UAB
Universitat Autònoma de Barcelona

Basic Research Skills in Biochemistry, Molecular Biology and Biomedicine

Code: 42894
Credits: 9

2026/2027

Degree programme	Type	Course
Biochemistry, Molecular Biology and Biomedicine	OB	1

Contact lecturer

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Teaching staff

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Teaching staff (external to UAB)

Martí Aldea
Oscar Zaragoza

Group languages

You can consult this information at the end of the document.

Prerequisites

Graduates in Biomedical Sciences, Molecular Biology, Human Biology, Biochemistry, Biotechnology, Genetics, Microbiology, Medicine, Chemistry, Pharmacy, Computer Sciences, Physics, or Veterinary Medicine.

English is the only language used in the module, both in lecturers' explanations and in tutorials, classroom discussions, materials, as well as in students' oral presentations and written assignments. Therefore, it is highly recommended to have an upper-intermediate level of English (B2, Cambridge First, TOEFL iBT 72-94 or higher), above the level required for admission to the Master's programme (B1).

Objectives

The primary objective of the module is to equip the student with fundamental competencies in biomolecular and biomedical research, providing a solid foundation for the development of their scientific career. Specific objectives are detailed in the Content section.

Learning outcomes

- CA01 (Use scientific terminology to describe the conclusions of experimental results in the fields of Biochemistry, Molecular Biology and Biomedicine.) Use scientific terminology to describe the conclusions of experimental results in the fields of Biochemistry, Molecular Biology and Biomedicine.
- CA02 (Assess sex and gender-based inequalities in the academic and professional workplace in the fields of Biochemistry, Molecular Biology and Biomedicine.) Assess sex and gender-based inequalities in the academic and professional workplace in the fields of Biochemistry, Molecular Biology and Biomedicine.
- KA01 (Define molecular mechanisms in research contributing to the advancement of knowledge in the fields of Biochemistry, Molecular Biology and Biomedicine.) Define molecular mechanisms in research contributing to the advancement of knowledge in the fields of Biochemistry, Molecular Biology and Biomedicine.
- KA02 (Understand research methods and techniques in the fields of Biochemistry, Molecular Biology and Biomedicine in the context of experimental work and/or emerging fields in this area of study.) Understand research methods and techniques in the fields of Biochemistry, Molecular Biology and Biomedicine in the context of experimental work and/or emerging fields in this area of study.
- KA03 (Identify the current state of knowledge and frontiers in Biochemistry, Molecular Biology and Biomedicine and the influence of activities on biomedical and socioeconomic advancement.) Identify the current state of knowledge and frontiers in Biochemistry, Molecular Biology and Biomedicine and the influence of activities on biomedical and socioeconomic advancement.
- SA01 (In the context of basic, translational and/or economically relevant experimental work, apply knowledge of molecular mechanisms to problems in the fields of Biochemistry, Molecular Biology and Biomedicine.) In the context of basic, translational and/or economically relevant experimental work, apply knowledge of molecular mechanisms to problems in the fields of Biochemistry, Molecular Biology and Biomedicine.
- SA02 (Understand available and emerging research methods and techniques in the fields of Biochemistry, Molecular Biology and Biomedicine in the context of basic, translational and/or economically motivated experimental work.) Understand available and emerging research methods and techniques in the fields of Biochemistry, Molecular Biology and Biomedicine in the context of basic, translational and/or economically motivated experimental work.
- SA03 (Propose scientific solutions in the context of basic, translational and/or economically motivated experimental work, based on inductive reasoning and deductive methods.) Propose scientific solutions in the context of basic, translational and/or economically motivated experimental work, based on inductive reasoning and deductive methods.

Contents

1- At the bench

1.1- Research Design and Scientific Inference

Instructor: David G. Quintana

Objective: To equip students with a rigorous understanding of how to formulate research questions, design experimental and non-experimental studies, analyze and interpret data, evaluate causal claims, and improve reproducibility in biomolecular and clinical research.

Contents:

- Brief overview of scientific epistemology, scientific reasoning, uncertainty, and model building.

- Defining research questions, identifying knowledge gaps, and formulating research objectives.

- Hypothesis-driven, question-driven, exploratory, and data-driven research paradigms, including the emerging revolution of artificial intelligence.

- Experimental, observational, clinical, exploratory, and computational research approaches.

- Principles of study design: variables, controls, comparison groups, outcomes, sample size, biological and technical replicates, and time course.

