



UNIVERSITAT DE
BARCELONA

OFFICIAL MASTER IN TRANSLATIONAL MEDICINE
FACULTY OF MEDICINE (CAMPUS CLÍNIC)
UNIVERSITY OF BARCELONA

- STUDENT'S GUIDE -



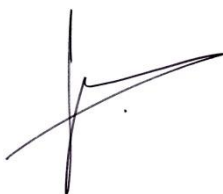
THE COORDINATOR



Josep M. Llovet is Professor of Medicine - Hepatic Oncology at the University of Barcelona and Director of the Master in Translational Medicine at the Faculty of Medicine University of Barcelona. He is also Professor of Research-ICREA, Liver Unit, IDIBAPS-Hospital Clínic of Barcelona (Spain), Director of the Liver Cancer Program, Full Professor of Medicine at the Mount Sinai School of Medicine in New York. He has been President of the International Liver Cancer Association (ILCA) and Chairman of the European Clinical Practice Guidelines on the Management of Liver Cancer (EASL-EORTC). He has published more than 388 articles in peer-reviewed journals, 55 book chapters, and has been awarded the AACR–Landon International Award and the International Hans Popper Prize, among others. Prof Josep M. Llovet has devoted his academic career to the study of the molecular pathogenesis and treatment of liver cancer, and has received competitive funding from the European Commission and the US National Institute of Health.

WELCOME FROM THE COORDINATOR

The Official Master in Translational Medicine-MSc from the University of Barcelona will offer you the opportunity to gain an excellent training both in academia and research. It will provide you comprehensive and updated knowledge of the basics, clinical and epidemiological entities associated with major human pathogenesis, examined from a cross-sectional view. Moreover, it will give you access to knowledge and skills necessary to develop translational research projects in the field of biomedicine.



Prof Josep M Llovet
Master Coordinator

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GENERAL INFORMATION

The Master in Translational Medicine is an Official Master from the University of Barcelona that allows posterior enrolment to PhD degree. It is a 60 credits Master in which we offer 4 compulsory subjects, 7 optional subjects (the student has to choose 4) and a minimum of 500 hours of research training for the Master Thesis. The Master is taught in English and can be completed in 1 or 2 years.

Virtual Campus

Students have a virtual environment with access to a range of specialized resources (updated programs for each subject, lecturer's PowerPoint presentations, videos, articles, etc.) and activities to ensure proper preparation for face-to-face sessions in the classroom. This online tool gives access to academic, administrative and information resources.

You can access the "Virtual Campus" through the following link:

<https://campusvirtual.ub.edu/my/>

Each student has their own ID, which is provided by the Secretariat of the University of Barcelona upon registration.

Calendar

Lectures are scheduled from **Monday to Thursday from 16h to 20h**, from September 29th, 2025 to June 18th, 2026. Most lessons will be taught in Classroom 14 (5th Floor) of the Faculty of Medicine. Please note some lessons/exams might be scheduled differently.

Evaluation

Compulsory and Optional subjects will be evaluated considering attendance (which will account for 50% of the final score) and the students' performance in a exam or project (which will account for the remaining 50%). Specifically, attendance will be evaluated as: 95%-100% → 50 points / 80% - 94% → 40 points / 60-79% → 30 points / 40-59% → 20 points / <40% → Subject Failure. The exam will consist on a written test, oral presentation or written report. The maximum score will be 50 points, and the minimum mark requested to pass the subject will be 20 points.

To pass the subject, students will have to fulfill three requisites: Attendance-score $\geq 20/50$, exam-score $\geq 20/50$, and overall score (attendance + exam) $\geq 50/100$.

The final score of the **Master thesis** will be calculated from the written report mark (40%), the oral defense mark (40%) and the practicum assessment (20%). Following UB regulations, students need to pass all master subjects in order to be able to defend their master thesis.

Re-evaluation of compulsory and optional subjects

In case of failing the ordinary evaluation, students might have the chance to pass the subject by doing a report, exam or presentation (please check this point on each subject's study plan). The maximum score on the re-evaluation is 50/100.

PRE-ADMISSION REQUIREMENTS

Students seeking for admission to the Master program should possess one of the following qualifications: Medicine, Biomedical Sciences, Biomedical Engineering, Biology, Biochemistry, Biotechnology, Pharmacy, Genetics and similar disciplines.

Students who meet the entry criteria will be assessed according to the evaluation of the following items:

- Curriculum Vitae
- Motivation Letter, explaining the student's interest on the Master
- Proven High level of English

International students must validate their previous studies to access the Spanish Education System. More information is available on the master's website.

