# COURSE DESCRIPTION CARD

NOTE: If the course includes lectures and classes, the Course Description Card applies to both types of instruction.

| | |
|---|---|
| **1.** Course title:<br>in Polish / in English<br>Metody wielowymiarowe / Multivariate Methods | **2.** Course code:<br>Number of ECTS credits: 5<br>Course completion mode: E<br>Course commenced / Year 2019/2020 |

**3.** Major: Finance and Accounting

**4.** Department of major coordinator: Department of Banking and Financial Markets

**5.** Name of course instructor: Lecture dr hab. Tomasz Żądło, prof. UE, dr Rafał Kucharski
Classes --- Lab classes ---
**Examiner** dr hab. Tomasz Żądło, prof. UE, dr Rafał Kucharski

**6.** Department of course instructor: Department of Statistics, Econometrics and Mathematics

**7.** Number of contact hours with students:

| Type of instruction | Full-time study | Part-time study |
|---|---|---|
| lectures | 45 | - |
| classes | - | - |
| foreign language classes | - | - |
| lab classes | - | - |
| seminars | - | - |
| e-learning | - | - |
| other | - | - |
| **Total hours** | 45 | - |
| examination (hours) | 3 | - |

**8.** Course timeframe - no. of semesters: 1

Course commencement / Year 1

Course commencement / Semester 1

| | |
|---|---|
| **9.** Level of tertiary education: 2 | **10.** Course status<br>□ Compulsory for the major ...<br>□ Compulsory for the specialization X<br>□ Elective … |

**11.** Course prerequisites
Compulsory: descriptive statistics
Recommended:

**12.** Course objectives: to give intensive practice in multivariate analyses

**13.** Teaching and learning methods:

**A.** Direct student-instructor contact:

| No. | Teaching methods | Description | Number of hours | |
|---|---|---|---|---|
| | | | Full-time study | Part-time study |
| 1. | practice exercises | solving exercises with R | 25 | 0 |
| 2. | formal teaching | formal lecture | 20 | 0 |
| 3. | | | | |
| … | | | | |
| Total | | | AS: 45 | AN: 0 |

**B.** Self-study:

| No. | Learning methods | Description | Number of hours | |
|---|---|---|---|---|
| | | | Full-time study | Part-time study |
| 1. | practice exercises | | 30 | 0 |
| 2. | individual work | using PC | 30 | 0 |
| 3. | individual literature studies | research and reading | 20 | 0 |
| … | | | | |
| Total | | | BS: 80 | BN:0 |

Total AS+BS = 125
Examination (E) = 3
Total AS+BS+E=128

Total AN+BN = 0
Examination (E) = 0
Total AN+BN+E = 0

**14.** Key words: data analysis, estimation, statistical multivariate methods

**15.** Course content:

1. R – software for data analyses
2. Multivariate random variables
3. Parametric and nonparametric tests in R
4. Nonparametric methods of point and interval estimation
5. Linear model
6. Logit and probit models
7. Principal components analysis

**16.** Course learning outcomes as related to the learning outcomes of the major and methods for assessing student attainment

| Intended learning outcomes of the major / Symbols | Intended learning outcomes of the course | Methods for assessing student learning outcomes | Documentation |
|---|---|---|---|
| <u>Knowledge</u> | | | |
| FiR2_W02# | Student deeply knows and understands methods of multivariate analysis | midterm test and final test | test scripts |
| <u>Skills</u> | | | |
| FiR2_U04# | Student is able to interpret results and describe multivariate analyses in English | midterm test and final test | test scripts |
| <u>Social competences</u> | | | |
| FiR2_K01# | Student sees the necessity of self-education in the area of multivariate methods | midterm test and final test | test scripts |

**17.** Method for determining the final course grade:

| No. | Methods for awarding credits and course completion requirements | Description | Percentage of the final course grade* |
|---|---|---|---|
| 1. | midterm test | solving exercises using R | 50% |
| 2. | final test | solving exercises using R | 50% |
| | | | |

* If students are required to obtain both a class grade and an exam grade, the class grade constitutes at least 30% of the final course grade.

**18.** Reading list

Mandatory readings:

- Y. Fujikoshi, V.V. Ulyanov, R. Shimizu: Multivariate Statistics. High-Dimensional and Large-Sample Approximations. Wiley, 2010.
- J. F. Hair: Multivariate data analysis. Pearson, 2014.
- Tabachnick, B,G., Fidell L.S.: Using Multivariate Statistics. Pearson, 2007.
- F. Husson, S. Le, J. Page: Exploratory multivariate analysis by example using R. CRC Press, 2011.
- K.V. Mardia, J.T. Kent, J.M. Bibby: Multivariate analysis. Academic Press, 1979.

Suggested readings:

- J. Albert, M. Rizzo: R by Example. Concepts to Code. Springer, 2012. (https://link.springer.com/book/10.1007/978-1-4614-1365-3).
- Alexander, C.: Practical financial econometrics. Wiley, 2008.
- Alexander, C.: Quantitive methods in finance. Wiley, 2008.
- W. N. Venables, B. D. Ripley : Modern Applied Statistics with S-PLUS . Springer, 1999. (https://link.springer.com/book/10.1007/978-1-4757-3121-7).

**19.** Language of instruction:
English

**20.** Course instructors' recommendations:

lectures in computer laboratories (MsOffice, R, RStudio)