Teaching Guide				
Identifying Data				2016/17
Subject (*)	Química de Produtos Naturais		Code	610509017
Study programme	Mestrado en Investigación Química e Química Industrial (plan 2016)			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	Yearly	First	Optativa	3
Language	SpanishEnglish			
Teaching method	Face-to-face			
Prerequisites				
Department	Química Fundamental			
Coordinador	Jimenez Gonzalez, Carlos	E-mail	carlos.jimenez@udc.es	
Lecturers	Jimenez Gonzalez, Carlos Rodriguez Gonzalez, Jaime	E-mail	carlos.jimenez@udc.es jaime.rodriguez@udc.es	
Web				
General description	This material is intended for students to acquire a thorough understanding of the Natural Products Chemistry. It starts from their applications, mainly at pharmacological level, following by the importance of their study and then, their classification from the biogenetic point of view. In order to do this, it will display the most important biogenetic routes from which originate the most abundant skeletons. Some modern techniques used today to accelerate their isolation and identification along with the use of genetic studies on new biotechnological strategies in their production is also seen			

Study programme competences	
Code	Study programme competences
A1	Define concepts, principles, theories and specialized facts of different areas of chemistry.
A3	Apply materials and biomolecules in innovative fields of industry and chemical engineering.
A4	Innovate in the methods of synthesis and chemical analysis related to the different areas of chemistry
B2	Students should apply their knowledge and ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study.
B4	Students should be able to communicate their conclusions, and the knowledge and the reasons that support them to specialists and non-specialists in a clear and unambiguous manner
B5	Students must possess learning skills to allow them to continue studying in a way that will have to be largely self-directed or autonomous.
B7	Identify information from scientific literature by using appropriate channels and integrate such information to raise and contextualize a research topic
B10	Use of scientific terminology in English to explain the experimental results in the context of the chemical profession
B11	Apply correctly the new technologies to gather and organize the information to solve problems in the professional activity.

Learning outcomes			
Learning outcomes	Study programme competences		
Acquisition of advanced knowledge in the chemistry of Natural Products, from both terrestrial and marine origin	AC1	BC2 BC4 BC7	
Learning of the most important applications, mainly as drugs and as tools in biomedical research	AC3	BC2 BC5	
Learning of the main biogenetic routes and the main metabolites that originate	AC1	BC2 BC7	
Learning of the modern techniques used for their isolation and identification	AC4	BC10 BC11	

Contents

Topic	Sub-topic
CHAPTER 1. Introduction to the study of natural products	Concepts of natural product and secondary metabolite. Main natural sources. Main applications. Importance of natural products in the pharmaceutical industry. Classification and examples.
CHAPTER 2. Main metabolic pathways of the secondary metabolism	General scheme of secondary metabolism, main types of natural products that originate and classification based on metabolic pathways. Main mechanisms of biological pathways. Methods of elucidation of a metabolic route.
CHAPTER 3. Metabolites derived from acetate: poliketides, fatty acids and related compounds	Metabolites derived from acetate: poliketides, fatty acids and related compounds.
CHAPTER 4. Metabolites derived from mevalonate: terpenes and steroids	Metabolites derived from mevalonate: terpenes and steroids.
CHAPTER 5. Metabolites derived from shikimic acid	Biosynthetic origen of shikimic acid. Phenylpropanoids. Metabolites of mixed origin: Flavonoids.
CHAPTER 6. Natural nitrogenous compounds	Aliphatic alkaloids: derivates from lysine and ornithine. Aromatic alkaloids: derivates from phenylalanine/tyrosine and tryptophan. Other estructural frameworks. Biosynthesis of non ribosomal peptides.
CHAPTER 7. Modernas estrategias de aislamiento e identificación	Traditional methods. Dereplication techniques. Biotechnology strategies based on genetic studies: Genome mining, recombinant biosynthesis and combinatorial biosynthesis.

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A1 B7 B10	12	24	36
Problem solving	A4 B4 B5 B11	7	17.5	24.5
Mixed objective/subjective test	A3 B2	2.5	10	12.5
Personalized attention		2	0	2
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Guest lecture / keynote speech	It will be held 12 sessions of lectures in one group where the theoretical contents of the course will be associated with illustrative examples. It will consist mainly in PowerPoint presentations. Copies of these presentations will be available for the students in advance via the virtual campus of the course. This will allow the students to study ahead the contents of the course and to facilitate the monitoring of explanations
Problem solving	7 sessions in small group seminars where students will present the work proposed by the professor followed by a discussion section. Students will have in advance the proposed exercises and papers via the virtual campus of the course. Attendance at these classes is mandatory
Mixed objective/subjective test	The final exam will cover all the contents of the course

Personalized attention	
Methodologies	Description
Problem solving	Tutoring scheduled by the professor and coordinated by the Centre. It will be 2 hours per student and will involve the supervision of proposed work, clarifying doubts, etc. Attendance at these classes is mandatory

Assessment			
Methodologies	Competencies	Description	**Qualification**

Problem solving	A4 B4 B5 B11	They will consist of two components: interactive class in problems solving clases (seminars) and interactive class in very small groups (tutorials). This part within the continuous assessment (N1) will be 40% of the qualification	40
Mixed objective/subjective test	A3 B2	The final exam (N2) will cover all the contents of the course. This part will be 60% of the qualification.	60

Assessment comments
The evaluation of this course will be done by means of the continuous assessment and completion of a final exam. Access to the exam will be conditioned on the participation in at least 80% of the mandatory classroom teaching activities (seminars and tutorials). Continuous assessment (N1) will be 40% of the qualification and the final exam (N2) will cover all the contents of the course. The student's score will result of applying the following formula: Final score = 0.4 x N1 + 0.6 x N2 N1 and N2 are the marks corresponding to the continuous assessment (0-10 scale) and the final exam (0-10 scale), respectively The repeaters will have the same system of class attendance than those who study the course for first time

Sources of information	
Basic	- Jonathan Clayden, Nick Greeves, Stuart Warren (2012). Organic Chemistry. New York: University Press - J. Alberto Marco (2006). Química de los productos naturales. Madrid: Síntesis - Pilar Gil Ruiz (). Productos naturales. Pamplona: Universidad Pública de Navarra - J. Mann (1992). Secondary Metabolism. Oxford: Oxford Science Publications - Richard B. Herbert (1989). The biosynthesis of secondary metabolites. London: Chapman and Hall - S. D. Sarker, L. Nahar (2012). Natural Products Isolation. New Jersey: Human Press
Complementary	- Edwin Haslam (1993). Shikimic Acid: Metabolism and Metabolites. Chichester: John Wiley & Sons - Ana M. Lobo, Ana M. Lourenco (2007). Biossíntese de productos naturais. Lisboa: IST Press

Recommendations
Subjects that it is recommended to have taken before
Profundización en Química Orgánica/610509004 Análise Estrutural Avanzado/610509005
Subjects that are recommended to be taken simultaneously
Síntese estereoselectiva/610509012 Química de Biomoléculas/610509014
Subjects that continue the syllabus
Other comments

The students should review the theoretical concepts
introduced in each chapter using the reference manual and the material provided
by the professor. Those students, which have significant difficulties when working the proposed activities,
should contact with the professor during the tutorials,
in order to analyze the problem and to receive the
necessary support.The professor will analyze with those students
who do not successfully pass the evaluation,
and so wish, their difficulties in learning the course
content. Additional material (questions,
exercises, tests, etc..) to strengthen the learning of the course might be also
provided.