

Academic year	2015-16
Subject	11220 - Biotechnology in Biomedicine
Group	Group 1, 1S
Teaching guide	B
Language	English

### Subject identification

<b>Subject</b>	11220 - Biotechnology in Biomedicine
<b>Credits</b>	1.2 de presencials (30 hours) 3.8 de no presencials (95 hours) 5 de totals (125 hours).
<b>Group</b>	Group 1, 1S (Campus Extens)
<b>Teaching period</b>	First semester
<b>Teaching language</b>	English

### Professors

Lecturers	Horari d'atenció als alumnes					
	Starting time	Finishing time	Day	Start date	Finish date	Office
Bernhard Oliver Vögler - <a href="mailto:oliver.vogler@uib.es">oliver.vogler@uib.es</a>	08:30	09:30	Friday	14/09/2015	31/07/2016	Ed. Instituts Universitaris de Recerca, 1º pisó, despacho 111 (avisar con antelación)

### Contextualisation

Biotechnology is one of the industrial sectors with the best growth perspectives in the 21st century. An important transfer of basic scientific knowledge to the productive sector is particularly expected in the emerging field of biomedicine, which will support health and economical welfare of industrial countries. In this context, the subject 'Biotechnology in Biomedicine' develops the interdisciplinary understanding of the distinct subjects of the Master 'Applied Biotechnology' and the possibilities of their implementation in the socio-economic environment of our society.

Concretely, the educational objective of this subject is to delineate in detail the biotechnological fundaments of biomedicine, and the extent to which the bases of seemingly unrelated fields are integrated, i.e., informatics, ethics, current legislation and economy. This holistic focus will deepen the knowledge about how a successful scientific-technological transfer from basic research to the productive sector can be achieved.

### Requirements

The course is aiming at providing a general overview how biomedical research within the field of biotechnology can be successfully integrated in a socio-economic environment.

#### Essential requirements

As the official course language is English a solid knowledge of this language, both orally and in written form, is required. The linguistic capabilities of the students should be at least comparable to level B2 according to

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the Common European Framework of References for Languages, although it is not necessary to present a certificate when enrolling in the course.

### Recommendable

In order to achieve the objective of the course it is recommended that the students already have basic knowledge regarding the different disciplines of Life Sciences. Such basic knowledge is usually existing when having studied one of the following bachelor's degrees: biology, biochemistry, pharmacy, medicine, odontology. However, it is not obligatory to present one of these bachelor's degrees when enrolling in the course.

### Skills

The course has the purpose to promote the acquisition of the following subject-specific and generic competences, which are predetermined by the Ministry of Education (see Real Decreto 861/2010 modifying Real Decreto 1393/2007).

#### Specific

- \* E2 - Design and manage biotechnological and environmental projects..
- \* E3 - Acquire knowledge, skills and an update in the use of advanced technologies in order to conduct R&D projects, as well as to equip the student with the necessary tools to solve problems in a multidisciplinary environment..
- \* E4 - Know how to create and consolidate a biotechnological company, develop and apply for patents..
- \* S1 - Learn the advanced molecular, genetic and celular concepts involved in the biotechnology of health..
- \* S2 - Know the technological, strategical, commercial and legal fundamentals allowing to convert knowledge in useful and profitable products of the health sector..
- \* S3 - Capacity to understand and interconnect the different biomedical aspects of biotechnological exploitation at industrial level..

#### Generic

- \* CB6 - To have and to understand knowledge which serves as a base or opportunity to be original in the development and/or application of ideas, particularly in the context of research..
- \* CB7 - That the students know how to apply the acquired knowledge and their capacity to solve problems in new or less known environments within broader (or multidisciplinary) contexts related to their field of study..
- \* CB8 - That the students are able to integrate knowledge and to face the complexity of expressing judgements starting with an information which, being incomplete or limited, takes into consideration social as well as ethical responsibilities linked to the application of their knowledge and judgement..
- \* CB9 - That the students know to communicate their conclusions - and the knowledge and reasons that ultimately support them - in a clear and non-ambiguous manner to a specialized and non-specialized audience..
- \* CB10 - That the students have the learning abilities which will allow them to continue learning in a mostly auto-directed and independent way..
- \* CG2 - Capacity to express hypothesis and to design the ideal studies for their verification..

