

**COURSE DATA****Data Subject**

<b>Code</b>	35075
<b>Name</b>	Criminal Analysis Techniques
<b>Cycle</b>	Grade
<b>ECTS Credits</b>	6.0
<b>Academic year</b>	2021 - 2022

**Study (s)**

<b>Degree</b>	<b>Center</b>	<b>Acad. year</b>	<b>Period</b>
1302 - Degree in Criminology	Faculty of Law	2	Second term
1923 - D.D. in Law-Criminology	Faculty of Law	2	Second term

**Subject-matter**

<b>Degree</b>	<b>Subject-matter</b>	<b>Character</b>
1302 - Degree in Criminology	15 - Forensic techniques	Obligatory
1923 - D.D. in Law-Criminology	3 - Year 2 compulsory subjects	Obligatory

**Coordination**

<b>Name</b>	<b>Department</b>
HERRERO SENDRA, SALVADOR	194 - Genetics
PIQUERAS GARCIA, CARMEN	315 - Physical Chemistry

**SUMMARY**

The advance of the techniques in physic-chemistry, genetics, biochemistry and molecular biology in the last 60 years have allowed the application and adaptation to the peculiarities presented by the samples collected at the crime scene. , This technology is put to use in laboratories where forensic scientists works to obtain relevant information from biological materials (hair, semen, saliva, blood ...) or chemical (drugs, explosives, poisons, drugs ...). The subject of "Techniques in criminal analysis" aims to bring professional in criminology at the laboratory where these tests are performed. With this subject we aim that students learn about the scientific language employed in criminal analysis and also about the scientific basis of the different techniques used in the laboratory. Additionally we want student to know the applications that this techniques have in criminology.



## PREVIOUS KNOWLEDGE

### Relationship to other subjects of the same degree

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

### Other requirements

## OUTCOMES

### 1302 - Degree in Criminology

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## LEARNING OUTCOMES

The course is designed so students, as a result of the learning, acquire the following competencies:

- Be able to discern about the appropriateness of applying or demanding certain forensic test.
- To properly know the concepts used in forensic laboratories and reports.
- Be able to cooperate with different expert in forensic analysis in the field of chemical, toxicological and molecular biology.
- To learn the methodology and instrumental techniques used in forensic laboratories.

## DESCRIPTION OF CONTENTS

### 1. The DNA, the molecule that carries the genetic material

Definition of gene

Biochemical and Structural Properties of DNA

Genes are located on chromosomes

What gives us DNA? Daubert standard

### 2. Flow of genetic information

DNA Replication

Central Dogma of molecular biology (one gene, one protein)

Transcription and Translation

Variability in proteins

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### 3. Sources of DNA in forensic applications. Collection and processing of biological samples

Where do we find DNA?

Main sources of DNA in forensic applications

Different types of DNA in forensic applications

Biological samples. Collection and processing

DNA manipulation in the laboratory

### 4. Basic laws of inheritance

One gene, one locus, multiple alleles

Basic laws of inheritance: Mendel and his peas

Calculating the probability of transmitting a character

Interpretation of a pedigree

Basic patterns of inheritance

Prediction of physical and psychic traits

### 5. Genetic variability in populations

Where to find genetic variability

Types of DNA markers

Inheritance of genetic markers

mitochondrial DNA

DNA markers and probabilistic analysis.

### 6. Techniques for the detection and analysis of nucleic acids and proteins

Polymerase chain reaction (PCR)

Genetic fingerprinting by PCR

Immunological techniques for the detection of proteins and other substances.

Protein Electrophoresis

### 7. Physical and electrochemical techniques

Physical techniques: mass and volume measurements. Forensic light sources. Microscopies. Detection of radioactive elements. Electrochemical techniques: measurement of pH and conductivity.

### 8. Identification of toxic chemicals

Atomic spectroscopy techniques: Emission, Atomic Absorption and Fluorescence, for the identification and

quantification of toxic chemical elements

**9. Identification of narcotic drugs and toxic substances (I)**

Molecular spectroscopy techniques: Ultraviolet-Visible Absorption, Fluorescence Emission, Infrared Absorption and Raman Dispersion, for the identification and quantification of narcotic drugs and toxic substances.

**10. Identification of narcotic drugs and toxic substances (II)**

Separation techniques: Electrophoresis, Chromatography, Ionic Mobility Spectrometry and Mass Spectrometry, for identification and quantification of narcotic drugs and toxic substances.

**11. Instrumental Techniques Laboratory****12. The Molecular Genetics Laboratory I: Introduction****13. The Laboratory of Molecular Genetics I: biochemical and genetic markers for people identification****WORKLOAD**

ACTIVITY	Hours	% To be attended
Theory classes	40,00	100
Laboratory practices	20,00	100
Development of group work	10,00	0
Study and independent work	30,00	0
Preparing lectures	40,00	0
Preparation of practical classes and problem	10,00	0
<b>TOTAL</b>	<b>150,00</b>	

**TEACHING METHODOLOGY**

The development of the course is structured in weekly session of 2 hours and 30 min and 5 laboratory sessions that will be spread throughout the course.

During the weekly sessions in the classroom the most important aspects of each topic will be reviewed. In these sessions students will be encouraged to actively participate through the inclusion during the sessions of short questions related to the topic.



In the laboratory sessions the students will get in contact with the methodology used in forensic laboratories while also consolidating the knowledge acquired in the theoretical sessions.

