

Matlab

1. **Course number and name:** 020MATNI4 MATLAB
2. **Credits and contact hours:** 2 ECTS credits, 1x1:15 contact hours
3. **Name(s) of instructor(s) or course coordinator(s):** Aicha El Cheikh, Elie Nicolas, Elie Hleihel
4. **Instructional materials:** PowerPoint Slides

5. **Specific course information**

a. **Catalog description:**

This course covers various key aspects of MATLAB and Simulink, with a particular focus on symbolic computation in calculus and algebra, matrix calculations, programming, and an introduction to Simulink. Students will have the opportunity to explore the advanced features of MATLAB in depth, with an emphasis on its application in different engineering fields.

Symbolic calculus and algebra enable students to manipulate complex mathematical expressions, simplify equations, compute derivatives and integrals, and solve systems of symbolic equations. Students will learn to manipulate matrices and vectors and perform essential matrix operations. Additionally, the course also covers practical aspects of MATLAB programming, teaching students how to write custom scripts and functions.

Furthermore, the course provides an introduction to Simulink, MATLAB's graphical environment dedicated to modeling and simulating dynamic systems.

In summary, this course provides students with a comprehensive understanding of MATLAB and Simulink, emphasizing their application in engineering. Topics include symbolic algebra, matrix calculations, essential programming skills in MATLAB, and an introduction to Simulink for modeling and simulating dynamic systems.

b. **Prerequisites:** 020ANGNI1 General Analysis and 020IF1NI2 Programming 1

c. **Required/Selected Elective/Open Elective:** Required

6. **Educational objectives for the course**

a. **Specific outcomes of instruction:**

- Utilize advanced features of MATLAB to solve problems in symbolic calculus and algebra.
- Perform essential matrix operations, manipulate matrices and vectors, and understand key concepts of matrix calculus.
- Use MATLAB programming to write custom scripts and functions, automating complex tasks.
- Apply acquired knowledge to solve real-world engineering problems using

MATLAB.

- Understand the basics of Simulink and be able to model and simulate simple dynamic systems.
- Apply acquired skills in practical projects and exercises, demonstrating a deep understanding of the taught concepts.

b. PIs addressed by the course:

PI	1.1	1.2	1.3	7.1
Covered	x	x	x	x
Assessed	x	x	x	x

7. Brief list of topics to be covered

- Introduction to MATLAB software (1 lecture)
- Symbolic computation in calculus (variables, eval function, limit function, diff function, int function, Taylor function, dsolve function) (2 lectures)
- Symbolic computation in algebra (poly2sym and sym2poly functions, factor function, expand function, sort function, roots function, solve function) (2 lectures)
- Matrix computation (matrix creation, data selection, special matrices, matrix operations) (2 lectures)
- Programming in MATLAB (Input/output, "if" statement, "for" loop, "while" loop, functions) (2 lectures)
- Simulink (General overview, Simulink functions and blocks, Building a Simulink model) (3 lectures)