COURSE DATA

DATA SUBJECT

Code: 41090
Name: Odontologic research methodology
Cycle: Master's Degree
ECTS Credits: 15
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
2006 - Master's Degree in Dental Sciences	Facultat de Medicina i Odontologia	1	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
2006 - Master's Degree in Dental Sciences	Methodology of dentistry research	COMPULSORY

COORDINATION

ALMERICH SILLA JOSE MANUEL

SUMMARY

The first 5 credits of this subject will be allocated to knowledge and training in Scientific Method and Logic, as well as in the Design and Planning of Scientific Work.
On the other hand, some training activities will be developed that will be aimed at the student's knowledge and training of those tools that statistical analysis contributes to scientific methodology. Rigorous scientific work requires a precise statistical methodology, both in descriptive and inferential statistical analyzes and in all the tests necessary for its validation. For correct learning, 6 credits of this subject will be allocated to Statistics.
Learning the Physical Bases for research in Dentistry and the Digital Analysis of Signals and Images, both necessary elements in the student's scientific training, will occupy 4 credits within this first subject.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

The profile of recommended revenue is Licentiate or grade in Dentistry, Licentiate or grade in medicine and Medical specialists in Stomatology
Previous competences recommended for a better utilization of the master:
Knowledge of English language (level of reading and comprehension of scientific texts in the area of the Sciences of the Health).
Knowledge of computer science to level of advanced user of programs Word, Excel, Acces, PowerPoint.

COMPETENCES / LEARNING OUTCOMES

2006 - Master's Degree in Dental Sciences

Analizar los datos observados utilizando algún paquete estadístico.

Be able to integrate knowledge and handle the complexity of formulating judgments based on information that, while being incomplete or limited, includes reflection on social and ethical responsibilities linked to the application of knowledge and judgments.

Describir y sintetizar adecuadamente el conjunto de datos observado en el experimento.

Diseñar experimentos útiles para alcanzar los objetivos del estudio.

Extraer conclusiones a partir de la información estadística obtenida.

Interpretar correctamente los resultados proporcionados por paquetes estadísticos.

Poseer las habilidades de aprendizaje que les permitan continuar estudiando de un modo que habrá de ser en gran medida autodirigido o autónomo.

Saber aplicar los conocimientos adquiridos y ser capaces de resolver problemas en entornos nuevos o poco conocidos dentro de contextos más amplios (o multidisciplinares) relacionados con su área de estudio.

Saber comunicar sus conclusiones y los conocimientos y razones últimas que las sustentan a públicos especializados y no especializados de un modo claro y sin ambigüedades.

Ser capaces de desarrollar un razonamiento lógico y científico en el marco de la investigación odontológica.

Ser capaces de trabajar en un grupo de investigación
consolidado.

Ser competentes en el desarrollo de las técnicas de investigación propias del ámbito de la Estomatología y la Odontología, así como en la evaluación e interpretación de los resultados obtenidos mediante las mismas.

To have the ability to choose the more suitable laboratory technique or techniques to deal with the research problem set out.

DESCRIPTION OF CONTENTS

1. METHODOLOGY OF THE INVESTIGATION IN DENTISTRY

Theory:
The scientific method and the phases of an investigation.
Design of research studies.
Ethics in research.
Sampling and sample size. Power of a study.
Frequency and association measures.
Sensitivity and Specificity Analysis. Analysis of concordance and survivorship.
Design and validation of questionnaires.
Preparation of a research protocol.
Practice:
Methodology, analysis and interpretation of a cross-sectional study.
Methodology, analysis and interpretation of a case-control study.
Methodology, analysis and interpretation of a cohort study.
Methodology, analysis and interpretation of an experimental study.
Methodology, analysis and interpretation of diagnostic tests.
Methodology, analysis and interpretation of questionnaire validations.

2. BIOSTATISTICS IN DENTISTRY
The Biostatistics like tool of investigation Foundations of the Biostatistics.
Design and statistical analysis of experimental information.
Linear Regression and widespread.
Models Technical multivariants of classification
BIOSTATISTICS IN DENTISTRY
BIOSTATISTICS IN DENTISTRY
BIOSTATISTICS IN DENTISTRY

Biostatistics as a research tool
Working with variation
Contrast hypothesis: T tests
Analysis of non-normal data
One way ANOVA
Multivariate ANOVA
Correlation and Regression
ANCOVA and repeated measures.
Categorical data analysis.

