDMIOTU**

|  |  |
| --- | --- |
| Item Name/Nazwa przedmiotu | **Modeling of economic processes** |
| Direction/Kierunek | **Management** |
| Form of study/Forma studiów | **Stationary** |
| Level of education/Poziom kształcenia | **Second degree** |
| Year/Rok | **1** |
| Semester/Semestr | **I** |
| Guide unit/Jednostka prowadząca | **Department of Econometrics and Statistics** |
| Drafter/Osoba sporządzająca | **PhD Wioletta Skrodzka** |
| Profile/Profil | **General academic** |
| Number of ECTS credits/Liczba punktów ECTS | **3** |

**TYPE OF CLASSES - NUMBER OF HOURS PER SEMESTER/RODZAJ ZAJĘĆ – LICZBA GODZIN W SEMESTRZE**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Lecture/Wykład | Exercise/Ćwiczenia | Laboratory/Laboratorium | Project/Projekt | Seminar/Seminarium |
| **15** |  | **30** |  |  |

**COURSE DESCRIPTION/OPIS PRZEDMIOTU**

**PURPOSE OF THE COURSE/CEL PRZEDMIOTU**

**C1.** Introduction of students to forecasting methods and tools used to model business processes.

**C2.** Acquiring by students the ability in selecting the form of a forecasting model of the economic process, its construction, verification, and estimation of forecast errors.

**C3.** Acquiring by students the ability in constructing forecasts using quantitative forecasting methods and available computer programs.

**PREREQUISITES FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCIES/WYMAGANIA WSTĘPNE W ZAKRESIE WIEDZY, UMIEJĘTNOŚCI I INNYCH KOMPETENCJI**

1. Knowledge of mathematical analysis, statistics and econometrics.
2. Knowledge of enterprise management methodology.

**LEARNING OUTCOMES/EFEKTY UCZENIA SIĘ**

**EU 1**. The student has the ability to make forecasts business processes using cause-and-effect models.

**EU 2**. The student has the ability to forecast using time series models.

**EU 3**. The student is able to construct a forecast using various forecasting methods and available computer programs and knows the possibilities of using them in modeling economic phenomena.

**EU 4**. The student is able to assess the size of the error committed in the process of predicting economic phenomena based on statistical measures of forecast accuracy.

**CURRICULUM CONTENT/TREŚCI PROGRAMOWE**

|  |  |
| --- | --- |
| **Form of classes/Forma zajęć –LECTURE/ WYKŁADY** | **Number of hours/Ilość godzin** |
| **W 1** The role of forecasts in a market economy. Definition of basic concepts. Assessment of forecast accuracy. | **1** |
| **W 2** Forecasting based on time series. Introduction (components of time series and principles of their extraction). Specificity of adaptive methods. Smoothing methods (moving average method, exponential smoothing). | **1** |
| **W 3** Adaptive models in computer packages. |  |
| **W 4** Estimating ex post prediction errors. | **1** |
| **W 5** Forecasting business processes using the classical cause-effect model. | **1** |
| **W 6** Linear Regression Model | **1** |
| **W 7** Computer programs used for linear regression analysis | **1** |
| **W 8** Estimating ex ante prediction errors. Point and interval forecasts of macro- and microeconomic variables. | **1** |
| **W 9** Nonlinear regression | **1** |
| **W 10** Periodic fluctuations and the forecasting process. | **1** |
| **W 11** Models of time series with seasonal fluctuations | **1** |
| **W 12** Holt’s linear method | **1** |
| **W 13** Holt-Winters’ method | **1** |
| **W 14** Additive and multiplicative decomposition | **1** |
| **W 15** Klein’s method | **1** |
| **Form of classes/Forma zajęć – LABORATORY/LABORATORIUM** | **Number of hours/Ilość godzin** |
| **L1-2** An introduction to forecasting issues. Assessment of accuracy and acceptability of forecasts. | **2** |
| **L3-4** Specificity of adaptive methods. Adaptive models in computer packages. | **2** |
| **L5-6** Exponential smoothing | **2** |
| **L7-8** The sources and measures of forecast errors. Estimating ex post prediction errors. | **2** |
| **L9-10** Forecasting business processes using the classical cause-effect model. | **2** |
| **L11-12** Linear Regression Model | **2** |
| **L13-14** Computer programs used for linear regression analysis | **2** |
| **L15-16** Estimating ex ante prediction errors. | **2** |
| **L17-18** Colloquium | **2** |
| **L19-20** Nonlinear regression | **2** |
| **L21-22** Models of time series with seasonal fluctuations | **2** |
| **L23-24** Holt’s linear method | **2** |
| **L25-26** Holt-Winters’ method | **2** |
| **L27-28** Additive and multiplicative decomposition | **2** |
| **L29-30** Colloquium | **2** |

