# COURSE OUTLINE

## (1) GENERAL

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| **SCHOOL** | *SCHOOL OF SCIENCE* |
| **ACADEMIC UNIT** | *COMPUTER SCIENCE* |
| **LEVEL OF STUDIES** | *UNDERGRADUATE* |
| **COURSE CODE** | **204ΓΥΥΚ**      **SEMESTER**   2<sup>nd</sup> |
| **COURSE TITLE** | *MATHEMATICS II* |

| **INDEPENDENT TEACHING ACTIVITIES** *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* | **WEEKLY TEACHING HOURS** | **CREDITS** |
|---|---|---|
| *Lectures* | *2* | *3* |
| *Seminars and Exercises* | *2* | *2* |
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| *Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).* | | |

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| **COURSE TYPE** *general background, special background, specialised general knowledge, skills development* | *General Background* |
| **PREREQUISITE COURSES:** | *MATHEMATICS I* |
| **LANGUAGE OF INSTRUCTION and EXAMINATIONS:** | *Greek* |
| **IS THE COURSE OFFERED TO ERASMUS STUDENTS** | *No* |
| **COURSE WEBSITE (URL)** | *https://moodle.cs.ihu.gr/moodle/course/view.php?id=15* |

## (2) LEARNING OUTCOMES

*The course focuses on the concepts of Infinite Calculus, Linear Algebra, and Probability Theory, as well as on their practical applications for problem solving.*

*Specifically, as outcome of completing the course, the student will be able to:*
- Identify and solve systems of linear equations, utilizing augmented matrix, elementary row operations and reduced echelon form.
- Execute all basic matrix operations.
- Calculate the inverse of a matrix and utilize the properties of the determinants.
- Solve basic differential equations.
- Solve double, triple, and curve integrals.
- Explain and utilize the rules of probability calculus, including the concepts of mutual exclusive events, conditional probability, dependent and independent events.
- Distinguish quantitative and categorical data and identify suitable graphical and table-based techniques.
- Interpret metrics regarding the central tendency and the variation of a data set.
- Utilize the models of Binomial distribution, Poisson distribution, and Normal Distribution.
- Utilize the correlation factors and the equations of linear regression.
- Identify confidence intervals and utilize the *t* distribution.

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Adapting to new situations
- Decision-making
- Working independently
- Team work
- Criticism and self-criticism
- Production of free, creative and inductive thinking

## (3) SYLLABUS

- Linear Algebra: Matrices, matrix operations, determinants, linear systems, eigenvalues, eigenvectors, matrix order.
- Arithmetical methods: Solving linear systems, solving differential equations
- Differential and Integral Calculus: Double/triple integrals, generalized integrals, curve integrals
- Probabilities/Statistics: Basic elements of the probability theory, conditional probability and

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| Bayes theorem, random variables, distributions of discrete (Binomial, Poisson) and continuous (Normal) random variables, descriptive statistics, correlation and regression, confidence intervals, application of the t-student distribution. |

## (4) TEACHING and LEARNING METHODS - EVALUATION

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| **DELIVERY**<br>*Face-to-face, Distance learning, etc.* | *Face-to-face (in class)* |
| **USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY**<br><br>*Use of ICT in teaching, laboratory education, communication with students* | *Supporting learning process through the online platform e-class* |
| **TEACHING METHODS**<br>*The manner and methods of teaching are described in detail.*<br>*Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.*<br><br>*The student's study hours for each lear*ning activity are given as well as the hours of non-directed study according to the principles of the ECTS | <table><tr><td><b><i>Activity</i></b></td><td><b><i>Semester workload</i></b></td></tr><tr><td><i>Lectures</i></td><td><i>26x2 = 52 hours</i></td></tr><tr><td><i>Seminars and Exercises</i></td><td><i>26x2 = 52 hours</i></td></tr><tr><td><i>Independent Study</i></td><td><i>21 hours</i></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td><i>Course total</i></td><td><b><i>125 hours</i></b></td></tr></table> |
| **STUDENT PERFORMANCE EVALUATION**<br>*Description of the evaluation procedure*<br><br>*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*<br><br>*Specifically-defined evaluation criteria are given, and if and where they are accessible to students.* | *Total grade (100%) final written examination* |

## (5) ATTACHED BIBLIOGRAPHY

*[1] Bird John, "Bird's Μαθηματικά για Μηχανικούς-Από τις Βασικές Αρχές έως τους Ολοκληρωτικούς Μετασχηματισμούς", Broken Hill Publishers Ltd, 2022.*
*[2] Μυλωνάς Νικόλαος, Σχοινάς Χ., Παπασχοινόπουλος Γ., "Λογισμός Συναρτήσεων μιας Μεταβλητής και Γραμμική Άλγεβρα", Εκδόσεις Τζιόλα, Θεσσαλονίκη, 2017.*
*[3] Μυλωνάς Νικόλαος, Σχοινάς Χ., Παπασχοινόπουλος Γ., "Λογισμός Συναρτήσεων Πολλών Μεταβλητών & Εισαγωγή στις Διαφορικές Εξισώσεις", Εκδόσεις Τζιόλα, Θεσσαλονίκη, 2016.*
*[4] Μυλωνάς Νίκος, «Διαφορικός και Ολοκληρωτικός Λογισμός Συναρτήσεων Πολλών Μεταβλητών», εκδ. Τζιόλα, Θεσσαλονίκη, 2014.*
*[5] Robert T. Smith, Roland B. Minton, Calculus, McGraw Hill, 4th edition, 2012.*
*[6] Papoulis A., Pillai S.U., "Πιθανότητες, τυχαίες μεταβλητές και στοχαστικές διαδικασίες", 4η έκδοση ΤΖΙΟΛΑ, Θεσσαλονίκη, 2019.*
*[7] Κολυβά - Μαχαίρα Φωτεινή, Μπόρα - Σέντα Ευθυμία, Μπράτσας Χαράλαμπος, "Στατιστική", Εκδόσεις ΖΗΤΗ, Θεσσαλονίκη, 2018.*

[8] Τσιάντος Βασίλης, "Ανώτερα Μαθηματικά για Μηχανικούς", Εκδόσεις Τζιόλα, Θεσσαλονίκη, 2005.
[9] Σάλτας Βασίλειος, "Μαθηματικά II: Θεωρία και Πράξη", Εκδόσεις Κλειδάριθμος, Αθήνα, 2011.