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### Basic

- \* You may consult the basic competencies students will have to achieve by the end of the Master's degree at the following address: [http://estudis.uib.cat/master/comp\\_basiques/](http://estudis.uib.cat/master/comp_basiques/)

### Content

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Given that a plethora of interesting and important biotechnological and biomedical issues exist, the topics indicated below should be understood as the core content of the course that may to a certain extent thematically be broadened or adapted to the interests and necessities of the students.

#### Theme content

##### TOPIC 1. History of Biotechnology and Technical Terms

- \* Traditional and modern biotechnology
- \* Organisation for Economic Co-operation and Development (OECD)
- \* Types of biotechnological companies

##### TOPIC 2. Gene Therapy

- \* Horizontal and vertical gene transfer
- \* Knock-out and knock-in
- \* Gene carriers
- \* Properties of viruses
- \* History of gene therapy and case reports
- \* Legal status and current market situation

##### TOPIC 3. Tissue Engineering

- \* Tissue and transplant types (mechanism of graft rejection)
- \* Tissue engineering cycle
- \* Stem cells (embryonic, adult and induced pluripotent stem cells)
- \* Somatic cell nuclear transfer
- \* Scaffolds
- \* Signals
- \* Bioreactors

##### TOPIC 4. Drug Development

- \* Drug discovery (screening techniques, chemical libraries, plant screening, drug design, molecular targeting)
- \* Common abbreviations (e.g., NCE, NCM, API, NOAEL, NOEL y NEL)
- \* Preclinical trials (objectives, suitable animal models)
- \* Clinical trials (approval, phases and objectives, clinical trial protocol and structure, databases)
- \* Drug Safety Management

##### TOPIC 5. Synthetic Biology

- \* Technical requirements
- \* Minimum Gene Project
- \* Synthia
- \* BioBricks
- \* Applications
- \* Synbiosafe

##### TOPIC 6. Data Mining

- \* Knowledge discovery in databases (KDD)
- \* Knowledge discovery in text (KDT)

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- \* Swansons Theorem
- \* Undiscovered public knowledge
- \* DAD-System

TOPIC 7. Biosafety

- \* Environmental biosafety (Convention on Biological Diversity)
- \* Biocontainment and hygiene
- \* Primary and secondary barriers
- \* Safety Equipment
- \* Genetically modified organisms
- \* Biosafety Levels

TOPIC 8. Bioethics

- \* Nuremberg Code
- \* Declaration of Helsinki
- \* Good Clinical Practice
- \* Experiments involving embryonic stem cells (legal status)
- \* Experiments involving animals (principle of three R's, requirements of facilities, personnel and researchers)
- \* Experiments involving humans (informed consent, clinical trials with children, data protection, bioethical committees)

TOPIC 9. Patents

- \* Intellectual property rights (Creative Commons License, copyleft, copyright, trademark, commercial secret)
- \* Requirements and objective of patents
- \* Biotechnological patents
- \* Patenting process (national, international, time frames)
- \* Priority date (first-to-file, first-to-invent)
- \* Patent Structure
- \* Freedom-to-operate

TOPIC 10. Strategies and Social-Economical Impact of Biomedicine

- \* Global Burden of Disease Study (World Health Organization)
- \* Progress in biomedical sciences
- \* Personalized medicine
- \* Future Perspectives

## Teaching methodology

The course is part of the project Campus Extens which is based on the digital platform MOODLE, an educational instrument promoting electronic distance learning. In this way, the students will benefit from an electronic calendar pointing out interesting news, electronic documents and objective assessment tests.