BIOMECHANICS
-Newton's laws. Forces and moments applied to dental structures. Leverage effect.
ELASTIC PROPERTIES OF MATERIALS
-Structure of solids. Elasticity concept. Elastic test. Module and Elastic Constant concepts.
-Elastic tensile test. Tensile strain and deformation: Hooke's Law. Young's module. Poisson's coefficient.

3. PHYSICAL BASES FOR THE INVESTIGATION IN DENTISTRY

BIOMECHANICS
-Newton's laws. Forces and moments applied to dental structures. Leverage effect.
ELASTIC PROPERTIES OF MATERIALS-Other elastic tests: shear, volumetric compression, bending and torsion.
-Fractures of dental pieces. Impact fracture.
PHYSICAL PROPERTIES OF LIQUIDS
-Surface tension. Wetting and surfactant substances. Solid-liquid contact angles. Capillarity phenomena. Dental applications.
-Viscosity. Newtonian liquids. Factors that influence the viscosity. Factors that influence viscosity. Viscoelastic materials and their dental interest.

OVERVIEW OF THE IMAGE
-The eye: sensor of human vision.
-Formation of the image: object, lens and sensor.
-Sampling and quantification.
-Monochrome and colour images.
-Storage of images. Formats.
PROCESADO DIGITAL DE IMAGEN.
-Contrast and brightness.
-The histogram Modification of the histogram.
-Image filters.
-Segmentation by areas of interest.
IMAGING SYSTEM I
-Introduction.
-Visible image. Photography. Intraoral scan.
-Radiological image I: Radiography. Orthopantomography.
IMAGING SYSTEM II
-Radiological image II: TAC. CBCT.
-Electronic image formats.
PRACTICAL APPLICATIONS OF THE DIGITAL TREATMENT OF MEDICAL IMAGES
-Introduction.
-Co-record of multimodal medical images: rigid fusion and deformable fusion.
-Segmentation of medical images. Manual segmentation and automatic segmentation: examples.
Visualization of medical images: level and window.
PRACTICE: ACQUISITION AND TREATMENT OF THERMOGRAPHIC IMAGES
-Basis.
-Applicability.
PRACTICE: TREATMENT OF IMAGES OBTAINED WITH CBCT.
-Basis.
-Applicability.
PRACTICE: TREATMENT OF MEDICAL IMAGE I
-Colour, colour depth, RGB channels.
-Level and window in a digital medical image.
-Image resolution.
PRACTICE: TREATMENT OF MEDICAL IMAGE II

4. DIGITAL ANALYSIS OF SIGNS AND IMAGES IN DENTISTRY

OVERVIEW OF THE IMAGE
-The eye: sensor of human vision.
-Formation of the image: object, lens and sensor.
-Sampling and quantification.
-Monochrome and colour images.
-Storage of images. Formats.
PROCESADO DIGITAL DE IMAGEN.
-Contrast and brightness.
-The histogram Modification of the histogram.
-Image filters.
-Segmentation by areas of interest.
IMAGING SYSTEM I
-Introduction.
-Visible image. Photography. Intraoral scan.
-Radiological image I: Radiography. Orthopantomography.
IMAGING SYSTEM II
-Radiological image II: TAC. CBCT.
-Measure distances and angles.
-Improvement of the image by manipulation of the histogram.
-Subtraction of images. Its application in medical images.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	16,00
Laboratory	8,00
Computer classroom practice	51,00
Total hours	**75,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	80,00
Independent study and work	167,00
Preparation of lessons	0,00
Preparation for assessment activities	0,00
Resolution of case studies	40,00
Total hours	**287,00**

TEACHING METHODOLOGY

The methodology used will consist of: master classes supported by projectors with PowerPoint

presentations, practical classes with computers and various devices, laboratory classes, as well as individual and group work.

The gender perspective, respect for diversity and the sustainable development goals (SDGs) will be incorporated into teaching, whenever possible.

