UNIVERSITAT DE VIC
UNIVERSITAT CENTRAL DE CATALUNYA

STUDENT GUIDE

2025-2026

FACULTY OF SCIENCE, TECHNOLOGY AND ENGINEERING

DEGREE IN BIOTECHNOLOGY

GBIOTEC-09UV-2025-1

CONTENTS

SYLLABUS

Subject area	Credits
Foundation Training (FB)	72
Compulsory (OB)	120
Optional (OP)	30
Final Year Project (TFG)	12
External Academic Practicum (PAE)	6
Total	240

FIRST YEAR

	Semester	Credits	Type
Biology	1st	6.0	FB
Chemistry I	1st	6.0	FB
Introduction to Biological Sciences	1st	6.0	FB
Mathematics	1st	6.0	FB
Scientific Communication Skills	1st	6.0	FB
Animal Biology	2nd	6.0	FB
Biochemistry	2nd	6.0	FB
Chemistry II	2nd	6.0	FB
Introduction to Physics	2nd	6.0	FB
Plant Biology	2nd	6.0	FB

SECOND YEAR

	Semester	Credits	Type
Basic Instrumental Techniques	1st	6.0	OB
Biostatistics	1st	6.0	FB
General Microbiology	1st	6.0	OB
Genetics	1st	6.0	OB
Introduction to Programming	1st	6.0	FB
Advanced Microbiology	2nd	6.0	OB
Cell Culture	2nd	6.0	OB
Integrated Laboratory Practicals I	2nd	3.0	OB
Introduction to Engineering	2nd	6.0	OB
Introduction to Physiology	2nd	3.0	OB
Molecular Genetics	2nd	6.0	OB

THIRD YEAR

	Semester	Credits	Type
Advanced Biostatistics	1st	3.0	OB
Bioinformatics I	1st	6.0	OB
Bioreactors	1st	9.0	OB
Genetic Engineering	1st	6.0	OB
Immunology	1st	3.0	OB
Integrated Laboratory Practicals II	1st	3.0	OB
Bioinformatics II	2nd	6.0	OB
Biotechnology Processes and Products	2nd	6.0	OB
Integrated Laboratory Practicals III	2nd	6.0	OB
Protein Chemistry and Engineering	2nd	6.0	OB
Regulation of Metabolism	2nd	6.0	OB

FOURTH YEAR

	Semester	Credits	Type
Industrial Biotechnology	1st	6.0	OB
Social and Legal Aspects of Biotechnology	1st	6.0	OB
Final Year Project	1st or 2nd	12.0	TFG
Internship I	1st or 2nd	6.0	PAE
Optional subjects		30.0	OP

OPTIONAL SUBJECTS - WITHOUT SPECIALIST TRACK

	Credits
Advanced Bioinformatics	6.0
Minig and Visualisation of Omics Data	6.0
Genomics	6.0
Economics	6.0
Bio-Enterprise Creation	6.0
Optional External Practicum	6.0
Cancer Biology	6.0
Trends in Biomedical Biotechnology	6.0
Proteomics	6.0
Environmental Biotechnology	6.0

COMPULSORY SUBJECTS IN THE FIRST YEAR

Biology

Type: Foundation Training (FB)
Credits: 6.0
Semester: 1st

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	Catalan	Lluís Benejam Vidal Andrea Casadesús Cabral Juana Maria Hallat Sánchez
G12, classroom instruction, mornings	Catalan	Juana Maria Hallat Sánchez Julita Oliveras Masramon Lluís Benejam Vidal

SUSTAINABLE DEVELOPMENT GOALS (SDG)

— 4. Quality education
— 5. Gender equality
— 17. Partnerships for the goals

COMPETENCIES

General skills

— Combine scientific knowledge with technical skills and technological resources to deal with problems in professional practice.

Specific skills

— Act in accordance with an integrated view of the operation of molecular mechanisms for regulation and control of cellular metabolism, so as to understand and respond to new biotechnological needs and challenges.
— Apply knowledge of the molecular basis of biological systems and basic aspects of hereditary transmission to biotechnology problems and situations in this field.
— Interpret results obtained in biotechnology laboratories on the basis of correct application of laboratory protocols and basic techniques, making appropriate use of suitable instruments, with due regard for established safety standards.
— Know about subcellular structure and the cell types of organisms, and understand the processes of functional integration in organisms.
— Study and manipulate genes and their structure and mechanisms of expression in a variety of professional and research contexts.
— Understand the different levels of organisation of organisms and have overall knowledge of the different systematic groups.
— Work properly in a laboratory, individually and in groups, with due regard for safety, sterilisation, handling, quality control, elimination of biological and chemical residues and annotated records of activities.

Basic skills

— Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
— Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.
— Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgements that include reflection on relevant social, scientific and ethical issues.

Core skills

— Be a critical thinker before knowledge in all its dimensions. Show intellectual, cultural and scientific curiosity and a commitment to professional rigour and quality.
— Become the protagonist of one's own learning process in order to achieve personal and professional growth and acquire all-round training for living and learning in a context of respect for linguistic, social, cultural, gender and economic diversity.

BIBLIOGRAPHY

Key references

— Alberts, B. [et al.] (2011). *Introducción a la biología celular* (3 ed.). Médica Panamericana.
— Cavallaro, Sandra. (2016). *Biología*. Bibliografia en línia https://elibro.net/es/ereader/bibliouvic/118128?page=12.
— Curtis, H., Barnes, S. [et al.] (2016). *Invitación a la biología* (7 ed.). Médica Panamericana.

— Freeman, S. [et al.] (2018). *Fundamentos de biología* (6 ed.). Pearson.
— Mader, S., Windelspecht, M. (2019). *Biología* (13 ed.). McGraw-Hill.

Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

Chemistry I

Type: Foundation Training (FB)
Credits: 6.0
Semester: 1st

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	Catalan	Àngels Leiva Presa
		Irene Cuervas Oliveras
		Montserrat Capellas Herms
		Xavier Serra Jubany
G12, classroom instruction, mornings	Catalan	Àngels Leiva Presa
		Irene Cuervas Oliveras
		Montserrat Capellas Herms
		Xavier Serra Jubany
G13, classroom instruction, mornings	Catalan	Àngels Leiva Presa
		Xavier Serra Jubany

COMPETENCIES

Specific skills

— Apply the tools of mathematics, statistics, computer science, and the principles of physics and chemistry in the context of biotechnology.
— Have oral and written skills in English for communicating results, conclusions and processes deriving from biotechnology research and process management.
— Interpret results obtained in biotechnology laboratories on the basis of correct application of laboratory protocols and basic techniques, making appropriate use of suitable instruments, with due regard for established safety standards.
— Work properly in a laboratory, individually and in groups, with due regard for safety, sterilisation, handling, quality control, elimination of biological and chemical residues and annotated records of activities.

Basic skills

— Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
— Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

Core skills

— Be a critical thinker before knowledge in all its dimensions. Show intellectual, cultural and scientific curiosity and a commitment to professional rigour and quality.

BIBLIOGRAPHY

Key references

— Atkins, P., Jones, L. (2006). *Principios de química. Los caminos del descubrimiento* . Médica Panamericana.
— Chang, R. (2003). *Química*. McGraw-Hill Interamericana.
— Chang, R., Overby, J., & Álvarez, R. (2020). *Química*. Retrieved from https://ucercatot.uvic-ucc.cat/permalink/34CSUC_UVIC/1nl2ep/alma991059735441706706
— Petrucci, R.H. (2017). *Química general : principios y aplicaciones modernas* . Retrieved from https://ucercatot.uvic-ucc.cat/permalink/34CSUC_UVIC/qq5d82/alma991001003129806718

Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

Introduction to Biological Sciences

Type: Foundation Training (FB)
Credits: 6.0
Semester: 1st

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	Catalan	Montserrat Capellas Herms Àngels Leiva Presa Maria Mercè Molist López Mireia Bartrons Vilamala Sebastià Bennassar Llobera
G12, classroom instruction, mornings	Catalan	Àngels Leiva Presa Maria Mercè Molist López Mireia Bartrons Vilamala Montserrat Capellas Herms Sebastià Bennassar Llobera

COMPETENCIES

General skills

— Endeavour to combine independence and personal initiative with teamwork in multidisciplinary activities.

Specific skills

— Have oral and written skills in English for communicating results, conclusions and processes deriving from biotechnology research and process management.

Core skills

— Be a critical thinker before knowledge in all its dimensions. Show intellectual, cultural and scientific curiosity and a commitment to professional rigour and quality.
— Display professional skills in complex multidisciplinary contexts, working in networked teams, whether face-to-face or online, through use of information and communication technology.
— Use oral, written and audiovisual forms of communication, in one's own language and in foreign languages, with a high standard of use, form and content.

BIBLIOGRAPHY

Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

Mathematics

Type: Foundation Training (FB)
Credits: 6.0
Semester: 1st

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	Catalan	Josep Ayats Bansells Montserrat Corbera Subirana
G12, classroom instruction, mornings	Catalan	Josep Ayats Bansells Montserrat Corbera Subirana
G13, classroom instruction, mornings	Catalan	Jordi Villà Freixa

SUSTAINABLE DEVELOPMENT GOALS (SDG)

— 4. Quality education
— 5. Gender equality
— 14. Life below water
— 15. Life on land

COMPETENCIES

Specific skills

— Apply the tools of mathematics, statistics, computer science, and the principles of physics and chemistry in the context of biotechnology.

Basic skills

— Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
— Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

Core skills

— Be a critical thinker before knowledge in all its dimensions. Show intellectual, cultural and scientific curiosity and a commitment to professional rigour and quality.

BIBLIOGRAPHY

Key references

— Aguadé, J. (2018). *Matemàtiques i modelització per a les ciències ambientals*. Retrieved from https://ucercatot.uvic-ucc.cat/permalink/34CSUC_UVIC/1nl2ep/alma991010389568106709
— Edelstein-Keshet, L. (2020). *Differential calculus for the life sciences*. Retrieved from https://open.bccampus.ca/browse-our-collection/find-open-textbooks/?uuid=c8c2b69f-5ff7-4b6d-a35a-1856363ec9a2
— Larson, R.E., Edwards, B.H. (1994). *Introducción al álgebra lineal*. Limusa Noriega.
— Smith, R.T. Minton, & R.B. Rafhi Z.A.T. (2019). *Cálculo de una variable: trascendentes tempranas*. Retrieved from https://ucercatot.uvic-ucc.cat/permalink/34CSUC_UVIC/1nl2ep/alma991000964479706718
— Solá, L.E. (2016). *Introducción a los métodos matemáticos en biología y ciencias ambientales*. Retrieved from https://ucercatot.uvic-ucc.cat/permalink/34CSUC_UVIC/1nl2ep/alma991003029159406707

Scientific Communication Skills

Type: Foundation Training (FB)
Credits: 6.0
Semester: 1st

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	English	Qian Zhang Suzanne Tyler
G12, classroom instruction, mornings	English	Qian Zhang Suzanne Tyler

SUSTAINABLE DEVELOPMENT GOALS (SDG)

— 2. Zero hunger
— 4. Quality education
— 5. Gender equality
— 6. Clean water and sanitation
— 7. Affordable and clean energy
— 13. Climate action
— 14. Life below water

OBJECTIVES

This course introduces you to the scientific and academic language and skills that you need to study specific subjects in English in the area of science during your degree.

The main aim of the course is to develop your ability to engage in basic scientific communication at university level. To do this you will:

— Improve reading, speaking, writing and listening in a scientific context.
— Build up knowledge of scientific language.
— Demonstrate learner autonomy by maximising use of resources and producing quality work.
— Enhance your awareness of other cultures and countries
— Analyse and reflect on the relationship between science and technology, gender, culture and society.

LEARNING OUTCOMES

1. Demonstrate understanding of specialised academic texts looking for general and specific information.
2. Interpret everyday conversations and the general idea of scientific discourse.
3. Demonstrate an increased competence in writing more effectively and precisely.
4. Participate with a certain confidence and coherence in conversations in class or in small groups.
5. Prepare and give a scientific presentation.
6. Recognise scientific vocabulary and grammatical rules and apply them in context.
7. Demonstrate teamwork skills: leadership, communication and conflict management.
8. Perform self and peer assessment critically and responsibly.

COMPETENCIES

General skills

— Endeavour to combine independence and personal initiative with teamwork in multidisciplinary activities.

Specific skills

— Have oral and written skills in English for communicating results, conclusions and processes deriving from biotechnology research and process management.

Basic skills

— Students can communicate information, ideas, problems and solutions to both specialists and non-specialists.
— Students have developed the learning skills necessary to undertake further studies with a high degree of independent learning.
— Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgements that include reflection on relevant social, scientific and ethical issues.

Core skills

— Become the protagonist of one's own learning process in order to achieve personal and professional growth and acquire all-round training for living and learning in a context of respect for linguistic, social, cultural, gender and economic diversity.

— Interact in international and worldwide contexts to identify needs and and new contexts for knowledge transfer to current and emerging fields of professional development, with the ability to adapt to and independently manage professional and research processes.
— Use oral, written and audiovisual forms of communication, in one's own language and in foreign languages, with a high standard of use, form and content.