## In-class work activities

Modality	Name	Typ. Grp.	Description	Hours
Theory classes	Lectures	Large group (G)	The aim of the lectures is to convey scientific and economic background knowledge, history, theories, equations and critical information. This goal will be achieved by oral	24



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Modality	Name	Typ. Grp.	Description	Hours
			presentation of the different areas of interest by the professor. Nevertheless, active participation of the audience in form of questions, critical remarks or personal points of view based on already existing individual knowledge is explicitly welcomed, because it will help to provide a more dynamic teaching environment and avoid simple one-way communication.	
ECTS tutorials	Course Related Tutorials	Small group (P)	Each student will have an individual tutorial during the preparation of the long presentation. In this tutorial the distinct assessment schemes and criteria as well as the appropriate techniques to prepare and conduct oral presentations will be applied to his specific task. In this way, the student will be trained by a practical example to visualize his subject matter in a correct manner and to find solutions for specific problems that may appear during the preparation phase of his presentation.	2
Assessment	Exam	Large group (G)	The aim of the exam is to provide evidence about the acquired level of knowledge of each student regarding the different course subjects treated in class.	2
Assessment	Long oral presentation	Large group (G)	The aim of this activity is to engage the student in the preparation and subsequent oral presentation of a complete academic subject in English language. The oral presentation will be conducted by each student in front of his fellow students and the matter dealt with will be part of the exam. The successful completion of this task will transmit the appropriate knowledge and self-confidence to the student to successfully conduct this type of presentation during his future career.	0.5
Assessment	Short oral presentation	Large group (G)	The aim of this activity is to gain first experience in the oral presentation of an academic subject in English language. The oral presentation will be conducted by each student in front of his fellow students and the matter dealt with might be part of the exam. Even though the oral presentation will only be short the subsequent assessment of the presentation techniques by the professor will provide a valuable feedback for the student for conducting the long oral presentation.	1.5

At the beginning of the semester a schedule of the subject will be made available to students through the UIBdigital platform. The schedule shall at least include the dates when the continuing assessment tests will be conducted and the hand-in dates for the assignments. In addition, the lecturer shall inform students as to whether the subject work plan will be carried out through the schedule or through another way included in the Campus Extens platform.

### Distance education work activities

Modality	Name	Description	Hours
Individual self-study	Preparation of lecture subjects	The lecture subjects will be recapitulated by the students after the lecture has been given in order to consolidate their knowledge about the specific matter. Moreover, any doubts and questions arising during self-study will be solved during the next lecture.	25

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Modality	Name	Description	Hours
Individual self-study	Preparation of long oral presentation	The aim of this activity is to engage the student in the preparation of a complete academic subject in English language (duration of presentation: 45 min). A list with subtopics will be given to the student in order to facilitate the selection of the matter for the presentation. The successful completion of this task will transmit the appropriate knowledge and selfconfidence to the student to successfully prepare this type of presentation during his future career. The presentation is supposed to be prepared as digital file in a format, which must be readable by the commonly used computer programs (i.e., Microsoft Powerpoint, Open Office, Keynote) or as an online Prezi presentation. The student will also prepare a written summary of the subject, which has to be handed-in at least two weeks before the written exam. At the day of the deadline all summaries will be published at once on Campus Extens without this being understood as a copyright infringement regarding the legal authorship rights of the student, who prepared the summary. The matter of summaries that were not handed-in until the deadline will not be part of the exam.	55
Individual self-study	Preparation of short oral presentation	The aim of this activity is to gain first experience in the preparation of a presentation about an academic subject in English language (duration of presentation: 10 min). A list with subtopics will be given to the student in order to orientate him about the matter that should be treated in the presentation. Even though the presentation will only be short, the problems encountered during its preparation and the subsequent assessment by the professor will provide a valuable feedback for the student before starting with the preparation of the long oral presentation. The presentation is supposed to be prepared as digital file in a format, which must be readable by the commonly used computer programs (i.e., Microsoft Powerpoint, Open Office, Keynote), or as an online Prezi presentation.	15

### Specific risks and protective measures

The learning activities of this course do not entail specific health or safety risks for the students and therefore no special protective measures are needed.

