# COURSE DESCRIPTION

## 1. Information about the programme

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| **1.1** Institution of higher education | **Alexandru Ioan Cuza University of Iasi** |
| **1.2** Faculty | **Faculty of Economics and Business Administration** |
| **1.3** Department | **Department of Finance, Money and Public Administration** |
| **1.4** Field of study | **Finance** |
| **1.5** Level | **Master** |
| **1.6** Study programme/ Qualification | **Finance and Risk Management** |

## 2. Information about the course

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| **2.1** Course name | **Advanced Mathematics for Economics** | | | | | | |
| **2.2** Course coordinator | **Orest IFTIME** (Professor – University of Groningen, Netherlands) | | | | | | |
| **2.3** Seminar coordinator | **Delia DIACONAȘU** (PhD) | | | | | | |
| **2.4** Year of study | **1** | **2.5** Semester | **2** | **2.6** Type of assessment | **EVP** | **2.7** Course status | **C** |

*\* C – Compulsory / E - Elective*

## 3. Total estimated time (hours alloted to teaching activities per semester)

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| **3.1** Number of hours per week | **3** | of which: **3.2** lecture | **1** | **3.3** seminar/lab | **2** |
| **3.4** Number of hours in the curriculum | **42** | of which: **3.5** lecture | **14** | **3.6** seminar/lab | **28** |
| Time distribution | | | | | hrs |
| Study of the textbook, coursebook, bibliography and lecture notes | | | | | **36** |
| Additional research in the library, online and on the field | | | | | **12** |
| Preparation of seminars/labs, homework, projects, portfolios and essays | | | | | **32** |
| Tutorials | | | | | **1** |
| Assessment | | | | | **2** |
| Other activities.................................. | | | | | |

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| **3.7** Total number of self-study hours | **83** |
| **3.8** Total number of hours per semester | **125** |
| **3.9** Number of credits | **5** |

## 4. Prerequisites (if applicable)

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| **4.1** Curriculum-based | **-** |
| **4.2** Competence-based | **Basic Calculus** (recommended) |

## 5. Conditions (if applicable)

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| **5.1** For lectures | ▪ Attendance at lectures is strongly encouraged.<br>▪ Operation of cell phones and other handheld electronic devices for sending and reading text messages and e-mails, recording or other disruptive activities for fellow students and instructor is not allowed. Devices should be turned off or set to the vibrate mode before the start of the lecture. |

| **5.2** For seminars / labs | ▪ Attendance is compulsory at minimum 70% of the labs. In case of absence, the instructor should be informed in advance.<br>▪ Operation of cell phones and other handheld electronic devices for sending and reading text messages and e-mails, recording or other disruptive activities for fellow students and instructor is not allowed. Devices should be turned off or set to the vibrate mode before the start of the laboratory. |
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## 6. Specific competencies

| Professional competencies | **C1.** Analysis of the theoretical and practical aspects of financial markets, models, instruments that are used in the management of risks.<br>**C2.** Adequate use of mathematical and statistical concepts, methods and techniques in assessing risks and performing independent research in finance.<br>**C3.** Evaluation of the main risk factors for organizations and financial systems.<br>**C4.** Implementing effective financial management and reporting within the business environment to ensure value creation.<br>**C5.** Ensuring effective and appropriate governance and management of risk within an organization, in the context of an overall ethical framework. |
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| Transversal competencies | **CT1.** Application of the professional ethical norms and values in decision-making and undertaking of complex professional tasks, independently or within a team.<br><br>**CT2.** Human resources planning within a group or organization, in the context of awareness of own responsibility for professional outcomes.<br><br>**CT3.** Assuming the need for continuous development to create prerequisites for career progression and adapt own professional and managerial competencies to the economic dynamics. |

## 7. Course objectives (provided by the specific competencies grid)

| 7.1. Main objective | The course aims to develop an understanding of the mathematical theory and techniques relevant for applications in economics.<br>Students become familiar with the several mathematical tools and improve their analytical skils in order to prepare them for a job as company analyst, financial analyst or risk manager.<br>After passing the course, the student is able to apply the mathematicals tools to various models in economics. |
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| 7.2. Specific objectives | On completion of the course, students will be able to:<br>▪ Write logical mathematical argumentation.<br>▪ Use the key concepts and techniques from algebra.<br>▪ Analyze the properties of functions of one variable.<br>▪ Solve optimization problems for functions of one variable.<br>▪ Differentiate functions of several variables.<br>▪ Use the basic rules of integral calculus.<br>▪ Demonstrate basic matrix algebra<br>▪ Apply basic mathematical tools to simple economics problems.<br>▪ Contrast risk valuation methods |

**8. Content**

| 8.1 | Lectures | Teaching methods | Observations (hours & readings) |
|---|---|---|---|
| 1. | Functions | Lecture | 1hrs: EMEA(5) |
| 2. | Differentiation | Lecture | 1hrs: EMEA(6, 7) |
| 3. | Integrals | Lecture | 1hrs: EMEA(9) |
| 4. | Computing Integrals & Applications | Lecture | 1hrs: EMEA(9) |
| 5. | Matrix and Matrix Operations | Lecture | 1hrs: EMEA(15) |
| 6. | Gaussian Elimination | Lecture | 1hrs: EMEA(15) |
| 7. | Determinants and Matrix Inverses | Lecture | 1hrs: EMEA(16) |
| 8. | Eigenvalues and Eigenvectors | Lecture | 1hrs: FMEA(1) |
| 9. | Implicit Differentiation | Lecture | 1hrs: EMEA(12) |
| 10. | Differential of a Function | Lecture | 1hrs: EMEA(7) |
| 11. | Differentiating Systems of Equations | Lecture | 1hrs: EMEA(12) |
| 12. | Topics in integration | Lecture | 1hrs: FMEA(4) |
| 13. | First order equations | Lecture | 1hrs: FMEA(5) |
| 14. | Second order equations | Lecture | 1hrs: FMEA(6) |