CONTENT

The course contents includes:

— **Speaking** (presentations, discussions, debates and podcasts)
(4 x 2h whole class content presentation and practice + 2h group presentations, discussion and debates)
— **Listening** (everyday and technical conversations, monologues set in a professional context)
(6 x 1h contact hours whole group content presentation and practice)
— **Writing** (describing visuals, scientific method, motivational letter and reports)
(5 x 1h contact hours whole group presentation and practice)
— **Reading** (short technical documents and articles)
(5 x 30 minutes contact hours quizzes + 10 contact hours text analysis and comprehension)
— **Language points** (grammar and technical terminology)
(15 contact hours presentation and practice)
— **Project work** (Gender Bias project, COIL - Collaborative Online International Learning)
(6 x 1h whole group contact hours, content presentation and practice)
— **Test 1. Listening, writing, language points** (mid-course)
(2h)
— **Test 2. Listening, Writing, Language Points** (end of course)
(2h)
— **Test 3. Speaking** (end of course)
(10-15 minutes)

This subject encourages critical thinking on social, cultural, and economic impacts, as well as gender diversity, in the field of science and technology.

* All hours referenced refer to contact hours, based on approximations provided in the course guide, which may be updated or adjusted over time. A more detailed and regularly updated work plan is available in the virtual classroom. These contact hours represent roughly one-third of the total time students are expected to dedicate to the course. The remaining two-thirds consist of independent activities, including self-directed study, assignments, projects, and consultations with teaching staff.

ASSESSMENT

Course assessment is a mixture of formative and summative assessment. The final mark of the subject (NF) is the weighted average of the marks of the following items.

Component 1. Theory and Skills

— **Test 1** (20% of NF): Writing, grammar and vocabulary, listening. RA2, RA3, RA6
  • Individual assessment; may be retaken
— **Test 2** (20% of NF): Writing, grammar and vocabulary, listening. RA2, RA3, RA6
  • Individual assessment; may be retaken
— **Test 3 (**10% of NF): Speaking. RA2, RA4, RA7
  • Individual assessment

If your average is 5.0 or above for Test 1 and Test 2, it will be added to your remaining course marks to make up your final course mark.

If your average is below 5.0 for Test 1 and Test 2, you do not pass the course.

Component 2. Practicals

— Speaking (20% of NF): Presentation, discussion, debate. RA5
  • Individual and group assessment
— Project work (15% of NF): RA1, RA2, RA3, RA4, RA5, RA6
  • Individual, group and peer assessment
— Class participation (5% of NF): RA4
  • Individual and self-assessment

Component 3. Reports and exercises

— Reading comprehension (10% of NF): RA1
  • Individual assessment

* Absence from classwork results in the following: 25% penalisation of group mark for justified absence and 50% for unjustified absence.

The final course mark will be obtained from summing the average scores of the different assessed activities.

General assessment criteria

— Possession of mobile phones or digital devices (smartphones, tablets, etc.) during an examination will result in a zero for the exam.
— Absence or non submission within the established deadlines for assessed activities will result in a zero for that activity. This mark will be taken into account when calculating the final course grade.
— In general, assessment is in person.
— Students may retake activities, if applicable, in the reassessment period.
— You cannot retake more than 50% of the course. If you do not retake an assessed activity, the initial grade will be kept. If an activity cannot be retaken, no minimum grade is required to calculate the final course grade.
— Attendance to practicals is compulsory.
— Unjustified absence from three or more practical activities will lead to a Fail grade.
— Justified absence from more than 50% of practicals will result in a mark of zero for the Practicals component

METHODOLOGY

The methodology used includes communicative activities, authentic materials in English, individual work, group work and whole class participation. Class sessions require attendance and active participation in English to maximise learning outcomes (RAs). You have between 50-60 contact hours during the semester. Classes are 4 hours a week, 2 hours in a subgroup and 2 hours with the whole group. You also have 90 hours of autonomous self-study for reading class material, preparing for assessed activities and taking part in the COIL project.

BIBLIOGRAPHY

Key references

— Mann, Malcolm, Taylore-Knowles, Steve (2008). *Destination B2*: *Grammar & Vocabulary with Answer Key*. Retrieved from https://www.academia.edu/40792840/Destination_B2_Grammar_and_Vocabulary_with_Answer_key
— McCarthy, M., & O'Dell, F., (2002). *English vocabulary in use : advanced*. Cambridge University Press.
— Murphy, Raymond (2019). *English Grammar in Use*: *A self-study reference and practice book for Intermediate students with answers*. Retrieved from https://can-ada.net/wp-content/uploads/2020/05/english-grammar-in-use-intermediate.pdf

Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

Animal Biology

Type: Foundation Training (FB)
Credits: 6.0
Semester: 2nd

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	Catalan	Anna Maria Dalmau Roda Jordi Artola Casacuberta Marc Ordeix Rigo
G12, classroom instruction, mornings	Catalan	Anna Maria Dalmau Roda Jordi Artola Casacuberta Marc Ordeix Rigo

OTHER TEACHERS

— Julita Oliveras Masramon

COMPETENCIES

General skills

— Combine scientific knowledge with technical skills and technological resources to deal with problems in professional practice.

Specific skills

— Act in accordance with an integrated view of the operation of molecular mechanisms for regulation and control of cellular metabolism, so as to understand and respond to new biotechnological needs and challenges.
— Apply knowledge of the molecular basis of biological systems and basic aspects of hereditary transmission to biotechnology problems and situations in this field.
— Have oral and written skills in English for communicating results, conclusions and processes deriving from biotechnology research and process management.
— Interpret results obtained in biotechnology laboratories on the basis of correct application of laboratory protocols and basic techniques, making appropriate use of suitable instruments, with due regard for established safety standards.
— Know about subcellular structure and the cell types of organisms, and understand the processes of functional integration in organisms.
— Study and manipulate genes and their structure and mechanisms of expression in a variety of professional and research contexts.
— Understand the different levels of organisation of organisms and have overall knowledge of the different systematic groups.
— Work properly in a laboratory, individually and in groups, with due regard for safety, sterilisation, handling, quality control, elimination of biological and chemical residues and annotated records of activities.

Basic skills

— Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
— Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.
— Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgements that include reflection on relevant social, scientific and ethical issues.

Core skills

— Use oral, written and audiovisual forms of communication, in one's own language and in foreign languages, with a high standard of use, form and content.

BIBLIOGRAPHY

Key references

— Gartner, L.P., Hiatt, J.L. (2007). *Atlas color de histología* (4 ed.). Médica Panamericana.
— Hickman, C. P. [et al.] (2009). *Principios integrales de zoología* (14 ed.). McGraw-Hill, cop.
— Junqueira, L.C., Carneiro, J. (2015). *Junqueira, L.C.; Carneiro, J: Texto y atlas* (12 ed.). Médica Panamericana.
— Kierszenbaum, Abraham (2020). *Histología y Biología celular*. Retrieved from https://www-clinicalkey-com.biblioremot.uvic.cat/student/content/toc/3-s2.0-C20190044457
— Michelena, J.M., Lluch, J.; Baixeras, J. (2004). *Fonaments de zoologia* . Universitat de València.

Biochemistry

Type: Foundation Training (FB)
Credits: 6.0
Semester: 2nd

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	Catalan	Núria Cortes Serra
		Susana Bodoy Salvans
G12, classroom instruction, mornings	Catalan	Susana Bodoy Salvans
		Miquel Lledós De Benito
		Núria Cortes Serra
G13, classroom instruction, mornings	Catalan	Núria Cortes Serra
		Yolanda Cámara Navarro

SUSTAINABLE DEVELOPMENT GOALS (SDG)

— 3. Good health and well-being

COMPETENCIES

Specific skills

— Apply knowledge of the molecular basis of biological systems and basic aspects of hereditary transmission to biotechnology problems and situations in this field.

Basic skills

— Students can communicate information, ideas, problems and solutions to both specialists and non-specialists.
— Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

Core skills

— Use oral, written and audiovisual forms of communication, in one's own language and in foreign languages, with a high standard of use, form and content.

BIBLIOGRAPHY

Key references

— David L. Nelson and Michael M. Cox (2017). *Lehninger Principles of Biochemistry* (7 ed.). New York : W.H. Freeman.
— Mathews, C.K.; van Holde, K.E.; Ahern, K.G. (2009). *Bioquímica* (4 ed.). Pearson Educación S.A.
— Richard A. Harvey; Denise R. Ferrier (2010). *Bioquímica*. Retrieved from https://elibro.net/es/ereader/bibliouvic/124797
— Stryer, L., Berg, J.M., Tymoczko, J.L. (2013). *Bioquímica* (7 ed.). Reverté.
— Voet, D., Voet. J.G., Pratt, C.W. (2009). *Fundamentos de bioquímica* (2 ed.). Médica Panamericana.

Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

Chemistry II

Type: Foundation Training (FB)
Credits: 6.0
Semester: 2nd

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	Catalan	Àngels Leiva Presa
		Ferran Comas Vila
		Irene Cuervas Oliveras
		Oriol Lecina Veciana
		Xavier Serra Jubany
G12, classroom instruction, mornings	Catalan	Àngels Leiva Presa
		Ferran Comas Vila
		Oriol Lecina Veciana
		Xavier Serra Jubany
G13, classroom instruction, mornings	Catalan	Àngels Leiva Presa
		Oriol Lecina Veciana
		Xavier Serra Jubany

COMPETENCIES

Specific skills

— Apply the tools of mathematics, statistics, computer science, and the principles of physics and chemistry in the context of biotechnology.
— Interpret results obtained in biotechnology laboratories on the basis of correct application of laboratory protocols and basic techniques, making appropriate use of suitable instruments, with due regard for established safety standards.
— Work properly in a laboratory, individually and in groups, with due regard for safety, sterilisation, handling, quality control, elimination of biological and chemical residues and annotated records of activities.

Basic skills

— Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
— Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

Core skills

— Be a critical thinker before knowledge in all its dimensions. Show intellectual, cultural and scientific curiosity and a commitment to professional rigour and quality.

BIBLIOGRAPHY

Key references

— Chang, R., Overby, J., & Álvarez, R. (2020). *Química*. Retrieved from https://ucercatot.uvic-ucc.cat/permalink/34CSUC_UVIC/1nl2ep/alma991059735441706706
— Harris, D.C. (2006). *Anàlisi química quantitativa*. Reverté.
— Petrucci, R.H. (2017). *Química general : principios y aplicaciones modernas*. Retrieved from https://ucercatot.uvic-ucc.cat/permalink/34CSUC_UVIC/qq5d82/alma991001003129806718
— Skoog, D.A., West, D.M., Holler, F.J., Crouch, S.R. (2017). *Fundamentos de química analítica* (9 ed.). Cengage Learning.

Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

Introduction to Physics

Type: Foundation Training (FB)
Credits: 6.0
Semester: 2nd

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	Catalan	Josep Dinarès Ferran Maria Àngels Crusellas Font
G12, classroom instruction, mornings	Catalan	Josep Dinarès Ferran Maria Àngels Crusellas Font
G13, classroom instruction, mornings	Catalan	Maria Àngels Crusellas Font Xavier Carpena Vilella

COMPETENCIES

Specific skills

— Apply the tools of mathematics, statistics, computer science, and the principles of physics and chemistry in the context of biotechnology.

Basic skills

— Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
— Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

Core skills

— Be a critical thinker before knowledge in all its dimensions. Show intellectual, cultural and scientific curiosity and a commitment to professional rigour and quality.

BIBLIOGRAPHY

Key references

— Cromer, A.H. (2018). *Física para las ciències de la vida* (2 ed.). Reverté.
— Jou, D., Llebot, J.E. & Pérez, C. (2009). *Física per a ciencias de la vida* (2 ed.). McGraw-Hill Accessible online: https://elibro.net/es/lc/bibliouvic/titulos/50165.
— Ortuño, M. (2019). *Física para las ciencias de la vida*. Tebar Flores.
— Tipler, P.A.& Mosca, G. (2010). *Física: para la ciencia y la tecnología. Vols. I i II* (6 ed.). Reverté Accessible online: https://www-ingebook-com.biblioremot.uvic.cat/ib/NPcd/IB_Escritorio_Visualizar?cod_primaria=1000193&libro=10372.
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Plant Biology

Type: Foundation Training (FB)
Credits: 6.0
Semester: 2nd

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	Catalan	Roser Rotches Ribalta Andrea Casadesús Cabral Jordi Compte Ciurana Juana Maria Hallat Sánchez Montserrat Capellas Herms
G12, classroom instruction, mornings	Catalan	Montserrat Capellas Herms Jordi Camprodon Subirachs Jordi Compte Ciurana Juana Maria Hallat Sánchez Roser Rotches Ribalta

SUSTAINABLE DEVELOPMENT GOALS (SDG)

— 15. Life on land

COMPETENCIES

General skills

— Combine scientific knowledge with technical skills and technological resources to deal with problems in professional practice.

Specific skills

— Act in accordance with an integrated view of the operation of molecular mechanisms for regulation and control of cellular metabolism, so as to understand and respond to new biotechnological needs and challenges.
— Apply knowledge of the molecular basis of biological systems and basic aspects of hereditary transmission to biotechnology problems and situations in this field.
— Have oral and written skills in English for communicating results, conclusions and processes deriving from biotechnology research and process management.
— Interpret results obtained in biotechnology laboratories on the basis of correct application of laboratory protocols and basic techniques, making appropriate use of suitable instruments, with due regard for established safety standards.
— Know about subcellular structure and the cell types of organisms, and understand the processes of functional integration in organisms.
— Understand the different levels of organisation of organisms and have overall knowledge of the different systematic groups.
— Work properly in a laboratory, individually and in groups, with due regard for safety, sterilisation, handling, quality control, elimination of biological and chemical residues and annotated records of activities.

Basic skills

— Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
— Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.
— Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgements that include reflection on relevant social, scientific and ethical issues.