- Bias, confounding, randomization, blinding, allocation, reproducibility, robustness, and transparency.

- Experimental and non-experimental study designs, including controlled experiments, cross-sectional, longitudinal, case-control, cohort, and interventional approaches.

- Data analysis and interpretation: effect size, variability, uncertainty, confidence intervals, statistical significance, biological or clinical relevance, and causal inference.

- Model validation, replication, independent confirmation, triangulation of evidence, and iterative refinement of hypotheses and study design.

1.2- Lab Life Basics

Instructors: Oscar Zaragoza, Jaume Farres.

Objective: An overview of general biolab organization and procedures.

Blocks:

- Organization of Biolabs.

- Handling of typical equipment and instruments.

- Your bench.

- Types of storage.

- The lab notebook.

- Lab safety. Good laboratory practices. Disposal of lab waste. How to react when facing spills and other accidents. Working with radioisotopes. Biosafety.

1.3- Scientific Integrity

Instructor: Oscar Zaragoza

Objective: For the student to become aware of the conflicts, tensions and uncertainties encountered in scientific research.

Contents:

- Case-based learning.

- Sources of pressure.

- Misconduct, fabrication, falsification, suppression, plagiarism.

- Misinterpretation, a priori convictions, insufficient reproducibility.

- Criteria for authorship.

2- Communication skills in Science

Instructors: Carlos Barcia, Joaquin Arino.

Objectives:

- For the student to acquire fundamental skills in written and oral communication of research results, in a concise, clear, honest manner.

- For the student to develop the ability to integrate knowledge and formulate reasonable conclusions from available information.

Blocks:

- Oral skills.

- The research article.

- The MSc and PhD thesis.

- Posters.

3- Science for Profit

Instructor: Jordi Pujols

Objectives:

- To understand how scientific discoveries can be transformed into real-world impact through licensing or startup creation.

- To acquire the basic tools needed to evaluate, develop, and communicate a technology-based business opportunity.

Contents:

- Technology transfer pathways: licensing & startup creation.

- Value proposition and Intellectual property.

- Business model and funding.

- Team building and stakeholders.

- Market awareness.

- Practical development of a business deck based on a research idea.

4- Journal Clubbing

Instructors (in alphabetical order): Marti Aldea, Jose R. Bayascas, Javier Garcia-Pardo, Irantzu Pallares, Guillem Prats, David Reverter, Natalia Sanchez de Groot, Enea Sancho, Carles Saura, Nathalia Varejao.

Objectives: The Journal Club is the central integrative activity of the module. It brings together research design, critical analysis, scientific reasoning, oral communication, and discussion of current biomolecular research.

An introduction to the journal club as an essential and standard tool to:

- Develop the ability to analyze, reason, and critically discuss scientific results.

- Become familiar with advanced research work.

- Keep up with the rapid progress of biomolecular sciences.

- Integrate MSc/PhD-level knowledge in Biochemistry, Molecular Biology, and Biomedicine.

- Practice the preparation, oral presentation, discussion, and defense of experimental results.

- Identify current frontiers in biomolecular research, including emerging methods and techniques.

Format: Students must prepare and defend presentations of 4 research articles of their choice from a selection of 10 articles provided by the instructors.

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Presentation of Journal clubs	8	0.32	CA01, KA01, KA02, KA03, SA01, SA02
Full group classes (TE, double helix) and split group seminars (SEM, Crick / Franklin)	68	2.72	CA01, CA02, KA01, KA02, KA03, SA01, SA02, SA03
One-on-one tutoring	5	0.2	CA01, KA02, SA01, SA02, SA03
Work on assignments and on Journal Clubs	60	2.4	CA01, KA01, KA02, KA03, SA01, SA02
Supervised work in the classroom in collaborative work teams	68	2.72	CA01, KA01, KA02, KA03, SA01, SA02, SA03

This is a highly practical course aimed at developing research competencies and self-confidence in future biomolecular researchers. Accordingly, all sessions are based on hands-on, experiential learning, with students placed at the center of the learning process.

Because of this approach, the assessed workload is substantial. All in-person sessions include in-class activities that cannot be made up outside the classroom. Attendance is therefore mandatory.

Annotation: within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
Presentation and discussion of Journal Clubs	20%	8	0.32	CA01, CA02, KA01, KA02, KA03, SA01, SA02, SA03

Presentation and defence of assignments	80%	8	0.32	CA01, KA01, KA02, KA03, SA01, SA02, SA03

Continuous evaluation:

Specific details of the different assignments will be provided by the instructors.