Finally, the individual study will be used to consolidate the knowledge acquired and will be evaluated through a written test.

Optionally (if the schedule allows it) students will attend conferences and seminars on issues related to the subject.

## EVALUATION

Learning assessment will be determined evaluating different aspects. To do this, the final mark of the subject is calculated based on the marks obtained in the following parts:

**Part A:** 70% of the final score will correspond to a written test to be held at the end of the course.

**Part B:** 30% of the final score will correspond to the assessment of laboratory practices. This block will be assessed considering the attendance at laboratory sessions and attitude of the student during the same (30% of the block). The knowledge acquired will be assessed (70% of the block) with the presentation of a report to discuss the results obtained during the practical sessions.

**It should be noted that attendance at laboratory sessions is essential to pass the course.**

Additionally, in the last section of the course and on a voluntary basis, students may prepare a written assignment, a seminar or other activities always proposed by the responsible teachers, on topics related to the subject as established by the responsible teachers (Part C). These works may contribute together up to 1 additional point in total to the final grade. The works will be delivered through the Virtual Classroom in the task created for this purpose. These works may be reviewed with the utilities against plagiarism of the University of Valencia and may be penalized according to the level of plagiarism of the work.

To pass the course, it will be necessary to obtain an overall mark higher than 5/10 between parts A (70%) and B (30%), with a minimum mark of 4.5 / 10 in part A and 5/10 in part B. Students who do not pass the subject in the first call of the course, will keep the grade of the approved part (A or B), if applicable, as well as of part C for the second call.

Students who are not assessed in any of the parts A and B, will appear as NO PRESENTED in the official marks.

## REFERENCES





### Basic

- Lorente, JA (2004). Un detective llamado ADN: tras las huellas de criminales, desaparecidos y personajes históricos. Ed. Temas de Hoy. ISBN: 84-846-0386-5
- Valls, O y Del Castillo, B (1998). Técnicas instrumentales en Farmacia y Ciencias de la Salud Ediciones Piroso. Barcelona. ISBN: 84-853-2515-X
- Matthewu E. Jholl (2009). Química e investigación criminal. Una perspectiva de la ciencia forense. Editorial Reverté. Barcelona. ISBN: 978-84-291-5512-9.
- Siegel, Jay A., Mirakovits, Kathy (2010). Forensic Science: the basics (second edition). CRC Press. Taylor and Francis Group. ISBN 978-1-4200-8902-8.
- Luque, J y Herráez, A (2001). Biología Molecular e Ingeniería genética. Ediciones Harcourt ISBN: 84-8174-505-7.
- DNA from the beginning: <http://www.dnaftb.org>
- Müller-Esterl, W. (2008) Bioquímica: Fundamentos para Medicina y Ciencias de la vida Editorial Reverté, Barcelona. ISBN 978-84-291-7393-2
- Baynes, JW y Dominizack, MH (2006). Bioquímica Médica. 2ª ed. Ed. Elsevier ISBN:84-8174-866-8

### Additional

- Griffiths, AJF, Suzuki, DT, Miller JH y Lewontin, RC (2002). Genética. Séptima Ed. Interamericana-McGraw-Hill. ISBN: 84-486-0368-0
- Pascual, L. i Moltó, MD (1999) Però, què és això de la Genètica?. Universitat de València. ISBN: 84-370-4157-0.
- Griffiths, AJF, Gelbart, WM, Miller, JH, y Lewontin, RC (2000). Genética moderna. McGraw-Hill-Interamericana. ISBN: 84-486-0279-X
- Butler, JM. (2005). Forensic DNA typing. 2ª ed. Ed. Elsevier. ISBN: 978-0-12-147952-7
- Goodwin, W, Linacre, A y Hadi, S (2007). An introduction to Forensic Genetics. John Wiley and Sons Ltd. ISBN: 978-0-470-01026-6
- Antón, F y De Luis, JV (1990). Policía científica. Vol. I y II. 3ª Edición. Editorial Tirant Lo Blanch. Valencia ISBN: 84-370-0642-2
- Herrero S, Ivorra JL, García-Sogo M, Martínez-Cortina, C. 2008. Biochemistry and molecular biology techniques for person characterization. BAMBED 18; 347-353
- International Society for Forensic Genetics: [www.isfg.org](http://www.isfg.org)
- DNAi.org (DNA interactive): <http://www.dnai.org/index.htm>
- Klaasen, W. Fundamentos de toxicología (2005). Mc Graw-Hill ISBN: 978-844-860-5346



## **ADDENDUM COVID-19**

**This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council**

### **BLENDED TEACHING MODEL:**

If academic authorities so state, this subject will be adapted to the blended teaching model established by the Faculty of Law, under which students will attend in-person theoretical-practical classes in alternate weeks. To this end, the Secretariat of the Faculty will divide the group into as many subgroups as necessary, and lectures will take place for a subgroup in the classroom at the schedule established for the subject according to the calendar established by the Faculty, whereas the others will attend the class, as a priority, through synchronous VIDEOCONFERENCE.

The contents, volume of work and assessment remain in the terms initially foreseen in the academic guide.

### **NON-PRESENTIAL TEACHING MODEL:**

If academic authorities declare the change into non-presential teaching, this subject will be taught to all students under the same conditions as those indicated for the distance teaching of the blended system.

The contents, volume of work and evaluation remain in the terms initially foreseen in the academic guide.