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 - 204**	**SEMESTER**	**2**
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		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: • be able to formulate mathematical modeling problems related to optics and vision technologies and related areas from the medical sciences. • understand the procedures for solving these problems and the appropriate tools-methods required.

- be able to solve simple mathematical modeling problems that use differential equations.
- evaluate the solutions of these problems.

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 formulate and solve complex problems of mathematical modelling.
- Development of analytical multi-level thinking.
- Work in a interdisciplinary environment.
- Promotion of creative and inductive thinking.
- Use of the University Library and multiple bibliographic references
- Search for sources, simulations, and electronic courses on the internet
- Search for packages to solve selected problems from the web.
- Autonomous and teamwork.

(3) SYLLABUS

1. **FUNDAMENTAL ORDINARY DIFFERENTIAL EQUATIONS & ELEMENTARY DYNAMICAL SYSTEMS**
   - 1.1. The concept of differential equation
   - 1.2. Autonomous differential equations
   - 1.3. Separable differential equations & solving by integration
   - 1.4. Balance & stability of solutions
   - 1.5. Modeling with differential equations
     - 1.5.1. Diffusion models of energy, drugs, etc.
     - 1.5.2. Models of chemical reactions
     - 1.5.3. Epidemiology models

2. FUNCTIONS OF SEVERABLE VARIABLES

- 2.1. Definition of the function of several variables
- 2.2. Graphing functions of several variables
- 2.3. Color representations and isosceles curves
- 2.4. Partial derivatives (heuristic definition & calculations)
- 2.5. Directional derivative & basic vector operators
- 2.6. Maxima & minima of functions of several variables
- 2.7. The method of least squares
- 2.8. Integrals of functions of several variables

3. **INTRODUCTION TO PARTIAL DIFFERENTIAL EQUATIONS** 3.1. The concept of partial differential equation 3.2. The diffusion equation. Fick's Law. 3.3. The wave equation

(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.* *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*	

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

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*	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.

work, clinical examination of patient, art interpretation, other *Specifically defined evaluation criteria are given, and if and where they are accessible to students.*	

(5) SUGGESTED 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