**Bibliography**
**Main readings:**
▪ Sydsaeter, K., P. Hammond, A. Strom and A. Carvajal (2016) *Essential Mathematics for Economic Analysis*, 5th edition, Pearson (EMEA)
▪ Sydsaeter, K., P. Hammond, A. Seierstad and A. Strom (2008) *Further Mathematics for Economic Analysis*, 2nd edition, Pearson (FMEA)
**Additional readings:**
Other readings such as cases, simulations, journal papers, press articles will be provided periodically throughout the course via FEAA eLearning platform, e-mail or handed-in in class.

| 8.2 | Seminars / Labs | Teaching methods | Observations (hours & readings) |
|---|---|---|---|
| 1. | Functions | Tutorial, Problem sets | 2hrs: EMEA(5) |
| 2. | Differentiation | Tutorial, Problem sets | 2hrs: EMEA(6, 7) |
| 3. | Integrals | Tutorial, Problem sets | 2hrs: EMEA(9) |
| 4. | Computing Integrals & Applications | Tutorial, Problem sets | 2hrs: EMEA(9) |
| 5. | Matrix and Matrix Operations | Tutorial, Problem sets | 2hrs: EMEA(15) |

| 6. | Gaussian Elimination | Tutorial, Problem sets | 2hrs: EMEA(15) |
|---|---|---|---|
| 7. | Determinants and Matrix Inverses | Tutorial, Problem sets | 2hrs: EMEA(16) |
| 8. | Eigenvalues and Eigenvectors | Tutorial, Problem sets | 2hrs: FMEA(1) |
| 9. | Implicit Differentiation | Tutorial, Problem sets | 2hrs: EMEA(12) |
| 10. | Differential of a Function | Tutorial, Problem sets | 2hrs: EMEA(7) |
| 11. | Differentiating Systems of Equations | Tutorial, Problem sets | 2hrs: EMEA(12) |
| 12. | Topics in integration | Tutorial, Problem sets | 2hrs: FMEA(4) |
| 13. | First order equations | Tutorial, Problem sets | 2hrs: FMEA(5) |
| 14. | Second order equations | Tutorial, Problem sets | 2hrs: FMEA(6) |

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**9. Corroboration of the course content with the expectations of community representatives, professional associations and representative employers from the programme's related field**

This course provides students with the core knowledge, skills, and abilities that are generally accepted and applied by finance, investment and risk management professionals throughout the world. Topics are selected in accordance to the requirements of Charted Financial Analyst (CFA) and Professional Risk Manager (PRM) world-leading certifications for finance and risk management, to offer the adequate preparation for CFA and PRM exams.

The content is correlated to that of the course *Mathematics for Pre-MSc* taught by the coordinator at the University of Groningen and is continuously updated based on the feedback of students and alumni.

Moreover, this is a student-centered course that follows the best practices of learning and teaching in graduate education through the adoption of a variety of active-learning instructional methods.

**10. Assessment**

| Type of activity | 10.1 Assessment criteria (based on the course learning objectives) | 10.2 Assessment methods | 10.3 Weight in final grade (%) |
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| **10.4** Lectures | ▪ Accuracy of writing logical mathematical argumentation.<br>▪ Clarity of demonstrations following the steps indicated<br>▪ Depth of understading notions such as functions, | **Written Project** | **50%** |

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| **10.5** Seminar/ Labs | ▪ matrix and systems<br>▪ Quality of the solution proposed to the economical problems<br>▪ Accuracy of computing derivatives, integrals and the general rules of calculus<br>▪ Quality of transfering knowledge from theory to economical examples | | |
| | ▪ Clarity of speech and ideas and quality of argument, introduction and conclusion in the oral examination<br>▪ Quality of the dicussion, using apropriate vocabulary, logical deduction and sound reasoning<br>▪ Accuracy of using the notions learned in the right context, with the correct meaning in order to convey the desired ides<br>▪ Depth of understanding proven by using the appropriate examples in relation to the notion explained<br>▪ Accuracy of definitions used in the argumentation<br>▪ Quality of demonstrations including all necessary steps | **Oral examination** | **50%** |

| **10.6** Minimum performance standard |
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| ▪ Demonstration of the ability to use mathematical language to explain economic phenomenon.<br>▪ Proof of the ability to produce accurate computation of function values, derivatives, integrals and operations with matrix.<br>▪ Demonstration of the ability to explain a simple definition from the ones studied in the course.<br>▪ Correct answers provided to at least half of questions in the written and oral examinations.<br>▪ A minimum passing grade of 5, computed as $F = 0.5 \times W + 0.5 \times O$, where F – final grade, W – written project grade, O – oral examination grade. |

Date      Course Coordinator      Seminar Coordinator
20.09.2023      Dr. Orest IFTIME      Dr. Delia DIACONAȘU

Date of approval      Head of Department
26.09.2023      Prof. dr. Ovidiu STOICA