### Student learning assessment

The student will receive a numerical mark between 0.0 and 10.0 in each of the assessments listed in the following table being 0.0 the lowest and 10.0 the highest possible mark. The final course mark will be calculated from the individual marks of the distinct assessments applying the percentages as indicated below.

$$\text{Final course mark} = (\text{exam mark} \times 0.5) + (\text{short presentation mark} \times 0.1) + (\text{long presentation mark} \times 0.4)$$

The marks of the individual assessments will be indicated with two digits after the decimal marker although the final course mark will only be indicated with one digit after the decimal marker. Rounding will be always be carried out in the common way: if the digit after the digit to be maintained is a 0, 1, 2, 3, or 4, the digit to be maintained will remain the same number and, if the digit after the digit to be maintained is a 5, 6, 7, 8, or 9, the digit to be maintained will be augmented one number. The minimum final course mark to successfully complete the course is 5.0 or above.

Only those students, who did not receive at least a 5.0 as final course mark and/or did not attend the exam, will be given the opportunity to repeat the exam. Those students, who received a final course mark of 5.0 or above

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(= successfully completed the course), will not be given the opportunity to repeat the exam independently of the achieved exam mark. The new final course mark of those students repeating the exam will be recalculated using the new exam mark and the same marks of the oral presentations as before.

Only those students who neither attended the exam nor gave their long oral presentation will be classified as "not attended" in the final course mark.

It is not permitted to conduct the exam in the university branches of Menorca or Ibiza. The oral presentations cannot be given through an online conference but must be held personally in front of the fellow students.

### Exam

Modality	Assessment
Technique	Objective tests ( <b>retrievable</b> )
Description	The aim of the exam is to provide evidence about the acquired level of knowledge of each student regarding the different course subjects treated in class.
Assessment criteria	The exam will consist of multiple choice questions with five possible answers (A-E) from which only one has to be marked. Each correct answer will give 1.0 point and each wrong answer will be penalized by subtracting 0.25 points. The mark of each partial exam will be calculated as follows:  $\text{Mark} = ((\text{correct answers} \times 1.0 - \text{wrong answers} \times 0.25) / \text{number of questions}) \times 10$ <p>If a student does not attend the exam, the mark of the exam will be automatically set to 0 and the student will be given the opportunity to repeat the exam.</p>

Final grade percentage: 50%

### Long oral presentation

Modality	Assessment
Technique	Observation techniques ( <b>non-retrievable</b> )
Description	The aim of this activity is to engage the student in the preparation and subsequent oral presentation of a complete academic subject in English language. The oral presentation will be conducted by each student in front of his fellow students and the matter dealt with will be part of the exam. The successful completion of this task will transmit the appropriate knowledge and self-confidence to the student to successfully conduct this type of presentation during his future career.
Assessment criteria	The conduction of the oral presentation will be assessed with the help of a rubric as scoring tool. The set of criteria and standards, related to the proposed learning objective and used in the applied rubric, will have been handed out to the students before the oral presentation.  <p>If a student does not give his long oral presentation during the classes of the course, the mark will be automatically set to 0.</p>

Final grade percentage: 40%

### Short oral presentation

Modality	Assessment
Technique	Observation techniques ( <b>non-retrievable</b> )
Description	The aim of this activity is to gain first experience in the oral presentation of an academic subject in English language. The oral presentation will be conducted by each student in front of his fellow students and the matter dealt with might be part of the exam. Even though the oral presentation will only be short the



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subsequent assessment of the presentation techniques by the professor will provide a valuable feedback for the student for conducting the long oral presentation.

Assessment criteria      The conduction of the oral presentation will be assessed with the help of a rubric as scoring tool. The set of criteria and standards, related to the proposed learning objective and used in the applied rubric, will have been handed out to the students before the oral presentation.

If a student does not give his short oral presentation during the classes of the course, the mark will be automatically set to 0.

Final grade percentage: 10%

## Resources, bibliography and additional documentation

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Due to the diversity of the course subjects and its interdisciplinary approach there is no single book, which would cover in a comprehensive manner all of the subjects listed under contents according to this course guide. Therefore, the professor will indicate necessary literature and scientific bibliography as well as current web resources during the course via Campus Extens.