Core skills

— Be a critical thinker before knowledge in all its dimensions. Show intellectual, cultural and scientific curiosity and a commitment to professional rigour and quality.
— Interact in international and worldwide contexts to identify needs and and new contexts for knowledge transfer to current and emerging fields of professional development, with the ability to adapt to and independently manage professional and research processes.
— Use oral, written and audiovisual forms of communication, in one's own language and in foreign languages, with a high standard of use, form and content.

BIBLIOGRAPHY

Key references

— Conesa, J.A., Pedrol, J., Recasens, J. (2002). *Estructura i organització d'espermatòfits*. Servei de Publicacions de la Universitat de Lleida.
— Izco, J., Barreno, E., Brugués, M., Costa, M., Devesa, J., Fernandez, F., Gallardo, T., Llimona, X., Salvo, E., Talavera, S., Valdés, B. (2004). *Botánica* (2 ed.). McGraw-Hill Interamericana.
— Nabors, M.W. (2006). *Introducción a la botánica*. Pearson Addyson Wesley.
— Rost, Thomas L. (2006). *Plant Biology* (2 ed.). Thomson/Brooks/Cole.
— Taiz, L., Zeiger, E., Møller, I.M., i Murphy, A. (2015). *Plant Physiology and Development* (6 ed.). Sinauer Associates.

COMPULSORY SUBJECTS IN THE SECOND YEAR

Basic Instrumental Techniques

Type: Compulsory (OB)
Credits: 6.0
Semester: 1st

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	Catalan	Ferran Comas Vila Alba Casellas Comallonga Josep Ferre Alemany
G12, classroom instruction, mornings	Catalan	Ferran Comas Vila Alba Casellas Comallonga Josep Ferre Alemany

OBJECTIVES

The main objectives of this course are:

— Understanding of the instrumental techniques fundamentals used in biology and biotechnology.
— Knowledge of the apparatus design developed for the application of the different techniques.
— Manipulation and analysis of samples in the laboratory.

LEARNING OUTCOMES

1. Perform well in the laboratory.
2. Acquire a basic knowledge of the basic instrumental techniques in biotechnology.
3. Being able to integrate the experimental evidence with the theoretical knowledge.
4. Acquire and show a good knowledge of the theoretical and practical aspects of the methodologies used in the field of biotechnology.
5. Analyse and interpret the experimental results.
6. Understand oral and written complex messages in English and local languages.

COMPETENCIES

Specific skills

— Apply knowledge of the molecular basis of biological systems and basic aspects of hereditary transmission to biotechnology problems and situations in this field.
— Have oral and written skills in English for communicating results, conclusions and processes deriving from biotechnology research and process management.
— Interpret results obtained in biotechnology laboratories on the basis of correct application of laboratory protocols and basic techniques, making appropriate use of suitable instruments, with due regard for established safety standards.
— Use the main techniques and methods for manipulation and modification of biological systems.
— Work properly in a laboratory, individually and in groups, with due regard for safety, sterilisation, handling, quality control, elimination of biological and chemical residues and annotated records of activities.

Basic skills

— Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
— Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

Core skills

— Use oral, written and audiovisual forms of communication, in one's own language and in foreign languages, with a high standard of use, form and content.

CONTENT

— Introduction to instrumental techniques

— Separation techniques
  1. Centrifugation
  2. Chromatography
  3. Electrophoresis

— Molecular biology techniques
  1. Isolation
  2. Digestion (restriction)
  3. Amplification (PCR)
— Immunological techniques
— Physicochemical techniques
— Microscopy

ASSESSMENT

The course follows a continuous evaluation through various assessment tools along the semester.

Evaluation takes into account both the theoretical and practical aspects of the subject.

The final overall mark is the obtained from the ponderated mean of the assessment items.

To pass the course a minimum overall mark of 5.0 is required.

— Working follow-up (15%). RA evaluated: 1-5. Not recoverable. Individual assessment
— Specific evaluation and reports on applied case-studies (30%). RA evaluated: 2, 4, 5. Not recoverable. Individual and team assessment
— Individual exam (30%). RA evaluated: 2, 4, 5. Recoverable. A minimum mark of 4.0 is required to pass the course. Individual assessment
— Lab work and Reports (25%). RA evaluated: 2, 4, 5. Not recoverable. A minimum mark of 5.0 is required to pass the course. Individual and team assessment

Attendance to Lab sessions is mandatory.

Sessions will begin at the scheduled time. Lack of punctuality impairs the proper development of practices (specially in lab sessions), and therefore, a negative score will be applied to the attendance score.

Overall attitude in the laboratory includes: involvement in experimental work, having the own material (experimental protocols, calculator, lab coat, etc). It will also be considered coordination, planning and teamwork for the good functioning of the experimental work.

General assessment criteria of Faculty

— The possession of cell phones or alike (smartphones, tablets, etc.) during an examination entails a zero for the exam.
— The absence at, or non-delivery within the established periods, of any of the assessment activities gives zero marks to that activity. This qualification will be taken into account when calculating the final marks of the subject.
— The final marks for the subject will be obtained, pondering, with the respective percentages, the arithmetic averages of the different activities.

BIBLIOGRAPHY

Key references

— Ansorge, Wilhelm J., Danielson, Phillip B., (2017). *Molecular diagnostics*. Retrieved from https://www-sciencedirect-com.biblioremot.uvic.cat/book/9780128029718/molecular-diagnostics
— Davidson, M.W., Abramowitz, M. (2002). *Optical microscopy*: *in Encyclopedia of imaging science and technology* . Retrieved from https://pdfs.semanticscholar.org/2bf9/917082c60a19b9c6db31e66fd6a82512ffb6.pdf
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— Pingoud, A., Urbanke, C., Hoggett, J., Jeltsch, A. (2002). *Biochemical Methods: A Concise Guide ford Students and Researchers*. John Wiley & Sons.
— Settle, F. (1997). *Handbook of Instrumental Techniques for Analytical Chemistry* . Prentice Hall.

Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

Biostatistics

Type: Foundation Training (FB)
Credits: 6.0
Semester: 1st

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	Catalan	Ramon Oller Piqué Ferran Oró Arán Judit Solà Roca Meritxell Pujolassos Tanyà
G12, classroom instruction, mornings	Catalan	Meritxell Pujolassos Tanyà Ferran Oró Arán Judit Solà Roca Ramon Oller Piqué

COMPETENCIES

Specific skills

— Apply the tools of mathematics, statistics, computer science, and the principles of physics and chemistry in the context of biotechnology.

Basic skills

— Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
— Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

Core skills

— Be a critical thinker before knowledge in all its dimensions. Show intellectual, cultural and scientific curiosity and a commitment to professional rigour and quality.

BIBLIOGRAPHY

Key references

— Daniel, W.W., Cross, Ch.L. (2013). *Biostatistics: Basic concepts and methodology for the heath sciences* (10 ed.). Wiley.
— Torres Huertas, José (2016). *Bioestadística*. Dextra Editorial.
— Van Belle, G., Fisher, L.D., Heagerty, P.J., Lumley, Th. (2004). *Biostatistics: A Methodology For the Health Sciences* (2 ed.). Wiley.
— Zaiats, V.; Calle, M.L. (2001). *Probabilitat i estadística: Exercicis II*. Edicions UAB.
— Zaiats, V.; Calle, M.L.; Presas, R. (2001). *Probabilitat i estadística: Exercicis I* (2 ed.). Edicions UAB.

General Microbiology

Type: Compulsory (OB)
Credits: 6.0
Semester: 1st

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	Catalan	Marc Llirós Dupré Anna Maria Dalmau Roda
G12, classroom instruction, mornings	Catalan	Marc Llirós Dupré Anna Maria Dalmau Roda

OTHER TEACHERS

— Anna González Tendero

SUSTAINABLE DEVELOPMENT GOALS (SDG)

— 2. Zero hunger
— 3. Good health and well-being
— 6. Clean water and sanitation
— 7. Affordable and clean energy
— 12. Responsible consumption and production
— 13. Climate action
— 14. Life below water
— 15. Life on land

COMPETENCIES

General skills

— Combine scientific knowledge with technical skills and technological resources to deal with problems in professional practice.

Specific skills

— Interpret results obtained in biotechnology laboratories on the basis of correct application of laboratory protocols and basic techniques, making appropriate use of suitable instruments, with due regard for established safety standards.
— Know about subcellular structure and the cell types of organisms, and understand the processes of functional integration in organisms.
— Understand the different levels of organisation of organisms and have overall knowledge of the different systematic groups.
— Use the molecular, cellular and physiological basis of organisms, including relationships with other organisms or agents, to design biotechnological products.
— Work properly in a laboratory, individually and in groups, with due regard for safety, sterilisation, handling, quality control, elimination of biological and chemical residues and annotated records of activities.

Basic skills

— Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

BIBLIOGRAPHY

Key references

— Madigan, M.T., Bender, K.S., Buckley, D.H., Sattley, W.M., Stahl, D.A. (2017). *Brock. Biology of microorganisms* (15 ed.). Pearson.
— Madigan, M.T., Martinko, J.M., Bender, K.S., Buckley, D.H., Stahl, D.A. (2015). *Brock. Biología de los microorganismos* (14 ed.). Pearson.
— Michael T. Madigan, Kelly S. Bender, Daniel H. Buckley, W. Matthew Sattley and David A. Stahl (2019). *Brock Biology of Microorganisms: Global edition. 15 Ed*. Retrieved from https://www.pearson.com/nl/en_NL/higher-education/subject-catalogue/biology/Brock-Biology-of-Microorganisms-Madigan.html
— Willey, J., Sherwood, L.M., Woolverton, C.J. (2009). *Microbiología: de Prescott, Harley y Klein* (7 ed.). McGraw-Hill Interamericana de España.
— Willey, J., Sherwood, L.M., Woolverton, C.J. (2017). *Prescott's Microbiology* (10 ed.). McGraw-Hill.

Genetics

Type: Compulsory (OB)
Credits: 6.0
Semester: 1st

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	Catalan	Josep Maria Serrat Jurado Alba Casellas Comallonga
G12, classroom instruction, mornings	Catalan	Josep Maria Serrat Jurado Alba Casellas Comallonga

SUSTAINABLE DEVELOPMENT GOALS (SDG)

— 5. Gender equality

COMPETENCIES

Specific skills

— Act in accordance with an integrated view of the operation of molecular mechanisms for regulation and control of cellular metabolism, so as to understand and respond to new biotechnological needs and challenges.
— Apply knowledge of the molecular basis of biological systems and basic aspects of hereditary transmission to biotechnology problems and situations in this field.
— Know about subcellular structure and the cell types of organisms, and understand the processes of functional integration in organisms.
— Study and manipulate genes and their structure and mechanisms of expression in a variety of professional and research contexts.
— Understand the different levels of organisation of organisms and have overall knowledge of the different systematic groups.

Basic skills

— Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

Core skills

— Be a critical thinker before knowledge in all its dimensions. Show intellectual, cultural and scientific curiosity and a commitment to professional rigour and quality.

BIBLIOGRAPHY

Key references

— Pierce, B.A. (2016). *Genética: Un enfoque conceptual*. Retrieved from https://ucercatot.uvic-ucc.cat/permalink/34CSUC_UVIC/qq5d82/alma991000928389706718
— Pierce, B.A. (2016). *Genética: Un enfoque conceptual* (5 ed.). Panamericana.

Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

Introduction to Programming

Type: Foundation Training (FB)
Credits: 6.0
Semester: 1st

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	Catalan	Jordi Surinyac Albareda Joan Vancells Flotats Maria Dolors Anton Solà
G12, classroom instruction, mornings	Catalan	Joan Vancells Flotats Maria Dolors Anton Solà Jordi Surinyac Albareda

COMPETENCIES

General skills

— Combine scientific knowledge with technical skills and technological resources to deal with problems in professional practice.
— Endeavour to combine independence and personal initiative with teamwork in multidisciplinary activities.

Specific skills

— Apply the tools of mathematics, statistics, computer science, and the principles of physics and chemistry in the context of biotechnology.
— Search, obtain and interpret information in the main biological and bibliographic databases using bioinformatics tools, and use programming techniques for problem solving.

Basic skills

— Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
— Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

Core skills

— Use oral, written and audiovisual forms of communication, in one's own language and in foreign languages, with a high standard of use, form and content.

BIBLIOGRAPHY

Key references

— Lutz, M. (2013). *Learning Python* (2 ed.). O'Reilly.
— Model, M.L. (2009). *Bioinformatics Programming using Python*. O'Reilly.

Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

Advanced Microbiology

Type: Compulsory (OB)
Credits: 6.0
Semester: 2nd

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	English	Marc Llirós Dupré Anna González Tendero Paula Cebollada Rica

SUSTAINABLE DEVELOPMENT GOALS (SDG)

— 2. Zero hunger
— 3. Good health and well-being
— 6. Clean water and sanitation
— 7. Affordable and clean energy
— 12. Responsible consumption and production
— 13. Climate action
— 14. Life below water
— 15. Life on land

OBJECTIVES

Microbes play a central role in global environmental processes and earth biogeochemistry. The purpose of this course is to provide students with a deeper knowledge of microbes and their processes in either natural ecosystems or in laboratory-scale systems.

Learning objectives

— To explain the impact and the importance of microbial activity on Earth.
— To highlight the connection between metabolic processes of microorganisms and the benefits of biotechnology.
— To show an improvement in students skills when working in a microbiology laboratory using either traditional or modern molecular techniques.
— To demonstrate an improvement in team-working skills through lectures and studying cutting edge microbiology.