The contribution of each block to the final grade is proportional to the corresponding workload:

- Research design (DGQ 25%)

- Scientific communication (CB 25%)

- Presentation and discussion of the Journal Clubs (25%)

- Science for profit (JP 10%)

- Scientific integrity, safety, good laboratory practices, biosafety (JF 10%, OZ 5%)

To pass the course, three conditions must be met:

(1) The scores in Research design, Scientific Communication, and Journal Clubs must each be equal to or greater than 4.0. If any of the three block scores is lower than 4.0, the course is failed, and the lower, limiting score will be recorded as the final grade.

(2) The average of the three main blocks must be equal to or greater than 5.0.

(3) The attendance-adjusted course grade must be at least 5.0. It will be calculated as follows: (0.25*DGQ + 0.25*CB + 0.25*JC + 0.10*JP + 0.10*JF + 0.05*OZ) * proportion of in-person hours attended.

Class attendance:

The instructors of Module 1 consider hands-on, experiential learning to be the most effective educational strategy. For this reason, all face-to-face sessions include in-class activities that cannot be made up. Consequently, absences without documented justification due to force majeure will result in a proportional score of zero for the missed hours when calculating the final overall grade. Further details are provided at the end of this document.

Late submission of coursework:

Coursework submitted after the deadline without a documented extenuating circumstance will incur a penalty. For each working day past the submission date, 10% of the total score will be deducted. This penalty applies until the solutions are released. Once solutions are made available, submissions will not be accepted, and a score of zero will be assigned.

Retake evaluation:

As the evaluation is based on continuous work, this module does not offer a retake evaluation option.

Single evaluation:

This module does not offer a single evaluation option.

Non-assessable:

A student who submits coursework accounting for less than two-thirds of the total grade will be classified as "Non-assessable".

Misconduct:

All written work and presentation materials may be scanned using plagiarism detection software or other tools for detecting academic misconduct. Any irregularity committed in an assessment activity -including academic

fraud, plagiarism, or improper use of AI (see details below)- shall result in a final grade of 0 for the entire module, not only for the specific assignment concerned. This includes the use of AI-generated content that the student is unable to understand, justify, elaborate upon, or explain. Disciplinary proceedings may also be initiated against any student who commits any of these irregularities.

Use of AI:

Students are encouraged to utilize textbooks, reputable academic online resources, and also artificial intelligence tools that help in their learning process and in the development of assignments. It is the instructors' responsibility, as part of the evaluation process, to ensure that the student has genuinely acquired the expected knowledge, understanding, and skills, and is not merely presenting copied information, which would constitute scientific misconduct and academic fraud.

Justification of absences from compulsory activities

Absences will only be neutralized, and evaluations will only be exceptionally rescheduled, for reasons of force majeure: illness preventing attendance, the death of an immediate family member, or a court summons, provided that these reasons are duly documented and that rescheduling is materially possible. In the case of illness, only a signed medical certificate will be accepted. The certificate must include the physician's name and medical registration number and must state that the student was not fit to attend the activity on the relevant date. Incomplete certificates or simple proof-of-attendance documents from a medical centre will not be accepted. In such cases, the missed class or evaluation activity will receive a score of 0. Supporting documentation must be submitted at the time of the absence or as soon as possible thereafter. Documentation submitted outside this period, for example at the end of the semester, will not be accepted.

Bibliography

The recommended textbooks are available at the UAB libraries.

- At the Bench. A laboratory Navigator. Kathy Barker. Cold Spring Harbor Laboratory Press, 2005.

- Experimental Design for Biologists. David J. Glass. Cold Spring Harbor Laboratory Press, 2007.

- Statistics at the Bench. A Step-by-Step Handbook for Biologists. Martina Bremer. Cold Spring Harbor Laboratory Press, 2009.

- How to Present at Meetings. George M. Hall, Neville Robinson. BMJ Books, London, 2011.

- University of Manchester Academic Phrasebank http://www.phrasebank.manchester.ac.uk/

Software

None.

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this link. To access the information, you will need to enter the course CODE

Type of teaching	Group	Language	Semester	Shift
(TEm) Theory (master)	1	English	annual	morning-mixed
(PLABm) Practical laboratories (master)	1	English	annual	morning-mixed
(SEMm) Seminars (master)	1	English	annual	afternoon

(PLABm) Practical laboratories (master)	2	English	annual	morning-mixed
(SEMm) Seminars (master)	2	English	annual	afternoon