EVALUATION

The final grade for the subject will be obtained with the weighted average, according to its theoretical-practical load, of each of the three modules that make up the subject. To be able to access the weighted average grade, you must obtain a pass (minimum 5 points out of 10) in each of the modules, independently.
A) Module of Physical Bases and Digital Analysis of Signals and Images (for assessment out of 10 points), weighting 20%:
-Written exam consisting of 6 short answer questions: rating out of 6 points.
-Written reports of Thermography and CBCT practices: assessment out of 4 points.
-Attendance at 80% of the practices is mandatory.
B) Biostatistics module (for assessment out of 10 points), weighting 48%:
-Written exam on the theoretical and practical contents of the module: 6 points. To average with the evaluation obtained in practices, it will be necessary to obtain a grade equal to or greater than 4 points out of 10 in this theoretical-practical exam.
-Practical tests: 3 points.
-Attendance at theoretical and practical classes with a participatory attitude: 1 point. Attendance at a minimum of 6 practices is mandatory.
C) Research Methodology Module (for assessment out of 10 points), weighting 32%:
-Written multiple choice exam (10 multi-option questions) and 10 short answer questions on the theoretical contents of the module: 5 points.
-Practical exam: 2 points.
-Practical tests during the course in a virtual classroom: 3 points.
-Attendance at the 6 practices is mandatory with a minimum of 80%.

REFERENCES

- Estadística para la investigación biomédica. Armitage P; Berry G. Ed. Harcourt Brace (1997)
- Métodos de investigación en odontología. Bases científicas y aplicaciones del diseño de la investigación clínica en las enfermedades dentales. Ramón Torrell J.M. Ed. Elsevier Masson (2009).
- KANE JW, STERNHEIM MM. Física. Ed. Reverte (2007). ISBN: 9788429143188
- CROMER AH. Física para las ciencias de la vida. Ed. Reverte (1996). ISBN: 9788429118087.

- GLASSNER AS. Principles of Digital Image Synthesis. M. Kaufmann Publ. Inc. (2014). ISBN: 1558602763.

- CARLYLE. Radiologic science for technologist: physic, biology and protection. Ed. Elsevier - Health Sciences Division (2016). ISBN: 9780323048378. -MAIER A, STEIDL S, CHRISTLEIN V, HORNEGGER J. (Eds.). Medical Imaging Systems: An Introductory Guide. Ed. Springer. (2018). ISBN: 9783319965192. -DOWSETT DJ. The physics of diagnostic Imaging. Ed. Taylor & Francis. CRC Press (2006). ISBN: 9780340808917. -ELETA F. Diagnóstico por imágenes. Ed. Journal (2011). ISBN: 9789870550501. -SCARFE WC, ANGELOPOULOS C. (Eds.). Maxillofacial Cone Beam Computed Tomography: Principles, Techniques and Clinical Applications. Ed. Springer (2018). ISBN: 9783319620596. -GONZÁLEZ RC, WOODS RE, EDDINS SL. Digital Image processing using MATLAB. Ed. Pearson (2020). ISBN: 9780982085417. -LEONDES CT ed. Medical Imaging Systems Technology. Ed. World Scientific (2005). ISBN: 9812563644. - METTLER F. Medical effects of ionizing radiation. Ed. Saunders (2008). ISBN: 978072160. - SEMMLOW JOHN L. Biosignal and biomedical image processing: MATLAB-based applications. Ed. Taylor & Francis. CRC Press; 3 edition (2014). ISBN: 824748034.

- GONZALEZ RC, WOODS RE. Digital image processing. Ed. Global Edition (2018). ISBN: 9781292223049.

- GIBSON R. Essential medical imaging. Ed. Cambridge University Press (2009). ISBN: 9780521709118.

- Lesaffre, E. et al Eds (2009) Statistical and Methodological Methods for Oral Health Research.

- Kim, J.S. and Dailey, R.J. (2008) Biostatistics for Oral Healthcare. Blacwell Pub.

- RECURSOS e-Salut: ClinicalKey Student Medicina, Odontologia y Enfermería. [https://uv-es.libguides.com/RecursosSalut]Acces Medicina. [https://uv-es.libguides.com/Access_Medicina] Médica Panamericana. [https://uv-es.libguides.com/Medica_Panamericana]