LEARNING OUTCOMES

— Describe how microorganisms interact with the environment and specifically with other organisms.
— Determine the chemotherapeutical alternatives against different microorganisms.
— Apply different molecular techniques to identify microorganisms in mixed populations.
— Prepare an English oral presentation to revise content
— Write a synthetic review on a scientific issue in English.
— Use appropriate spoken language (verbal and non-verbal) to communicate in personal and professional situations in English.

COMPETENCIES

General skills

— Combine scientific knowledge with technical skills and technological resources to deal with problems in professional practice.

Specific skills

— Interpret results obtained in biotechnology laboratories on the basis of correct application of laboratory protocols and basic techniques, making appropriate use of suitable instruments, with due regard for established safety standards.
— Know about subcellular structure and the cell types of organisms, and understand the processes of functional integration in organisms.
— Understand the different levels of organisation of organisms and have overall knowledge of the different systematic groups.
— Use the molecular, cellular and physiological basis of organisms, including relationships with other organisms or agents, to design biotechnological products.

Basic skills

— Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.
— Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgements that include reflection on relevant social, scientific and ethical issues.

Core skills

— Interact in international and worldwide contexts to identify needs and and new contexts for knowledge transfer to current and emerging fields of professional development, with the ability to adapt to and independently manage professional and research processes.
— Use oral, written and audiovisual forms of communication, in one's own language and in foreign languages, with a high standard of use, form and content.

CONTENT

Theoretical content

Subject 1. Methods in microbial ecology

(2.0h whole group + 0.5h autonomous work + 15h practice lessons)

— Theory
— Practice 1, 2

Subject 2. Microbial diversity (soil, aquatic and biogeochemical cycles)

(2.0h whole group + 0.5h autonomous work + 7.5h practice lessons)

— Theory
— Practice 1

Subject 3. Biotechnology: History, microbes, definitions and core concepts

(2.0h whole group + 0.5h autonomous work)

— Theory

Subject 4. Microbial diversity in biotechnology

(2.0h whole group + 0.5h autonomous work)

— Theory

Subject 5. Environmental microbiology

(2.0h whole group + 0.5h autonomous work + 7.5h practice lessons)

— Theory
— Practice 1

1st exam (subjects 1 to 5)

Subject 6. Search for microbes with industrial interest

(2.0h whole group + 0.5h autonomous work + 15h practice lessons)

— Theory
— Practice 1, 2

Subject 7. Antimicrobial products

(2.0h whole group + 0.5h autonomous work + 7.5h practice lessons)

— Theory
— Practice 1

Subject 8. Amino-acid biotechnological production

(2.0h whole group + 0.5h autonomous work)

— Theory

Subject 9. Enzyme biotechnological production

(2.0h whole group + 0.5h autonomous work)

— Theory

Subject 10. Environmental biotechnology and agriculture

(2.0h whole group + 0.5h autonomous work)

— Theory

Subject 11. Microbial biosensors

(2.0h whole group + 0.5h autonomous work)

— Theory

Subject 12. Clinical microbiology

(2.0h whole group + 0.5h autonomous work + 7.5h practice lessons)

— Theory
— Practice 2

Subject 13. Human diseases

(2.0h whole group + 0.5h autonomous work + 7.5h practice lessons)

— Theory
— Practice 2

2nd exam (subjects 6 to 13)

Practical laboratory content

1. Microbes from soil with industrial interest
   — Isolation of *Actinomyces* and *Bacillus species*
   — Detection of enzymatic activities of industrial interest from selected microbial isolates
   — Detection of antimicrobial activities from selected microbial isolates
2. Ecological aspects of skin microbiome
   — Identification of Staphylococcus species
   — Study of the amensalistic effect of *S. epidermidis* on *S. aureus* biofilms
   — Detection of different genes of Staphylococcus species

ASSESSMENT

The subject will be assessed in a continuous form (theory exam 40% + quizzes 10% + seminars 20% + practical lessons [exam 20% + report 10%]) based on:

— **Theoretical lectures** (40% of final grade): 2 written tests (first test, units 1-5 and second test units 6-10) weighted score (50% each). If less than 4/10 is scored, you must retake this part. Tests will be based on short responses or multiple-choice questions. At the end of each unit, students will self-evaluate themselves by doing a short test, with a final weight of 10% (a minimum of 10 tests must be passed out of a total of 13).
— **Quizzes** (10% of final grade)
— **Seminars** (20% of final grade): oral presentations of hot scientific topics (one microbial ecology topic [units 1-5] and one microbial action and antimicrobial activity units [units 6-10]). Minimum pass grade: 5/10
— **Practical lessons** (30% of final grade): final exam (10%), multiple-choice test at the end of the semester and a final report (20%) conducted and presented 2 weeks after finishing the practical week.

To pass the subject, students must pass each section with at least a 4/10. Students who do not pass all the sections can retake those, if applicable at the end of the course. Students who participate in less than 50% of the activities cannot be assessed.

General assessment criteria

— The possession of mobile phones or similar (smartphones, tablets, etc.) while conducting the tests involves a zero in the test.
— The non-show or not fulfilling deadlines in an evaluation activity gives a zero. This qualification will be taken into account when calculating the final grade for the course.
— The final grade is the result of the weighting of the marks obtained for each of the sections.
— Students who do not pass all of the activities can resubmit those applicable during the reassessment period. Reassessment takes places during the last two weeks of the semester and cannot exceed 50 % of the final course grade.
— If a student refuses to undertake required reassessment tests, the marks obtained in the previous tests for the particular items evaluated will be kept.
— For activities that may not be taken there is no minimum mark required to calculate the final grade for the course.
— Only when there is no evidence of any submitted activities will the course be graded as "not presented".
— This subject can only be passed if the practical section is passed with a quote equal or higher than 5 points.
— The final average quote for all items must be equal or higher than 5 to pass subject.

METHODOLOGY

The learning process will combine lectures, microbiology laboratory sessions and class sessions.

— Self-study activities, and other activities to facilitate autonomous work will be offered to the students.
— Scheduled tutorial sessions will be at students' disposal.
— Scientific articles are used to support the class sessions.
— During practical lessons, various analytical tools are used to solve problems. Students must present a short report at the end of the session.

BIBLIOGRAPHY

Key references

— Cann, A.J. (2005). *Principles of Molecular Virology* (4 ed.). Academic Press.
— Madigan, M.T., Bender, K.S., Buckley, D.H., Sattley, W.M., Stahl, D.A. (2018). *Thumbnail Brock Biology of microorganisms* (15 ed.). Pearson.
— Paul, E. (2014). *Soil Microbiology, Ecology and Biochemistry* (4 ed.). Elsevier.
— Paul, E.A. (2007). *Soil microbiology, ecology and biochemistry*. Retrieved from https://login.biblioremot.uvic.cat/login?qurl=http%3a%2f%2fbiblioremot.uvic.cat%2flogin%3furl%3dhttps%3a%2f%2fwww.sciencedirect.com%2fscience%2fbook%2
— Prescott, L.M., Harley, J.P., Klein, D.A. (2005). *Microbiology* (6 ed.). McGraw-Hill.

Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

Cell Culture

Type: Compulsory (OB)
Credits: 6.0
Semester: 2nd

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	Catalan	Marta Otero Viñas Cristina Bancells Bau

SUSTAINABLE DEVELOPMENT GOALS (SDG)

— 3. Good health and well-being
— 4. Quality education

COMPETENCIES

General skills

— Combine scientific knowledge with technical skills and technological resources to deal with problems in professional practice.
— Endeavour to combine independence and personal initiative with teamwork in multidisciplinary activities.
— Show a positive attitude to lifelong learning, innovation, creating value and acquiring knowledge.

Specific skills

— Apply knowledge of the molecular basis of biological systems and basic aspects of hereditary transmission to biotechnology problems and situations in this field.
— Design, develop and assess processes to obtain biotechnological products of interest.
— Have oral and written skills in English for communicating results, conclusions and processes deriving from biotechnology research and process management.
— Interpret results obtained in biotechnology laboratories on the basis of correct application of laboratory protocols and basic techniques, making appropriate use of suitable instruments, with due regard for established safety standards.
— Use the main techniques and methods for manipulation and modification of biological systems.
— Work properly in a laboratory, individually and in groups, with due regard for safety, sterilisation, handling, quality control, elimination of biological and chemical residues and annotated records of activities.

Basic skills

— Students have developed the learning skills necessary to undertake further studies with a high degree of independent learning.
— Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgements that include reflection on relevant social, scientific and ethical issues.

Core skills

— Project the values of entrepreneurship and innovation in one's academic and professional career, through contact with a variety of practical contexts and motivation for professional development.
— Use oral, written and audiovisual forms of communication, in one's own language and in foreign languages, with a high standard of use, form and content.

BIBLIOGRAPHY

Key references

— De Boer Jan, A. van Blitterswijk, C. (2023). *Tissue engineering* (3 ed.). Elsevier.
— Doyle, A., Griffiths, J.B. (1998). *Cell and Tissue Culture: Laboratory procedures in biotechnology*. John Wiley & Sons.
— Freshney, R.I. (2010). *Culture of animal cells: A manual of basic technique and specialized applications* (6 ed.). Wiley-Blackwell.
— Sarvazyan, N. (2020). *Tissue engineering. Principles, protocols, and practical exercises*. Retrieved from https://ebookcentral-proquest-com.biblioremot.uvic.cat/lib/uvicsp/reader.action?docID=6157297
— Sigma-Aldrich. Lab & Production Materials (2018). *Fundamental Techniques in Cell Culture Laboratory Handbook : 4th Edition*. Retrieved from https://www.sigmaaldrich.com/life-science/cell-culture/learning-center/ecacc-handbook.html

Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

Integrated Laboratory Practicals I

Type: Compulsory (OB)
Credits: 3.0
Semester: 2nd

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	English	Juan Bertrán Comulada Patricia Resa Infante

OBJECTIVES

The aim of this course is that students improve the following key skills:

— Follow safety rules and regulations in the laboratory.
— Handle properly standard laboratory equipment.
— Apply laboratory rules and follow microbiology and molecular biology protocols.
— Produce an ordered and intelligible record of the activities performed in the laboratory.
— Apply extraction, amplification and nucleic acid analysis protocols.
— Apply protocols for the construction of an expression vector.
— Implement the transformation and cultivation of a microorganism.

LEARNING OUTCOMES

1. Perform the practice tasks collaboratively as a part of a team and improve their degree of autonomy and initiative in the work in the laboratory.
2. Use equipment in a molecular biology laboratory, following safety and waste disposal regulations.
3. Produce an activity record and write reports that justify and analyse the tasks and experiments performed.
4. Interpret correctly the experiment results and draw conclusions.
5. Demonstrate comprehension of spoken and written messages of different types in Catalan, Spanish, and English.

COMPETENCIES

General skills

— Combine scientific knowledge with technical skills and technological resources to deal with problems in professional practice.
— Endeavour to combine independence and personal initiative with teamwork in multidisciplinary activities.

Specific skills

— Have oral and written skills in English for communicating results, conclusions and processes deriving from biotechnology research and process management.
— Interpret results obtained in biotechnology laboratories on the basis of correct application of laboratory protocols and basic techniques, making appropriate use of suitable instruments, with due regard for established safety standards.
— Work properly in a laboratory, individually and in groups, with due regard for safety, sterilisation, handling, quality control, elimination of biological and chemical residues and annotated records of activities.

Basic skills

— Students have developed the learning skills necessary to undertake further studies with a high degree of independent learning.
— Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgements that include reflection on relevant social, scientific and ethical issues.

Core skills

— Use oral, written and audiovisual forms of communication, in one's own language and in foreign languages, with a high standard of use, form and content.

CONTENT

1. Introduction to laboratory work *(2h)*
   — Basic laboratory regulations
   — Laboratory waste disposal
   — Record of activities in the laboratory book
   — Group work
2. Cloning of a cDNA fragment *(10 h in lab sessions + 2h whole group + 1h exercises)*
   — Amplification of a particular cDNA using PCR
   — Purification of a vector plasmid

— Cloning of the cDNA in the vector plasmid using restriction enzymes and DNA ligase

3. Isolation of the clone of interest *(12 h in lab sessions + 1h whole group + 2h exercises whole group)*
   — Transformation and cultivation of a microorganism with the recombinant vector
   — Identification of the correct clones

ASSESSMENT

Assessed activities that represent 100% of the final course grade (NF):

— Activity 1: Written test (40%). Minimum pass mark 4/10 (may be retaken).
— Activity 2: Group work presentation (20%).
— Activity 3: Final report/exercise (20%). (Late submission penalisation: 20%)
— Activity 4: Exercises, quizes and attitude in the lab (20%)

Attendance to all sessions is compulsory.

METHODOLOGY

This subject is developed through several guided laboratory sessions. Students are given a series of lab protocols that they must follow to achieve partial goals in the development of a broader project. The generation of reagents by the student is necessary to proceed from one step to another.

There are also group discussions on the need for certain steps in the development of the project and the discussion of particular questions given to small groups of 2-3 students to work on. These questions are presented to the rest of the class.

There are 7 class sessions with the whole group to introduce new concepts and to prepare the written exam.

