

370503 - MATES - Mathematics for Optics and Optometry

Coordinating unit: 370 - FOOT - Terrassa School of Optics and Optometry
Teaching unit: 749 - MAT - Department of Mathematics
Academic year: 2019
Degree: BACHELOR'S DEGREE IN OPTICS AND OPTOMETRY (Syllabus 2009). (Teaching unit Compulsory)
ECTS credits: 7,5 Teaching languages: Catalan

Teaching staff

Coordinator: Molinero Albareda, Xavier (<http://futur.upc.edu/XavierMolineroAlbareda>)
Others: Pujol Vazquez, Gisela (<https://futur.upc.edu/GiselaPujolVazquez>)
Oliver Uriel, Oscar (<https://directori.upc.edu/directori/dadesPersona?p?id=1248751>)

Degree competences to which the subject contributes

Specific:

1. Apply geometry, calculations and statistics for modeling and solving problems related to optics and optometry.
2. Being able to take, treat, represent and interpret experimental data. "Use basic laboratory equipment and techniques"

General:

3. Display information orally and in writing of reasonably and coherent.
4. Extract the main points of a text or any source of information (oral or written)
5. Analyze and relate the knowledge and acquired skills.

Teaching methodology

Scheduled sessions consist of lecture classes (medium-sized group), informatics lab sessions (small-sized group) and quarter-term and final exams.

In the lecture sessions, short introductions to basic concepts and specific learning goals are combined with its use to develop problem solving skills. Students are so fostered to actively engage in their own learning process. Plenty of course materials are available online at the virtual learning environment ATENEA.

Lab sessions take place in the Faculty's informatics rooms where students are acquainted with specific software such as WIRIS and Minitab. Skills lab worksheets are first completed by students and they are subsequently asked to take a self assessment lab quiz.

Additional individual work is required to complete theory-oriented self assessment quizzes, try to solve exercises proposed in the lecture sessions, conclude unfinished tasks and to study.

Learning objectives of the subject

Upon completion of the course Mathematics for Optics and Optometry, the student should have:

Developed critical thinking skills about clinical, scientific, ethical and social involvement in the practice of optometry.

Shown a general understanding of the subject of Optometry and link it to specific and complementary disciplines.

Demonstrated and implemented methods of critical analysis, development of theories and their application to the



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disciplinary field of Optometry.

Study load

Total learning time: 185h	Hours large group:	0h	0.00%
	Hours medium group:	49h	26.49%
	Hours small group:	26h	14.05%
	Guided activities:	5h	2.70%
	Self study:	105h	56.76%

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Content

<p>1. PLANE GEOMETRY</p>	<p>Learning time: 52h Practical classes: 14h Laboratory classes: 8h Self study : 30h</p>
<p>Description: 1.1. Triangles and trigonometry. 1.2. Points, vectors and lines of the plane. 1.3. Conic sections.</p> <p>Specific objectives: Set links between these basic mathematical concepts and vision, particularly visual acuity.</p>	
<p>2. REAL FUNCTIONS OF ONE REAL VARIABLE</p>	<p>Learning time: 34h Practical classes: 10h Laboratory classes: 4h Self study : 20h</p>
<p>Description: 2.1 Elementary real functions. 2.2 Concept of limit and of local continuity, continuity on intervals. 2.3 Derivatives and applications.</p>	
<p>3. REAL FUNCTIONS OF SEVERAL VARIABLES</p>	<p>Learning time: 52h Practical classes: 14h Laboratory classes: 8h Self study : 30h</p>
<p>Description: 3.1 Functions of two real variables. Level curves and plots. 3.2 Differentiability and the calculation of partial derivatives. 3.3 Linear approximation. Application to error estimation. 3.4 Gradient and directional derivative</p>	

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4. DESCRIPTIVE STATISTICS

Learning time: 42h

Practical classes: 11h
Laboratory classes: 6h
Self study : 25h

Description:

- 4.1 Tabular and graphic description of qualitative (categorical) and quantitative variables and summary statistics.
- 4.2 Description of the relationship between two qualitative variables.
- 4.3 Description of the relationship between a qualitative variable and a quantitative variable.
- 4.4 Description of the relationship between two quantitative variables. The regression line.

Qualification system

The final grade is the sum of three partial qualifications:

$$N_{\text{final}} = 0,65 * \text{Exam.} + 0,3 * \text{Lab.} + 0,05 \text{ Theor.}$$

The weights of each proof are as follows:

	BLOCK 1	BLOCK 2	BLOCK 3	BLOCK 4	TOTAL
Theor.	1,25	1	1,5	1,25	5
Lab.	7,5	6	9	7,5	30
Exam.	16,25	13	19,5	16,25	65
	25	20	30	25	100

Reassessment of "Matemàtiques per a l' Òptica i l' Optometria" will be taken according to general rules established in the "Normativa general de Graus i Màsters de la UPC" and to particular rules from the "Facultat d' Òptica i Optometria de Terrassa". It will be a single final exam covering all the subjects of the course.

A final grade of 5 will be awarded to students passing this exam, otherwise the previous grade will remain.

Regulations for carrying out activities

- Missed assessment tasks will be awarded a mark of zero.

Bibliography

Basic:

Álvarez Quetglas, M.J. [et al.]. Matemàtiques per a l'òptica i l'optometria. Barcelona: Edicions UPC, 2008. ISBN 9788483019603.

Larson, R.; Edwards, B.H. Cálculo 1 de una variable. 9a ed. México: McGraw-Hill, 2010. ISBN 9786071502735.

Devore, J.L.; Peck, R. Statistics: the exploration and analysis of data. St. Paul: West Publishing Company, 1986. ISBN 0314931724.