**DIDACTIC TOOLS/NARZĘDZIA DYDAKTYCZNE**

1. Textbooks, articles and scripts.
2. Possibility of using e-learning platform.
3. *Gretl, Excel*
4. Books and magazines included in library databases.
5. Lecture with the use of multimedia presentations.

**METHODS OF ASSESSMENT (F- FORMATIVE, P - SUMMATIVE)/SPOSOBY OCENY ( F – FORMUJĄCA, P – PODSUMOWUJĄCA)**

F1. Participation in the discussion (activity during classes)

F2. Project executive

P1. Colloquium

**STUDENT WORKLOAD/OBCIĄŻENIE PRACĄ STUDENTA**

|  |  |  |
| --- | --- | --- |
| **Form of activity** | **Average number of hours for**  **realization of the activity** | |
| **[h]** | **ECTS** |
| Contact hours with the teacher (lecture, exercise)/Godziny kontaktowe kontaktowe z nauczycielem (wykłady, ćwiczenia) | 45 | 1,8 |
| Preparing for the exercise/Przygotowanie do ćwiczeń | 15 | 0,6 |
| Reading the indicated literature/Zapoznanie się ze wskazaną literaturą | 10 | 0,4 |
| Consultations**/**Konsultacje | 5 | 0,2 |
| **TOTAL NUMBER OF ECTS POINTS FOR ITEM/SUMARYCZNA LICZBA PUNKTÓW ECTS**  **DLA PRZEDMIOTU** | **75h** | **3 ECTS** |

**BASIC AND SUPPLEMENTARY LITERATURE/LITERATURA PODSTAWOWA I UZUPEŁNIAJĄCA**

**Basic Literature/Literatura podstawowa:**

1. Maddala G. S. , Introduction to Econometrics, Wiley, New York 2009.
2. Clements M., Red P., A companion to economic forecasting, Blackwell Publishing, 2004.
3. Hyndman R. J., Athanasopoulos G., Forecasting: Principles and Practice, OTexts, 2021, <https://otexts.com/fpp3/>
4. Cieślak M. (red.), *Prognozowanie gospodarcze: metody i zastosowania*, PWN, Warszawa 2012
5. Zeliaś A., Pawełek B., Wanat S., *Prognozowanie ekonomiczne*, PWN, Warszawa 2022
6. Błaszczuk D., *Wstęp do prognozowania i symulacji*, Wydawnictwo PWN, Warszawa 2020
7. Kufel T., *Ekonometria Rozwiązywanie problemów z wykorzystaniem programu GRETL*, PWN, Warszawa 2013
8. Maciąg A., Pietroń R., Kukla S., *Prognozowanie i symulacje w przedsiębiorstwie.,*PWE, Warszawa 2013
9. [Dittmann I.,](https://livro.pl/autor/436517/Dittmann+Iwona.html)[Szabela-Pasierbińska E.](https://livro.pl/autor/438228/Szabela-Pasierbińska+Ewa.html), [Szpulak A.](https://livro.pl/autor/438229/Szpulak+Aleksandra.html), [Dittmann P.](https://livro.pl/autor/509583/Dittmann+Paweł.html), *Prognozowanie w zarządzaniu przedsiębiorstwem.,* Wydawnictwo Nieoczywiste, Warszawa, 2017