BIBLIOGRAPHY

Key references

— Ausubel, F.M., Brent, R., Kingston, R.E., Moore, D.D., Seidman, J.G., Smith, J.A, Struhl, K. (2002). *Short Protocols in Molecular Biology* (5 ed.). John Wiley & Sons.
— Maddocks, S. & Jenkins, R. (2017). *Understanding PCR : a practical bench-top guide* . Retrieved from https://ucercatot.uvic-ucc.cat/permalink/34CSUC_UVIC/qq5d82/alma991001156422006718

Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

Introduction to Engineering

Type: Compulsory (OB)
Credits: 6.0
Semester: 2nd

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	Catalan	Marta Cullell Dalmau
G12, classroom instruction, mornings	Catalan	Marta Cullell Dalmau

SUSTAINABLE DEVELOPMENT GOALS (SDG)

— 8. Decend work and economic growth
— 9. Industry, innovation and infrastructure
— 12. Responsible consumption and production

COMPETENCIES

Specific skills

— Apply the tools of mathematics, statistics, computer science, and the principles of physics and chemistry in the context of biotechnology.
— Design, develop and assess processes to obtain biotechnological products of interest.

Basic skills

— Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgements that include reflection on relevant social, scientific and ethical issues.

Core skills

— Interact in international and worldwide contexts to identify needs and and new contexts for knowledge transfer to current and emerging fields of professional development, with the ability to adapt to and independently manage professional and research processes.

BIBLIOGRAPHY

Key references

— Aucejo, A., Benaiges, M.D., Berna, A., Sanchotello, M., Solà, C. (2013). *Introducció a l'enginyeria química* . Publicacions Universitat de València.
— Doran, P.M. (1995). *Bioprocess Engineering Principles*. Academic Press.
— Gòdia, F., López Santín, J. (2005). *Ingeniería bioquímica*. Síntesis.

Introduction to Physiology

Type: Compulsory (OB)
Credits: 3.0
Semester: 2nd

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	Catalan	Noèlia Téllez Besolí

SUSTAINABLE DEVELOPMENT GOALS (SDG)

— 3. Good health and well-being

COMPETENCIES

General skills

— Endeavour to combine independence and personal initiative with teamwork in multidisciplinary activities.

Specific skills

— Know about subcellular structure and the cell types of organisms, and understand the processes of functional integration in organisms.

Core skills

— Be a critical thinker before knowledge in all its dimensions. Show intellectual, cultural and scientific curiosity and a commitment to professional rigour and quality.
— Use oral, written and audiovisual forms of communication, in one's own language and in foreign languages, with a high standard of use, form and content.

BIBLIOGRAPHY

Key references

— Hall, J.E. (2016). *Guyton y Hall. Compendio de fisiología médica* . Retrieved from https://www-clinicalkey-com.biblioremot.uvic.cat/student/content/toc/3-s2.0-C20150041065
— Koeppen, B.M., Stanton, B.A. (2018). *Berne & Levi. Fisiología*. Retrieved from https://www-clinicalkey-com.biblioremot.uvic.cat/student/content/toc/3-s2.0-C20170016440

Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

Molecular Genetics

Type: Compulsory (OB)
Credits: 6.0
Semester: 2nd

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	Catalan	Josep Maria Serrat Jurado
G12, classroom instruction, mornings	Catalan	Neus Roca Ayats

SUSTAINABLE DEVELOPMENT GOALS (SDG)

— 5. Gender equality

COMPETENCIES

Specific skills

— Apply knowledge of the molecular basis of biological systems and basic aspects of hereditary transmission to biotechnology problems and situations in this field.
— Know about subcellular structure and the cell types of organisms, and understand the processes of functional integration in organisms.
— Study and manipulate genes and their structure and mechanisms of expression in a variety of professional and research contexts.

Basic skills

— Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

BIBLIOGRAPHY

Key references

— Watson, J.D. [et altri] (2017). *Biología molecular del gen* (7 ed.). Médica Panamericana.
— Watson, J.D. et alter (2016). *Biología Molecular del Gen*. Retrieved from https://ucercatot.uvic-ucc.cat/permalink/34CSUC_UVIC/qq5d82/alma991001226563606718

COMPULSORY SUBJECTS IN THE THIRD YEAR

Advanced Biostatistics

Type: Compulsory (OB)
Credits: 3.0
Semester: 1st

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	Catalan	Carlo Manzo

COMPETENCIES

Specific skills

— Apply the tools of mathematics, statistics, computer science, and the principles of physics and chemistry in the context of biotechnology.

Basic skills

— Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
— Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

Core skills

— Be a critical thinker before knowledge in all its dimensions. Show intellectual, cultural and scientific curiosity and a commitment to professional rigour and quality.

BIBLIOGRAPHY

Key references

— Crump, M. J. C. (2018). *Answering questions with data: Introductory statistics for psychology students*. Retrieved from https://crumplab.github.io/statistics/
— Daniel, W. W. (2005). *Bioestadística: Base para el análisis de la ciencias de la salud* (4 ed.). Limusa.
— Navarro, D. (2016). *Learning Statistics with R: A tutorial for psychology students and other beginners*. Retrieved from https://learningstatisticswithr.com/lsr-0.6.pdf

Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

Bioinformatics I

Type: Compulsory (OB)
Credits: 6.0
Semester: 1st

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	Catalan	Maria Luz Calle Rosingana Gabriel Ruiz Alías Mireia Olivella García

COMPETENCIES

General skills

— Combine scientific knowledge with technical skills and technological resources to deal with problems in professional practice.

Specific skills

— Apply the tools of mathematics, statistics, computer science, and the principles of physics and chemistry in the context of biotechnology.
— Search, obtain and interpret information in the main biological and bibliographic databases using bioinformatics tools, and use programming techniques for problem solving.

Basic skills

— Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
— Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.
— Students have developed the learning skills necessary to undertake further studies with a high degree of independent learning.

Core skills

— Display professional skills in complex multidisciplinary contexts, working in networked teams, whether face-to-face or online, through use of information and communication technology.
— Use oral, written and audiovisual forms of communication, in one's own language and in foreign languages, with a high standard of use, form and content.

BIBLIOGRAPHY

Key references

— Baldi, P., Brunak, S. (2001). *Bioinformatics* (2 ed.). MIT Press.
— Baxevanis, A. D. (editor), Ouellette, B. F. F. (editor) (2004). *Bioinformatics: A practical guide to the analysis of genes and proteins* (3 ed.). Wiley.
— Lopes, Heitor Silvério ; Cruz, Leonardo Magalhães (2011). *Computational Biology and Applied Bioinformatics*. Retrieved from https://csuc-uvic.primo.exlibrisgroup.com/permalink/34CSUC_UVIC/n4lsb5/cdi_oapen_doabooks_65083
— Model, Mitchell L. (2010). *Bioinformatics programming using Python*. O'Reilly.

Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

Bioreactors

Type: Compulsory (OB)
Credits: 9.0
Semester: 1st

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	Catalan	Marta Cullell Dalmau

SUSTAINABLE DEVELOPMENT GOALS (SDG)

— 6. Clean water and sanitation
— 13. Climate action

COMPETENCIES

Specific skills

— Apply the tools of mathematics, statistics, computer science, and the principles of physics and chemistry in the context of biotechnology.
— Design, develop and assess processes to obtain biotechnological products of interest.

Basic skills

— Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.
— Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgements that include reflection on relevant social, scientific and ethical issues.

Core skills

— Display professional skills in complex multidisciplinary contexts, working in networked teams, whether face-to-face or online, through use of information and communication technology.

BIBLIOGRAPHY

Key references

— Casas, C., Gonzàlez, G., Lafuente, F. J. (1998). *Ingeniería bioquímica*. Síntesi.
— Doran, P. M. (1998). *Principios de ingeniería de los bioprocesos* . Acribia.

Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

Genetic Engineering

Type: Compulsory (OB)
Credits: 6.0
Semester: 1st

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	English	Juan Bertrán Comulada Neus Roca Ayats
G40, classroom instruction, mornings	English	Juan Bertrán Comulada Neus Roca Ayats

SUSTAINABLE DEVELOPMENT GOALS (SDG)

— 5. Gender equality

OBJECTIVES

The objectives of this subject are to show students:

— State-of-the-art technology in genetic engineering
— Applications of genetic engineering in the development of research projects and the generation of commercial products
— Advantages and limitations of the different techniques described

LEARNING OUTCOMES

1. Apply the technology and methodology for cloning and characterisation of nucleic acids and take them into account in experimental design.
2. Analyse and interpret data.
3. Identify the apropriate methodology for genome analysis and to study gene expression and function in different settings.
4. Distinguish the methodology to genetically modify living organisms.
5. Demonstrate comprehension of both spoken and written English.
6. Question and reflect on scientific, social and ethical issues.

COMPETENCIES

General skills

— Combine scientific knowledge with technical skills and technological resources to deal with problems in professional practice.

Specific skills

— Apply knowledge of the molecular basis of biological systems and basic aspects of hereditary transmission to biotechnology problems and situations in this field.
— Have oral and written skills in English for communicating results, conclusions and processes deriving from biotechnology research and process management.
— Interpret results obtained in biotechnology laboratories on the basis of correct application of laboratory protocols and basic techniques, making appropriate use of suitable instruments, with due regard for established safety standards.
— Know about subcellular structure and the cell types of organisms, and understand the processes of functional integration in organisms.
— Study and manipulate genes and their structure and mechanisms of expression in a variety of professional and research contexts.
— Use the main techniques and methods for manipulation and modification of biological systems.
— Use the molecular, cellular and physiological basis of organisms, including relationships with other organisms or agents, to design biotechnological products.
— Work properly in a laboratory, individually and in groups, with due regard for safety, sterilisation, handling, quality control, elimination of biological and chemical residues and annotated records of activities.

Basic skills

— Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

Core skills

— Exercise active citizenship and individual responsibility with a commitment to the values of democracy, sustainability and universal design, through practice based on learning, service and social inclusion.

— Interact in international and worldwide contexts to identify needs and and new contexts for knowledge transfer to current and emerging fields of professional development, with the ability to adapt to and independently manage professional and research processes.

— Use oral, written and audiovisual forms of communication, in one's own language and in foreign languages, with a high standard of use, form and content.

CONTENT

1. Basic concepts *(2h)*
2. In vitro DNA recombination *(4h + 2h exercises)*
3. Polymerase chain reaction (PCR) *(2h + 2h exercises + 1h questionnaire)*
4. Prokaryotic cloning vectors *(4h + 2h exercise)*
5. Eukaryotic vector-host systems *(6h+ 2h exercises + 2h partial exam)*
6. Sequencing of nucleic acids *(2h)*
7. Study of gene expression *(6h + 2h exercises)*
8. Recombinant proteins *(2h + 2h exercise + 1h questionnaire)*
9. Genome edition. CRISPR-CAS *(2h + 2h seminar)*
10. Transgenic animals and plants *(6h + 2h exercises)*

Other activities

— 4h oral presentations on a case study

ASSESSMENT

Assessment activities represent 100% of the final course grade (FG):

— Activity 1. Written tests: 60% (FG); minimum pass mark: 4/10 ; tests may be retaken independently but you can only retake one of the two partial tests and the average of these two must be 4/10 or higher to be considered for final course grade.
— Partial test 1: 30% (FG)
— Partial test 2: 30% (FG)
— Activity 2. Questionnaires: 20% (FG)
— Activity 3. Case study / exercises: 20% (FG)

Reassessment

Each student can retake one partial test at the end of the semester in the reassessment period.

METHODOLOGY

— Presentation of theoretical aspects related to diverse technologies or methodologies
— Specific seminars on latest technology advances and applications
— Work on exercises
— Work on one case study with exercises on the techniques described during the course

BIBLIOGRAPHY

Key references

— Brown, T. A. (2020). *Gene Cloning and DNA Analysis*: *An introduction* (8 ed.). John Wiley & Sons.
— Brown, TA. (2002). *Genomes*. Retrieved from https://www.ncbi.nlm.nih.gov/books/NBK21128/?term=genomes%20brown
— Izquierdo, M. (2014). *Curso de genética molecular e ingeniería genética* . Pirámide.
— Primrose, S.B., & Twyman, R. M. (2006). *Principles of gene manipulation and genomics* (7 ed.). Blackwell.
— Watson, J. D., Caudy, A. A., Myers, R. M., & Witkowski, J. A. (2007). *Recombinant DNA*. Freeman & Co-CSHL Press.

Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

Immunology

Type: Compulsory (OB)
Credits: 3.0
Semester: 1st

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	Catalan	Alexandre Olvera Van Der Stoep

SUSTAINABLE DEVELOPMENT GOALS (SDG)

— 3. Good health and well-being

COMPETENCIES

Specific skills

— Apply knowledge of the molecular basis of biological systems and basic aspects of hereditary transmission to biotechnology problems and situations in this field.
— Know about subcellular structure and the cell types of organisms, and understand the processes of functional integration in organisms.
— Use the molecular, cellular and physiological basis of organisms, including relationships with other organisms or agents, to design biotechnological products.

Basic skills

— Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

Core skills

— Be a critical thinker before knowledge in all its dimensions. Show intellectual, cultural and scientific curiosity and a commitment to professional rigour and quality.
— Interact in international and worldwide contexts to identify needs and and new contexts for knowledge transfer to current and emerging fields of professional development, with the ability to adapt to and independently manage professional and research processes.
— Use oral, written and audiovisual forms of communication, in one's own language and in foreign languages, with a high standard of use, form and content.

BIBLIOGRAPHY

Key references

— (2017). *Microbiology and immunology on-line*. Retrieved from http://www.microbiologybook.org/book/welcome.htm
— (2019). *Immunopaedia*. Retrieved from https://www.immunopaedia.org.za/
— Abul K. Abbas, Andrew H. Lichtman,Shiv Pillai, David L. Baker (2022). *Inmunología celular y molecular*. Retrieved from https://www-clinicalkey-com.biblioremot.uvic.cat/student/content/toc/3-s2.0-C20210015248
— Janeway, C. A., Travers, P., Walport, M. [et al.] (2001). *Immunobiology*: *The immune system in health and disease* (5 ed.). Garland Science.
— Roitt, I., Brostoff, J., Male, D. (2012). *Immunology* (8 ed.). Elsevier.

Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

Integrated Laboratory Practicals II

Type: Compulsory (OB)
Credits: 3.0
Semester: 1st

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	Catalan	Ariadna Arbat Plana Marta Bau Puig

SUSTAINABLE DEVELOPMENT GOALS (SDG)

— 9. Industry, innovation and infrastructure
— 12. Responsible consumption and production

COMPETENCIES

General skills

— Combine scientific knowledge with technical skills and technological resources to deal with problems in professional practice.
— Endeavour to combine independence and personal initiative with teamwork in multidisciplinary activities.

Specific skills

— Interpret results obtained in biotechnology laboratories on the basis of correct application of laboratory protocols and basic techniques, making appropriate use of suitable instruments, with due regard for established safety standards.
— Use the main techniques and methods for manipulation and modification of biological systems.
— Work properly in a laboratory, individually and in groups, with due regard for safety, sterilisation, handling, quality control, elimination of biological and chemical residues and annotated records of activities.

Basic skills

— Students have developed the learning skills necessary to undertake further studies with a high degree of independent learning.
— Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgements that include reflection on relevant social, scientific and ethical issues.

Core skills

— Become the protagonist of one's own learning process in order to achieve personal and professional growth and acquire all-round training for living and learning in a context of respect for linguistic, social, cultural, gender and economic diversity.

BIBLIOGRAPHY

Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

Bioinformatics II

Type: Compulsory (OB)
Credits: 6.0
Semester: 2nd

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	English	Mireia Olivella García Roger Casals Franch

OBJECTIVES

The aim of this course is to use bioinformatic tools more deeply, covering sequence alignments, evolution and phylogeny, and genome wide association studies. Moreover, the students will have to solve biological problems using bioinformatic tools and programming.

LEARNING OUTCOMES

1. Aplica els coneixements de la bioinformàtica a problemes i exercicis relacionats amb l'evolució i la filogènia.
2. Prediu gens i regions promotores amb l'ajut d'eines bioinformàtiques.
3. Utilitza les eines bioinformàtiques avançades per resoldre problemes correctament.
4. Es mou amb desimboltura en l'ús general de les TIC i especialment en els entorns tecnològics propis de l'àmbit professional.
5. Comprèn missatges orals i escrits de diferent tipologia de forma completa expressats en les llengües pròpies i en anglès.
6. Elabora informes i documents escrits (principalment de caràcter tècnic) amb correcció ortogràfica i gramatical en català, castellà i anglès.

COMPETENCIES

General skills

— Combine scientific knowledge with technical skills and technological resources to deal with problems in professional practice.

Specific skills

— Apply the tools of mathematics, statistics, computer science, and the principles of physics and chemistry in the context of biotechnology.
— Search, obtain and interpret information in the main biological and bibliographic databases using bioinformatics tools, and use programming techniques for problem solving.

Basic skills

— Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
— Students have developed the learning skills necessary to undertake further studies with a high degree of independent learning.

Core skills

— Be a critical thinker before knowledge in all its dimensions. Show intellectual, cultural and scientific curiosity and a commitment to professional rigour and quality.
— Display professional skills in complex multidisciplinary contexts, working in networked teams, whether face-to-face or online, through use of information and communication technology.
— Use oral, written and audiovisual forms of communication, in one's own language and in foreign languages, with a high standard of use, form and content.

CONTENT

1. Sequence alignments. Fundamentals of sequence alignments. Pairwise sequence alignments. Multiple sequence alignments *(20 hours)*
2. Evolution and phylogeny *(8 hours)*
3. Sequence and data analysis using programming *(12 hours)*
4. Transcriptomic analysis *(20 hours)*

ASSESSMENT

— Partial exam 1: 25 % of the overall grade. It can be reassessed. RA1, RA3
— Partial exam 2: 25 % of the overall grade. It can be reassessed. RA2, RA6
— Partial exam 3: 25 % of the overall grade. It can be reassessed. RA2, RA6

— Exercises and practicals during the course. 25% of the overall grade. These activities can not be reassessed. RA1, RA2, RA3, RA4, RA8

To pass the subject it is necessary to obtain a minimum score of 5 for each partial exam and an overall grade of 5. Partial exams can be reassessed.

The mark obtained in the reassessment will substitute the mark obtained in the first assessment for the partial exams.

All sessions are mandatory. If a student does not attend to a session without any justified reason, there will be a penalisation of 0,5 points of the final score for each failed session.

Total or partial copy and/or plagiarism will imply a failure in the subject with a final grade of zero points and no access to retake exams.

METHODOLOGY

The sessions will combine theoretical concepts and hands-on-sessions. It is necessary that the student brings a laptop in order to follow the sessions.

BIBLIOGRAPHY

Key references

— Baxevanis, A. D., Francis, B.F. (2005). *Bioinformatics*: *A practical guide to the analysis of genes and proteins* (3 ed.). Wiley.
— Model, M. L., Tisdall, J. (2010). *Bioinformatics programming using Python*: *Practical programming for biological data*. O'Reilly.
— Mount, D. W. (2001). *Bioinformatics*: *Sequence and genome analysis*. Cold Spring Harbour.
— Stevens, T. J. (MRC Laboratory of Molecular Biology), Boucher, W. (University of Cambridge) (2014). *Python programming for biology, bioinformatics, and beyond*. Cambridge University Press.

Biotechnology Processes and Products

Type: Compulsory (OB)
Credits: 6.0
Semester: 2nd

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	Catalan	Tarik Ruiz Medina Judit Soy Platero

SUSTAINABLE DEVELOPMENT GOALS (SDG)

— 6. Clean water and sanitation
— 9. Industry, innovation and infrastructure
— 13. Climate action

COMPETENCIES

General skills

— Combine scientific knowledge with technical skills and technological resources to deal with problems in professional practice.

Specific skills

— Acquire scientific and technical training for study of the possible uses of organisms for the production of goods and services with commercial value, with due regard to ethics and intellectual property regulations.
— Apply knowledge of the molecular basis of biological systems and basic aspects of hereditary transmission to biotechnology problems and situations in this field.
— Design, develop and assess processes to obtain biotechnological products of interest.
— Interpret results obtained in biotechnology laboratories on the basis of correct application of laboratory protocols and basic techniques, making appropriate use of suitable instruments, with due regard for established safety standards.
— Use the main techniques and methods for manipulation and modification of biological systems.

Basic skills

— Students have developed the learning skills necessary to undertake further studies with a high degree of independent learning.
— Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgements that include reflection on relevant social, scientific and ethical issues.

Core skills

— Become the protagonist of one's own learning process in order to achieve personal and professional growth and acquire all-round training for living and learning in a context of respect for linguistic, social, cultural, gender and economic diversity.
— Use oral, written and audiovisual forms of communication, in one's own language and in foreign languages, with a high standard of use, form and content.

BIBLIOGRAPHY

Key references

— Beschkov, V., & Yankov, D. (2021). *Downstream Processing in Biotechnology*. de Gruyer.
— Flickinger, Michael C. (Editor) (2013). *Downstream Industrial Biotechnology: Recovery and Purification* . Wiley.

Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

Integrated Laboratory Practicals III

Type: Compulsory (OB)
Credits: 6.0
Semester: 2nd

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	English	Juan Bertrán Comulada Irene Cuervas Oliveras Magí Passols Manzano Manuel Joaquin Caudet

OBJECTIVES

— Observe safety rules and regulations in the laboratory.
— Handle properly standard laboratory equipment.
— Apply safe laboratory rules and follow molecular biology and tissue culture protocols.
— Produce an ordered and intelligible record of the activities performed in the laboratory.
— Design and use an experimental protocol.

LEARNING OUTCOMES

1. Demonstrate skill in transfecting cells and evaluating transfection efficiency.
2. Recognise cell differentiation markers by western blot and know of other methodologies (RT-PCR, flow cytometry, etc.).
3. Produce a monolayer cell culture using an established cell line.
4. Apply the basic techniques commonly used in molecular genetics such as cloning, transfection and transformation of a microorganism.
5. Use biochemical techniques for the evaluation of proteins, electrophoresis and immunodetection.
6. Analyse and interpret the data obtained.
7. Demonstrate comprehension of spoken and written messages of different types in Catalan, Spanish and English.
8. Prepare written reports and documents (mainly of a technical nature) with correct spelling and grammar in English.
9. Perform well in work situations with commitment and responsibility.

COMPETENCIES

General skills

— Combine scientific knowledge with technical skills and technological resources to deal with problems in professional practice.
— Endeavour to combine independence and personal initiative with teamwork in multidisciplinary activities.

Specific skills

— Have oral and written skills in English for communicating results, conclusions and processes deriving from biotechnology research and process management.
— Interpret results obtained in biotechnology laboratories on the basis of correct application of laboratory protocols and basic techniques, making appropriate use of suitable instruments, with due regard for established safety standards.
— Use the main techniques and methods for manipulation and modification of biological systems.

Basic skills

— Students have developed the learning skills necessary to undertake further studies with a high degree of independent learning.
— Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgements that include reflection on relevant social, scientific and ethical issues.

Core skills

— Become the protagonist of one's own learning process in order to achieve personal and professional growth and acquire all-round training for living and learning in a context of respect for linguistic, social, cultural, gender and economic diversity.
— Use oral, written and audiovisual forms of communication, in one's own language and in foreign languages, with a high standard of use, form and content.

CONTENT

— Permanent and transient transfection of cell lines (15h lab sessions + 5h whole group sessions)
  - Fluorescence microscopy follow up
  - Drug resistance

— Cell differentiation. Culture of myoblasts in different media to achieve their proliferation or differentiation; signalling pathways involved (30h lab sessions + 7h whole group sessions + 3h quizzes and exam)
  - Differentiation marker analysis using western blot and enzyme activity tests
  - Morphology assessment under the microscope using specific staining

ASSESSMENT

— Assessment of activities, that represent 100% of the final grade (FG):
  - Activity 1. Final written test (40%). Minimum pass mark 4/10 (may be retaken)
  - Activity 2. Group work oral presentation (15%)
  - Activity 3. Poster with data obtained (15%) (Late submission penalisation: 20%)
  - Activity 4. Attitude in the lab and questionnaires (15%)
  - Activity 5. Final report / exercise (15%)

— Attendance to all sessions is compulsory.

METHODOLOGY

This subject is developed through several guided laboratory sessions. Two demonstrative experiments are performed in groups of two or three people using different methodologies. Students are given a series of lab protocols that they must follow to achieve partial goals in the development of the project. The generation of reagents by the student is necessary to proceed from one step to another.

There are also group discussions during the development of the experiments and discussions on two research articles related to the methodology and contents of the experiments performed. Students are required to prepare different parts of the articles and present them to the rest of the class.

BIBLIOGRAPHY

Key references

— Ausubel, F. M., Brent, R., Kingston, R. E., Moore, D. D., Seidman, J.G., Smith, J. A., Struhl, K. (eds.) (2002). *Short protocols in molecular biology* (5 ed.). John Wiley & Sons.
— Blitterswijk,C.A. & Boer J. (2023). *Tissue engineering*. Retrieved from https://ucercatot.uvic-ucc.cat/permalink/34CSUC_UVIC/1nl2ep/alma991001143979106718

Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

Protein Chemistry and Engineering

Type: Compulsory (OB)
Credits: 6.0
Semester: 2nd

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	Catalan	Jordi Villà Freixa Montserrat Fàbrega Ferrer

SUSTAINABLE DEVELOPMENT GOALS (SDG)

— 3. Good health and well-being
— 12. Responsible consumption and production
— 13. Climate action

COMPETENCIES

Specific skills

— Act in accordance with an integrated view of the operation of molecular mechanisms for regulation and control of cellular metabolism, so as to understand and respond to new biotechnological needs and challenges.
— Apply knowledge of the molecular basis of biological systems and basic aspects of hereditary transmission to biotechnology problems and situations in this field.
— Know about subcellular structure and the cell types of organisms, and understand the processes of functional integration in organisms.
— Search, obtain and interpret information in the main biological and bibliographic databases using bioinformatics tools, and use programming techniques for problem solving.
— Use the molecular, cellular and physiological basis of organisms, including relationships with other organisms or agents, to design biotechnological products.

Basic skills

— Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

Core skills

— Interact in international and worldwide contexts to identify needs and and new contexts for knowledge transfer to current and emerging fields of professional development, with the ability to adapt to and independently manage professional and research processes.

BIBLIOGRAPHY

Key references

— Eu, B.C. (2018). *Reversible and Irreversible Thermodynamics*. Retrieved from https://www.worldscientific.com/worldscibooks/10.1142/10599#t=aboutBook
— Fersht, A. (2017). *Structure and Mechanism in Protein Science*. Retrieved from https://www.worldscientific.com/worldscibooks/10.1142/10574#t=aboutBook
— Jelokhani-Niaraki, Masoud (editor) (2023). *Membrane Proteins: Structure, Function and Motion* . MDPI - Multidisciplinary Digital Publishing Institute.
— Lesk, A. M. (2016). *Introduction to protein science* (3 ed.). Oxford University Press.
— Wong, T.S., & Tee, K.L. (2020). *A Practical Guide to Protein Engineering*. Springer.

Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

Regulation of Metabolism

Type: Compulsory (OB)
Credits: 6.0
Semester: 2nd

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	Catalan	Montserrat Moreno Sánchez

SUSTAINABLE DEVELOPMENT GOALS (SDG)

— 3. Good health and well-being
— 5. Gender equality

COMPETENCIES

Specific skills

— Act in accordance with an integrated view of the operation of molecular mechanisms for regulation and control of cellular metabolism, so as to understand and respond to new biotechnological needs and challenges.
— Apply knowledge of the molecular basis of biological systems and basic aspects of hereditary transmission to biotechnology problems and situations in this field.
— Know about subcellular structure and the cell types of organisms, and understand the processes of functional integration in organisms.
— Use the molecular, cellular and physiological basis of organisms, including relationships with other organisms or agents, to design biotechnological products.

Basic skills

— Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

BIBLIOGRAPHY

Key references

— Bender, D. A. & Cunningham, S. M. C. (2021). *Introduction to nutrition and metabolism* (6 ed.). CRC Press, Taylor & Francis Group.
— Blanco Gaitán, Maria Dolores (2017). *Fundamentos de bioquímica metabólica (4a. ed.)*. Retrieved from https://elibro.net/es/lc/bibliouvic/titulos/51989
— Frayn, K. N. (2019). *Human metabolism*: *A regulatory perspective* (4 ed.). Wiley-Blackwell.
— Newsholme, E. A., Leech, T. R. (2010). *Functional biochemistry in health and disease*. Wiley.
— Storey, K. B. (2004). *Functional metabolism*: *Regulation and adaptation*. Wiley.

Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

COMPULSORY SUBJECTS IN THE FOURTH YEAR

Industrial Biotechnology

Type: Compulsory (OB)
Credits: 6.0
Semester: 1st

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	Catalan	Marta Cullell Dalmau

SUSTAINABLE DEVELOPMENT GOALS (SDG)

— 9. Industry, innovation and infrastructure

COMPETENCIES

General skills

— Combine scientific knowledge with technical skills and technological resources to deal with problems in professional practice.
— Endeavour to combine independence and personal initiative with teamwork in multidisciplinary activities.
— Show a positive attitude to lifelong learning, innovation, creating value and acquiring knowledge.

Specific skills

— Acquire scientific and technical training for study of the possible uses of organisms for the production of goods and services with commercial value, with due regard to ethics and intellectual property regulations.
— Apply knowledge of the molecular basis of biological systems and basic aspects of hereditary transmission to biotechnology problems and situations in this field.
— Design, develop and assess processes to obtain biotechnological products of interest.
— Have oral and written skills in English for communicating results, conclusions and processes deriving from biotechnology research and process management.
— Interpret results obtained in biotechnology laboratories on the basis of correct application of laboratory protocols and basic techniques, making appropriate use of suitable instruments, with due regard for established safety standards.
— Use the main techniques and methods for manipulation and modification of biological systems.
— Work properly in a laboratory, individually and in groups, with due regard for safety, sterilisation, handling, quality control, elimination of biological and chemical residues and annotated records of activities.

Basic skills

— Students have developed the learning skills necessary to undertake further studies with a high degree of independent learning.
— Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgements that include reflection on relevant social, scientific and ethical issues.

Core skills

— Become the protagonist of one's own learning process in order to achieve personal and professional growth and acquire all-round training for living and learning in a context of respect for linguistic, social, cultural, gender and economic diversity.
— Project the values of entrepreneurship and innovation in one's academic and professional career, through contact with a variety of practical contexts and motivation for professional development.
— Use oral, written and audiovisual forms of communication, in one's own language and in foreign languages, with a high standard of use, form and content.

BIBLIOGRAPHY

Key references

— Flickinger, M. C., & Drew, S. W. (1999). *The encyclopedia of bioprocess technology : fermentation, biocatalysis, and bioseparation* . Wiley.

Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

Social and Legal Aspects of Biotechnology

Type: Compulsory (OB)
Credits: 6.0
Semester: 1st

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	Catalan	Montserrat Capellas Herms Jordi Galiano Landeira

SUSTAINABLE DEVELOPMENT GOALS (SDG)

— 4. Quality education
— 16. Peace, justice and strong institutions

COMPETENCIES

General skills

— Act professionally, with ethical commitment and respect for criteria of sustainability, accessibility and universal design.
— Combine scientific knowledge with technical skills and technological resources to deal with problems in professional practice.
— Endeavour to combine independence and personal initiative with teamwork in multidisciplinary activities.
— Show a positive attitude to lifelong learning, innovation, creating value and acquiring knowledge.

Specific skills

— Acquire scientific and technical training for study of the possible uses of organisms for the production of goods and services with commercial value, with due regard to ethics and intellectual property regulations.

Basic skills

— Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.
— Students have developed the learning skills necessary to undertake further studies with a high degree of independent learning.

Core skills

— Be a critical thinker before knowledge in all its dimensions. Show intellectual, cultural and scientific curiosity and a commitment to professional rigour and quality.
— Exercise active citizenship and individual responsibility with a commitment to the values of democracy, sustainability and universal design, through practice based on learning, service and social inclusion.
— Project the values of entrepreneurship and innovation in one's academic and professional career, through contact with a variety of practical contexts and motivation for professional development.

BIBLIOGRAPHY

Key references

— Cambra Badii, I.; Busquets, E.; Terribas, N.; Baños, J.E. (2024). *Bioethics. Foundations, Applications and Future Challenges*. Routledge.
— Cooley, D. R. (2010). *Tecnología, transgénicos y un código moral práctico*. Retrieved from https://link-springer-com.biblioremot.uvic.cat/content/pdf/10.1007%2F978-90-481-3021-4.pdf
— Goodwin, M., Tu, S., Paris, J. (2015). *Biotechnology, bioethics and the law*. Carolina Academic Press.
— Morrison, A. J. (2020). *Biotechnology law: A primer for scientists*. Retrieved from https://www-degruyter-com.biblioremot.uvic.cat/document/doi/10.7312/morr17938/html
— Ramos Pozón, S. (2018). *Bioética: una reflexión necesaria para las decisiones que más importan*. Plataforma Editorial.

Final Year Project

Type: Final Year Project (TFG)
Credits: 12.0
Semester: 1st or 2nd

COORDINATION

— Anna Maria Dalmau Roda

COMPETENCIES

General skills

— Be prepared to overcome adversity in professional activity and learn from mistakes in order to integrate knowledge and enhance one's preparation.

Basic skills

— Students have developed the learning skills necessary to undertake further studies with a high degree of independent learning.
— Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgements that include reflection on relevant social, scientific and ethical issues.

Core skills

— Be a critical thinker before knowledge in all its dimensions. Show intellectual, cultural and scientific curiosity and a commitment to professional rigour and quality.
— Become the protagonist of one's own learning process in order to achieve personal and professional growth and acquire all-round training for living and learning in a context of respect for linguistic, social, cultural, gender and economic diversity.
— Display professional skills in complex multidisciplinary contexts, working in networked teams, whether face-to-face or online, through use of information and communication technology.
— Interact in international and worldwide contexts to identify needs and and new contexts for knowledge transfer to current and emerging fields of professional development, with the ability to adapt to and independently manage professional and research processes.
— Use oral, written and audiovisual forms of communication, in one's own language and in foreign languages, with a high standard of use, form and content.

BIBLIOGRAPHY

Key references

— Coromina, E., Casacuberta, X., Quintana, D. (2000). *El treball de recerca : Procés d'elaboració, memòria escrita, exposició oral i recursos*. Eumo Editorial.
— Ferrer, V., Carmona, M., Sòria, V. (2012). *El trabajo de fin de grado : Guia para estudiantes, docentes y agentes colaboradores*. McGraw-Hill.
— Rigo, A., Gesnescà, G. (2000). *Tesis i treballs: Aspectes formals*. Eumo Editorial.
— Sancho, J. (2014). *Com escriure i presentar el millor treball acadèmic: Guia pràctica per estudiants i professors*. Eumo Editorial.

Internship I

Type: External Academic Practicum (PAE)
Credits: 6.0
Semester: 1st or 2nd

COORDINATION

— Anna Maria Dalmau Roda

COMPETENCIES

General skills

— Be prepared to overcome adversity in professional activity and learn from mistakes in order to integrate knowledge and enhance one's preparation.
— Endeavour to combine independence and personal initiative with teamwork in multidisciplinary activities.

Specific skills

— Act in accordance with an integrated view of the operation of molecular mechanisms for regulation and control of cellular metabolism, so as to understand and respond to new biotechnological needs and challenges.
— Design, develop and assess processes to obtain biotechnological products of interest.
— Have oral and written skills in English for communicating results, conclusions and processes deriving from biotechnology research and process management.
— Interpret results obtained in biotechnology laboratories on the basis of correct application of laboratory protocols and basic techniques, making appropriate use of suitable instruments, with due regard for established safety standards.
— Study and manipulate genes and their structure and mechanisms of expression in a variety of professional and research contexts.
— Use the molecular, cellular and physiological basis of organisms, including relationships with other organisms or agents, to design biotechnological products.
— Work properly in a laboratory, individually and in groups, with due regard for safety, sterilisation, handling, quality control, elimination of biological and chemical residues and annotated records of activities.

Basic skills

— Students can apply their knowledge to their work or vocation in a professional manner and have competencies typically demonstrated through drafting and defending arguments and solving problems in their field of study.
— Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgements that include reflection on relevant social, scientific and ethical issues.

Core skills

— Display professional skills in complex multidisciplinary contexts, working in networked teams, whether face-to-face or online, through use of information and communication technology.
— Project the values of entrepreneurship and innovation in one's academic and professional career, through contact with a variety of practical contexts and motivation for professional development.
— Use oral, written and audiovisual forms of communication, in one's own language and in foreign languages, with a high standard of use, form and content.

OPTIONAL SUBJECTS

Advanced Bioinformatics

Type: Optional (OP)
Credits: 6.0

OBJECTIVES

L'objectiu d'aquesta assignatura és dotar l'estudiant de les competències bàsiques per desenvolupar un projecte bioinformàtic de forma totalment autònoma.

Abans de matricular-se a aquesta assignatura, l'estudiant ha d'haver cursat Bioinformàtica I i Bioinformàtica II.

LEARNING OUTCOMES

1. Aprofundeix en l'ús i desenvolupament d'eines de programació aplicades a la bioinformàtica.
2. Es familiaritza amb els factors que condicionen l'èxit d'un projecte de recerca: formulació correcta d'hipòtesis, limitacions temporals, materials i metodològiques, interpretació de les dades, etc.
3. Aprèn a dissenyar i dur a terme un projecte de recerca: pla de treball, distribució de tasques, obtenció i anàlisi de dades, interpretació de resultats, presentació oral i escrita, etc.

COMPETENCIES

Specific skills

— Search, obtain and interpret information in the main biological and bibliographic databases using bioinformatics tools, and use programming techniques for problem solving.

Core skills

— Use oral, written and audiovisual forms of communication, in one's own language and in foreign languages, with a high standard of use, form and content.

CONTENT

— 1st part: Homology modelling for protein structures. Cristiano Galletti (2 ECTS)
  - From Sept 14th to Oct 15th
— 2nd part: Bioinformatic projects in Python to help the research of CoVid-19. Adrián Garcia (4 ECTS)
  - From Oct 19th to the end of the semester

ASSESSMENT

— 1rst part
  - Class participation: 5%
  - Test (general concepts): 5%
  - Project: 20%
— 2nd part
  - Class participation: 5%
  - Test (general concepts): 10%
  - Project: 40%
— Final oral presentations of projects (Bioinformatics Workshop): 15%

En cas de nova emergència sanitària que impliqui confinament, no s'alteraran les activitats ni les ponderacions de l'avaluació. En cas que les proves d'avaluació no es puguin fer a l'aula, es faran telemàticament.

METHODOLOGY

Sessions pràctiques en què els estudiants han de dur a terme anàlisis bioinformàtiques utilitzant els llenguatges de programació R i Python.

En cas d'una situació d'emergència sanitària que impliqui nou confinament la docència es portarà a terme telemàticament i s'adequarà la metodologia a aquest nou context.

BIBLIOGRAPHY

Key references

— Downey, A. B. (2015). *Think Python*: *How to think like a computer scientist* (2 ed.). O'Reilly Media.
— Stevens, T. J., and Boucher, W. (2015). *Python programming for biology*: *Bioinformatics and beyond*. Cambridge University Press.

Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

Cancer Biology

Type: Optional (OP)
Credits: 6.0

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	English	Gemma Fuster Orellana Aleix Noguera Castells

SUSTAINABLE DEVELOPMENT GOALS (SDG)

— 3. Good health and well-being
— 5. Gender equality

OBJECTIVES

The Cancer Biology course aims to provide a comprehensive understanding of the molecular and cellular mechanisms involved in cancer development and progression. The course covers key topics such as carcinogenesis, cell signaling, tumor microenvironment, metastasis, and current therapeutic strategies. It also introduces concepts of drug resistance, translational oncology, and emerging diagnostic tools.

The aim of the course is to learn about the complexity and variability of tumors and the characteristics of cancer processes, which encourages research to determine how to best deal with the disease. This reasoning is the principal of the personalised cancer medicine.

The main objectives are:

1. To acquire knowledge and to develop a critical point of view of the biology of cancer and cancer research, taking into account stromal and tumoral cells per se. This knowledge will bring to the students the opportunity to actively participate in the discussions and seminars.
2. Describe and identify the main signal transduction pathways and the most important tumor cell functions deregulations. To be able to identify therapeutical targets in these pathways and functions.
3. To develop abilities for collaborative work, share tasks and to be able to perform scientific critical discussions.
4. To develop skills in useful techniques in a cancer research laboratory.
5. To create a scientific report evaluating and discussing the results with criticism and designing alternatives or solutions to apply.
6. To introduce the students to cancer research to promote cancer research career.

