COURSE OUTLINE

(1) GENERAL

SCHOOL	**of MEDICINE AND SCIENCES AND TECHNOLOGY**		
ACADEMIC UNIT	**MEDICINE, MATERIALS MECHANICS AND TECHNOLOGY, MATHEMATICS AND APPLIED MATHEMATICS**		
LEVEL OF STUDIES	**POSTGRADUATE**		
COURSE CODE	**TAO - 102**	**SEMESTER**	**1**
COURSE TITLE	**MATHEMATICS I**		

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	4	7
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	general background
PREREQUISITE COURSES	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS	English
IS THIS COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.
Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

Upon successful completion of the course, students will be able to:

- use basic mathematical tools in applications related to optics and vision technologies
- understand the process of mathematical modeling of complex problems arising from

the medical sciences.

- be able to solve simple mathematical modeling problems that use tables and detailed description of curves and surfaces.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations Decision-making	*Respect for difference and multiculturalism*
Working independently Teamwork	*Respect for the natural environment*
Working in an international environment	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Working in an interdisciplinary environment Production of new research ideas	*Criticism and self-criticism*
	Production of free, creative and inductive thinking .....
	Others...
	.....

- Capacity to address complex problems of mathematical modelling.
- Development of scientific thinking.
- Work in a intertdisciplinary environment.
- Promotion of creative and inductive thinking.
- Use of the University Library and multiple bibliographic references
- Searching sources, simulations, and electronic courses on the internet
- Autonomous and teamwork.

(3) SYLLABUS

1. FUNCTIONS & GRAPHS
   1.1. Elementary functions
   1.2. Graphic representations
2. LINEAR ALGEBRA & ANALYTIC GEOMETRY
   2.1. Linear systems
      2.1.1 Graphical solution
      2.1.2. Solve by elimination
      2.1.3. Representation of systems with tables
   2.2. Matrices & determinants
      2.2.1. Operations between matrices
      2.2.2. Inverse matrix & calculation methods
   2.3. The concept of linear mapping. Eigenvalues & eigenvectors
   2.4. Analytic geometry
      2.4.1. Points & vectors in multidimensional spaces
      2.4.2. Inner product
      2.4.3. Parametric representation of lines & planes
3. DISCRETE TIME MODELS & SEQUENCES
   3.1. Models of population change in discrete time
   3.2. The concept of regression equation
   3.3. Heuristic definition of sequence & sequence limit
   3.4. The concept of series as a sequence of sums
   3.5. Modeling with regression equations

4. LIMITS & CONTINUITY OF FUNCTIONS
   4.1. Heuristic presentation of the limit of functions
   4.2. Calculation of limits
   4.3. The concept of continuity and its role in modeling
5. DERIVATIVE OF FUNCTIONS & APPLICATIONS
   5.1. Heuristic definition of the derivative
   5.2. Derivative properties & calculating derivatives of useful functions
   5.3. Derivatives of complex functions
   5.4. Linear approximation & errors (population evolution equation)
   5.5. Extremes, monotony & convexity
   5.6. Graphical representations & asymptotics
   5.7. Optimization
   5.8. The Newton & Raphson method
   5.9. Antiderivative & definite integral
6. INTEGRATION OF FUNCTIONS & APPLICATIONS
   6.1. Heuristic definition of the definite integral
   6.2. Properties and calculation of useful integrals
   6.3. Applications of the definite integral
   6.4. Taylor approximation
   6.5. The basic idea of numerical integration

(4) TEACHING and LEARNING METHODS - EVALUATION

Delivery *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Use of slides • Use of an asynchronous e-learning platform (e-class) where the following are provided: o *Bibliography of the course* *o Slides of the course* *o Solved and unsolved exercises* *o* Communication through the e-class platform, use of the discussion area facility with topics, email as well as fixed office hours announced.
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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.*	

Activity	***Semester workload***
Lectures	52
Assignments/Projects	30
Directed learning activity (office hours)	26
Non-directed learning activity	66
Course total	***174***

The student's study hours for each learning activity are given as well as the hours of non- directed study according to the principles of the ECTS	
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *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* *Specifically defined evaluation criteria are given, and if and where they are accessible to students.*	Language of Evaluation: English The final grade is the sum of 30% of a progress compulsory examination 70 % of the final written examination If the final exam grade is higher than the progress grade, the final grade is that of the final written exam.

(5) ATTACHED BIBLIOGRAPHY

Bibliography-

- C.Neuhauser & M. Ropper, Calculus for Biology and Medicine, 4th edition, Pearson, 2018
- J.R. Hass, C. Heil & M D. Weir, Thomas' Calculus in SI Units, Pearson, 2019