**Supplementary Literature/Literatura uzupełniająca:**

1. Dittman P., Prognozowanie w przedsiębiorstwie, Wydawnictwo Nieoczywiste, Warszawa 2022

2.Gajda J., Prognozowanie i symulacja w ekonomii i zarzadzaniu, Wydawnictwo C.H. Beck, Warszawa 2017

3. Guzik B., Appenzeller D., Jurek W., Prognozowanie i symulacje: wybrane zagadnienia, Wydawnictwo Akademii Ekonomicznej w Poznaniu, Poznań 2005

4. Osińska M. (red.), Ekonometria współczesna, Wydawnictwo „Dom Organizatora”, Toruń 2007

5. Suchwałko A.,Zagfański A., Analiza i prognozowanie szeregów czasowych, PWN, Warszawa 2019

6. Skrodzka W. *Comparative analysis of sustainable energy development in Poland against selected European Union countries*., [w:] Proceedings of the 4th International Conference on European Integration 2018 (red.) STANICKOVA Michaela, MELECKY Lukas, KOVAROVA Eva, DVOROKOVA Katerina, Ostrava, 2018, s.1297-1307.

7.Skrodzka W., *The Impact of the Pandemic on the Investments Effectiveness in the Shares of IT Sector Companies Listed on the Warsaw Stock Exchange*., Polish Journal of Management Studies, Vol. 24, nr2, 2021

8. Gołȩbiewski, D.; Barszcz, T.; Skrodzka, W.; Wojnicki, I.; Bielecki, A*. A New Approach to Risk Management in the Power Industry Based on Systems Theory*. *Energies,*2022

9. Kot I., Sukiennik K., Szczepanik T., Symulacje i analizy statystyczne a systemy komputerowe w nowoczesnym przedsiębiorstwie., *Zarządzanie w dynamicznym środowisku biznesowym. Wyzwania i strategie dla organizacji* (red.) PUTO Agnieszka. Wyd. PCz. , Częstochowa 2024

**INSTRUCTOR OF THE COURSE (NAME, SURNAME, E-MAIL ADDRESS)/PROWADZĄCY ZAJĘCIA (IMIĘ, NAZWISKO, ADRES E-MAIL)**

1. PhD Wioletta Skrodzka - wioletta.skrodzka@pcz.pl

2. PhD Katarzyna Sukiennik – katarzyna.sukiennik@pcz.pl

**MATRIX OF THE IMPLEMENTATION OF LEARNING OUTCOMES/MACIERZ REALIZACJI EFEKTÓW UCZENIA SIĘ**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Learning Outcome/Efekt uczenia się** | **Reference an effect to program-wide defined effects/ Odniesienie danego efektu do efektów zdefiniowanych dla całego programu** | **Course objectives/Cele przedmiotu** | **Curriculum content/Treści programowe** | **Teaching tools/Narzędzia dydaktyczne** | **Method of evaluation/Sposób oceny** |
| EU 1 | K\_W05;K\_W06;K\_W08;K\_U01;  K\_U04;K\_U06; K\_K03 | C1, C2, C3 | W1, W4-5, W8; L1-2; L7-10; | 1,2,3,4,5 | F1, F2, P1 |
| EU 2 | K\_W05;K\_W06;K\_W08;K\_U01;  K\_U04;K\_U06; K\_K03 | C1, C2, C3 | W1-W15; L1-L30 | 1,2,3,4,5 | F1, F2, P1 |
| EU 3 | K\_W05;K\_W06;K\_W08;K\_U01;  K\_U04;K\_U06; K\_K03 | C1, C2, C3 | W2-W15;L1-30 | 1,2,3,4,5 | F1, F2, P1 |
| EU 4 | K\_W05;K\_W06;K\_W08;K\_U01;  K\_U04;K\_U06; K\_K03 | C1, C2, C3 | W2-W15;L1-30 | 1,2,3,4,5 | F1, F2, P1 |