LEARNING OUTCOMES

1. Understand the biological and molecular bases of the cancer process.
2. Know the therapeutic strategies to fight against cancer.
3. Acquire a critical point of cancer biology and cancer research bringing them the opportunity to actively participate in discussions and seminars.
4. Develop the capacity for critical thought with respect to processes associated with the profession.
5. Describe and identify the main signal transduction pathways and the most important tumor cell function deregulations.
6. Develop abilities for collaborative work, share tasks and to be able to perform scientific critical discussions.
7. Develop skills in useful techniques in a cancer research laboratory.
8. Write a scientific report evaluating and discussing the results with criticism and designing alternatives or solutions to apply.

COMPETENCIES

Specific skills

— Acquire scientific and technical training for study of the possible uses of organisms for the production of goods and services with commercial value, with due regard to ethics and intellectual property regulations.
— Search, obtain and interpret information in the main biological and bibliographic databases using bioinformatics tools, and use programming techniques for problem solving.
— Study and manipulate genes and their structure and mechanisms of expression in a variety of professional and research contexts.

Basic skills

— Students have demonstrated knowledge and understanding in a field of study that builds on general secondary education with the support of advanced textbooks and knowledge of the latest advances in this field of study.

Core skills

— Be a critical thinker before knowledge in all its dimensions. Show intellectual, cultural and scientific curiosity and a commitment to professional rigour and quality.

— Project the values of entrepreneurship and innovation in one's academic and professional career, through contact with a variety of practical contexts and motivation for professional development.

CONTENT

THEORY

Part I. Cancer biology basis (17h)

— Topic 1. Introduction to cancer (2h)
— Topic 2. Carcinogenesis: Genetic and epigenetic alterations in cancer + student's journal club related to ODS3 (4h)
— Topic 3. Oncogenes and tumour suppressor genes (3h)
— Topic 4. Dysregulated cell signaling in cancer + case study (6h)

Exam lessons 1-6 (2h)

Part II. Tumour and stromal cell behaviour and characteristics (9h)

— Topic 5. Cell cycle and apoptosis deregulation and genome instability (2h)
— Topic 6. Metabolic reprogramming in cancer (2h)
— Topic 7. Tumor microenvironment (0,5h)
— Topic 8. Tumor angiogenesis (0,5h)
— Topic 9. Invasion and metastasis (2h)
— Visit to VHIO (2h)

Part III. Cancer diagnosis and therapy (12h)

— Topic 10. Cancer diagnostics and biomarkers (3h)
— Topic 11. Cancer therapies: Past, present, and future (4h)
— Topic 12. Mechanisms of drug resistance (2h)
— Topic 13. Introduction to cancer research and translational oncology (1h)
— Case study

Exam lessons 7-13 (2h)

PRACTICALS (15h)

— Teamwork in the laboratory (15 hours): Students will work in teams to carry out practical activities focused on the treatment of cancer cells, functional analysis, and molecular and phenotypic characterization of cancer cells.

Important note

All the hours mentioned refer to guided learning hours. They are approximate and based on the planned development of the course, which is always subject to changes and adjustments. The detailed planning will be updated periodically in the work plan section of the virtual classroom.

These hours represent approximately one third of the total time the student is expected to dedicate to the course. The remaining two thirds correspond to independent work, which includes completing assignments and projects, self-study, and any consultations with the teaching staff.

ASSESSMENT

Specific considerations for Cancer Biology

The evaluation of the subject will consider the acquisition of the skills and learning outcomes. It is based on the continuous monitoring of student work, which will be assessed throughout the course conducting written tests on the theory, the assistance and active participation in seminars, the practical written report, the completion of assignments proposed in class, and the resolution of case reports. The final grade for the course will be calculated as a weighted combination of the following items:

Theory contents (75%)

— **Activity 1. Two written tests:** 45% of the final grade (FG); minimum score to pass the subject: 5 points (mean of two exams); recoverable
  - First exam: accounts for 22.5% of activity 1; possibility to recover it; minimum grade of 4/10 to pass
  - Second exam: accounts for 22.5% of activity 1; possibility to recover it; minimum grade of 4/10 to pass

  If you fail one of the exams (first or second) or both, you will be able to retake the failed part in the recovery period exam.
— **Activity 2:** 30% of the FG in three activities; non-recoverable and mandatory
  - SDG 3 journal club presentation about your specific topic: team activity; 10% of FG
  - Case study: 15% of the FG (7.5% individual activity + 7.5% team activity)
  - Mandatory assistance and active participation in the seminars: 5% of the FG

Practicals content (25%)

The attendance to practice classes is mandatory at least at 50%; minimum score to pass the subject: 5 points; non-recoverable.

— **Activity 3. Skills in technical protocols:** 5% of the FG

— **Activity 4. Written report:** 20% of the FG; non-recoverable task (delays in delivery term penalise 50%)

METHODOLOGY

The Cancer Biology subject presents series of theoretical contents that will be taught regularly throughout the course in class sessions and seminars. They will be accompanied by the support of audiovisual resources, written documentation and bibliographical references and will be evaluated through written exams.

1. Theory classical contents classes (taught in three parts): Cancer basis, tumor and stromal cells features and behaviours, and cancer diagnosis and therapies. Exercises and questions about each lesson to do in small groups or individually and then discussed all together at classroom.
2. Reverse class: In the second part of the theory part of the subject, we will perform some lessons (receptors and signaling pathways) as a reverse class. Exercises: a questionnaire to be performed at virtual campus before coming to the class and then to participate in a collaborative work at classroom, and at the same classroom make a brief oral presentation about the work.
3. Seminars: To assist and participate in seminars and the discussion with multidisciplinary speakers (clinicians, biochemists, geneticists and biologists). Exercises: to ask a questionnaire.
4. Practical sessions: In four sessions to know how to evaluate and to perform some experimental assays in a cancer research laboratory. Exercises: To prepare a written report based on the results obtained in practical sessions similar to a scientific paper. The assistance to practical sessions is mandatory.

BIBLIOGRAPHY

Key references

— Alberts, B. (2008). *Molecular biology of the cell* (5 ed.). Garland Science.
— Alberts, B., Johnson, A., Lewis, J., et al. (2002). *Molecular Biology of the Cell*. Retrieved from https://www.ncbi.nlm.nih.gov/books/NBK21054/?term=Molecular%20Biology%20of%20the%20Cell
— Weinberg, R. A. (2014). *The biology of cancer* (2 ed.). Garland Science.

Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.

Trends in Biomedical Biotechnology

Type: Optional (OP)
Credits: 6.0

Group	Language of instruction	Teachers
G11, classroom instruction, mornings	English	Ferran Tarrés Freixas

SUSTAINABLE DEVELOPMENT GOALS (SDG)

— 2. Zero hunger
— 3. Good health and well-being
— 4. Quality education
— 8. Decend work and economic growth
— 9. Industry, innovation and infrastructure
— 10. Reduced inequalities

OBJECTIVES

Traditionally, course programs in science degrees are organised around the conceptual framework of specific disciplines, such as biochemistry or physiology. This favours specialisation, but is detrimental to knowledge integration and contextualisation, which requires multidisciplinary approaches.

In this course, we seek a holistic approach to research and innovation. Such an approach is vital to develop key analytical skills that can be applied to capture trends in the market and the research environment. Here, students will observe the health ecosystem from different perspectives to understand the deep relationship between research and the problems we face as a society. To achieve this goal, students will participate in various activities to promote a systemic view of the biomedical field.

The student will also get acquainted with different methodologies to display their results in an impactful manner to their peers and colleagues. These skills will also be beneficial in their future career, whichever path they choose to pursue (academic or private research, a career in biotechnology or pharmaceutical companies, or education).

LEARNING OUTCOMES

1. Analyse current research trends in the biomedical field.
2. Take on responsibilities when working individually or in teams, and to assess results.
3. Write reports with accurate spelling and grammar in Catalan, Spanish and English.
4. Propose interventions that respect democratic and sustainability values, and human rights.
5. Develop the capacity for critical thought with respect to processes associated with the profession.
6. Develop team work skills, by analysing current trends in biomedical biotechnology and proposing new projects beyond the state of the art.

COMPETENCIES

General skills

— Endeavour to combine independence and personal initiative with teamwork in multidisciplinary activities.

Specific skills

— Acquire scientific and technical training for study of the possible uses of organisms for the production of goods and services with commercial value, with due regard to ethics and intellectual property regulations.

Basic skills

— Students can communicate information, ideas, problems and solutions to both specialists and non-specialists.

Core skills

— Be a critical thinker before knowledge in all its dimensions. Show intellectual, cultural and scientific curiosity and a commitment to professional rigour and quality.
— Exercise active citizenship and individual responsibility with a commitment to the values of democracy, sustainability and universal design, through practice based on learning, service and social inclusion.
— Interact in international and worldwide contexts to identify needs and and new contexts for knowledge transfer to current and emerging fields of professional development, with the ability to adapt to and independently manage professional and research processes.
— Project the values of entrepreneurship and innovation in one's academic and professional career, through contact with a variety of practical contexts and motivation for professional development.

— Use oral, written and audiovisual forms of communication, in one's own language and in foreign languages, with a high standard of use, form and content.

CONTENT

1. Gene therapy and genome engineering
2. Engineered immune cells
3. Advanced cell culture
4. Pandemic preparedness and One Health
5. Regenerative medicine and tissue engineering
6. Microbiome's influence on health and disease
7. Personalised medicine
8. Artificial intelligence in healthcare
9. Nanobiotechnology-based therapies
10. Single-cell technologies guiding research
11. Epigenetic modifications for disease treatment

ASSESSMENT

The assessment of the subject will consider the acquisition of the skills and learning outcomes.

Evaluation will be based on the continuous monitoring of students' work through 3 main collaborative presentations (seminar, journal club, and poster sessions). Furthermore, assistance and active participation in debates will play a pivotal role throughout the module.

The final course grade will be the weighted average of the following items:

— Activity 1. Continuous evaluation of the course (assistance to mandatory sessions and participation in all the questionnaires of the modules) (15%). This activity includes:
  1. Assistance to class and participation in presentations (classes, preparation sessions, seminars, and posters).
  2. Answer to the questionnaires for each of the modules prepared by the professor or the students (questionnaires account for 50% of activity 1).
— Activity 2. Skills in collaborative work and participation (15%). This activity includes:
  1. Actively participate in the class dynamics by asking questions, joining or refuting your colleagues' or professor's points of views and enriching the debate.
  2. Share interesting information related to recent advances or hot topics in biomedical biotechnology.
  3. Read all the manuscripts suggested by the professor and/or your colleagues in the virtual campus, including those selected for journal clubs.
  4. Positive teamworking to prepare the mandatory presentations of this subject, which will be evaluated by your teammates.

Activities 3 and 4 are main activities that are compulsory and may be retaken.

— Activity 3. Seminar presentation about the state-of-the art of a hot topic in biomedical biotechnology (20%). Compulsory. This activity is divided in 30 hours of attendance + 40 hours of autonomous work. This activity includes:
  1. Evaluation of research material and continuous assessment.
  2. Presentation and oral speech evaluation, evaluated by the professor and your peers.
  3. Generation of a questionnaire with 6 questions to check if colleagues have understood explanation (with teacher's support and supervision).
— Activity 4. Journal club presentation of a manuscript chosen by the professor (30%). Compulsory. This activity is divided in 20 hours of attendance + 45 hours of autonomous work. This activity includes:
  1. Slides presentation and oral speech evaluation.
  2. Critical evaluation of the manuscript.
  3. Capacity to start a discussion about the manuscript and the topic.

Attending the seminar and presentations of your classmates is **compulsory**. If you don't come to class that day, 0.5 point in that activity will be subtracted.

Activity 5 is compulsory.

— Activity 5. Poster presentation of a novel topic on biomedical biotechnology (20%). This activity is divided in 10 hours of attendance + 35 hours of autonomous work. This activity includes:
  1. Generation of a scientific poster based on a topic of choice. This poster should be similar to a congress poster explaining technical procedures, with introduction, aims, method (advantages and problems), expected results in biomedical applications, ethical aspects of this application, commercial aspects, patents, or clinical trials.
  2. Poster defence and discussion with peers and the professor.

If you fail activity 3 or 4, you will be able to retake the failed part by writing a complete review of a different biotechnological application for biomedical purposes.

METHODOLOGY

— Plenary lectures: the professor will give some plenary sessions on hot topics related to biomedical biotechnology followed by discussion seminars.

— Discussion sessions and formal debates: there will be lessons dedicated to igniting discussion and debate.
— Working and consulting sessions: there will be some sessions dedicated to the supervision and discussion for the preparation of mandatory presentations.
— Autonomous work activities: students must dedicate 90 hours during the semester to prepare the presentations, besides the working and consulting sessions.
— Presentation sessions: students must present three projects (a seminar, a journal club, and a poster), which will be the main activities of this course.
— Project preparation
— Teamwork

BIBLIOGRAPHY

Key references

— (2025). *Cell Press publications*. Retrieved from https://www.cell.com/
— (2025). *Nature Biotechnology journal's publications*. Retrieved from https://www.nature.com/nbt/

Further reading

Teachers will provide complementary bibliography and compulsory reading throughout the course via the Virtual Campus.