**FORM OF ASSESSMENT - DETAILS/FORMY OCENY – SZCZEGÓŁY**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Per grade 2/**  **Na ocenę 2** | **Per grade 3/**  **Na ocenę 3** | **Per grade 4/**  **Na ocenę 4** | **Per grade 5/**  **Na ocenę 5** |
| **Effect 1/ Efekt 1** | The student does not know the statistical and econometric tools used for forecasting business processes using cause-and-effect models | The student knows selected statistical and econometric tools used for forecasting business processes using cause-and-effect models | The student knows most of the statistical and econometric tools used for forecasting business processes using cause-and-effect models. | The student fully knows the tools statistical and econometric used for forecasting business processes using cause-and-effect models |
| **Effect 2/**  **Efekt 2** | The student does not know the principles of building forecasts using time series models. | The student knows some principles of building forecasts using time series models. | The student knows most of the principles of building forecasts using time series models and the possibilities of using them. | The student knows the principles of building forecasts using time series models and independently analyzes the possibilities of their use in practice. |
| **Effect 3/**  **Efekt 3** | The student is not able to construct a forecast and is not able to use available computer packages and does not know the possibilities of using them in modeling economic phenomena | The student is able to partially construct a forecast using selected forecasting methods and available computer packages and selectively knows the possibilities of using them in modeling economic phenomena | The student is able to correctly construct a forecast using selected forecasting methods and available computer packages and is mostly familiar with the possibilities of using them in modeling economic phenomena | The student is able to correctly construct a forecast using various forecasting methods and available computer packages and is fully familiar with the possibilities of using them in modeling economic phenomena |
| **Effect 4/**  **Efekt 4** | The student is unable to independently assess the size of the error made in the prediction process | The student is partially able to assess the size of the error made in the prediction process. | The student is able to correctly assess the size of the error made in the prediction process. | The student is able to independently and critically assess the size of the error made in the prediction process and interpret the results in terms of the content presented during classes. |

\*A 3.5 half grade is awarded in the case of full credit for the learning outcomes with a 3.0 grade, but the student has not fully absorbed the learning for a 4.0 grade. A half-grade of 4.5 is awarded in the case of full credit for the learning outcomes with a 4.0 grade, but the student has not fully assimilated the learning outcomes for a grade of 5.0./ \*Ocena połówkowa 3.5 jest wystawiana w przypadku pełnego zaliczenia efektów uczenia się na ocenę 3.0, ale student nie przyswoił w pełni uczenia się na ocenę 4.0. Ocena połówkowa 4.5 jest wystawiana w przypadku pełnego zaliczenia efektów uczenia się na ocenę 4.0, ale student nie przyswoił w pełni efektów uczenia się na ocenę 5.0.

**OTHER USEFUL INFORMAION ABOUT THE ITEM/INNE PRZYDATNE INFORMACJE O PRZEDMIOCIE**

Information where you can read presentations for classes, etc. - Information is provided during the first class and sent electronically to the addresses of individual dean’s groups./ Informacje, gdzie można zapoznać się z prezentacjami na zajęcia itp. - Informacje udzielane są podczas pierwszych zajęć i przesyłane drogą elektroniczną na adresy poszczególnych grup dziekańskich

Information on the place of classes - Information can be found on the website of the Faculty of Management and in the USOS system./ Informacja o miejscu zajęć – Informacje znajdują się na stronie internetowej Wydziału Zarządzania oraz w systemie USOS.

Information on the date of classes (day of the week/time) - Information can be found on the website of the Faculty of Management and in the USOS system./ Informacja o terminie zajęć (dzień tygodnia/godzina) – Informacje znajdują się na stronie internetowej Wydziału Zarządzania oraz w systemie USOS

Information about consultations (hours + place) - Information is given during the first classes, it is also available on the website of the Faculty of Management./ Informacje na temat  godzin i miejsca konsultacji znajdują się na stronie internetowej Wydziału Zarządzania oraz podawane są na pierwszych zajęciach ze studentami.