MASTER COMMITTEE

- Master Coordinator
- Subjects Coordinators
- Students representatives
- Representatives of the Faculty of Medicine – University of Barcelona staff.

USEFUL LINKS

- 1.- Campus useful information: <http://www.ub.edu/monub>
- 2.- Virtual Campus access: <https://campusvirtual.ub.edu/>
- 3.- UB Academic regulations: <https://www.ub.edu/acad/noracad/>
- 4.- Accommodation: <https://www.ub.edu/allotjament/en>
- 5.- Enrollment procedures: <http://www.ub.edu/acad/en/masters/enrolment.html>
- 6.- Financial Information: <http://www.ub.edu/acad/matricula/preus.html#master>
- 7.- UB Health Insurance:
http://www.ub.edu/uri/estudiantsNOUB/intercanvis/abans_a.htm
- 8.- Language services (UB Catalan courses): <http://www.ub.edu/sl/en/fl/formling.html>
- 9.- Internships, placements and work: <https://www.ub.edu/feinaub/>
- 10.- Grants and Financial Aid: <https://www.ub.edu/beques/grausimasters/>
- 11.- UB sport services: <http://www.ub.edu/esports>
- 12.- Animal Experimentation Course site: <http://www.ccit.ub.edu/CA/ueacurs25.html>

MASTER COORDINATORS

	SUBJECT	PROFESSOR	EMAIL
COMPULSORY	SUBJECT 1 - MOLECULAR BIOLOGY IN HUMAN DISEASES	Dr. Morales Dr. Pascal	morales@clinic.cat mpascal@clinic.cat
	SUBJECT 2 - ANIMAL MODELING IN TRANSLATIONAL RESEARCH	Dr. Clària Dr. Fillat	jclaria@clinic.cat cfillat@clinic.cat
	SUBJECT 3 –TRANSLATIONAL MEDICINE	Dr. Llovet Dr. Pinyol	jmllovet@recerca.clinic.cat rpinyol@recerca.clinic.cat
	SUBJECT 4 – BIOMARKER DISCOVERY AND VALIDATION. SAMPLE MANAGEMENT AND BIOBANKS	Dr. Londoño Dr. Rodríguez	mlondono@clinic.cat arodr@recerca.clinic.cat
	MASTER THESIS	Dr. Llovet	jmllovet@recerca.clinic.cat
OPTIONAL	SUBJECT 5 – BASIC PRINCIPLES OF CLINICAL MEDICINE	Dr. Hernández-Gea Dr. Lens	vihernandez@clinic.cat slens@clinic.cat
	SUBJECT 6 – BIOINFORMATICS IN TRANSLATIONAL RESEARCH	Dr. Lopez-Bigas Dr. Tamborero	nuria.lopez@irbbarcelona.org david.tamborero@scilifelab.se
	SUBJECT 7 – IMAGING IN TRANSLATIONAL RESEARCH	Dr. Planas Dr. Soria	anna.planas@iibb.csic.es gsoria@ub.edu
	SUBJECT 8 – PUBLIC HEALTH AND TRANSLATIONAL RESEARCH	Dr. Grau	mariagrau@ub.edu
	SUBJECT 9 – STEM CELL RESEARCH	Dr. Gomis	roger.gomis@irbbarcelona.org
	SUBJECT 10 – CLINICAL TRIALS DESIGN AND EVALUATION OF MOLECULAR THERAPIES	Dr. Hernández-Gea	vihernandez@clinic.cat
	SUBJECT 11 – RESPONSIBLE RESEARCH, INNOVATION AND ENTREPRENEURSHIP	Dr. Martínez	pmsamper@uoc.edu

PROVISIONAL CALENDAR 2025-2026 (Check updates on the Virtual Campus)

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
SEPTEMBER 2025	1 registration	2 registration	3 registration	4 registration	5 registration
	8 registration	9 registration	10 registration	11 HOLIDAY	12 registration
	15 registration	16 registration	17 registration	18 registration	19 registration
	22 registration	23 registration	24 HOLIDAY	25 registration	26 registration
	29 16:00 Introductory class MOLECULAR BIOLOGY	30 MOLECULAR BIOLOGY	1 MOLECULAR BIOLOGY	2 MOLECULAR BIOLOGY	
OCTOBER 2025	6 MOLECULAR BIOLOGY	7 MOLECULAR BIOLOGY	8 MOLECULAR BIOLOGY	9 MOLECULAR BIOLOGY	
	13 MOLECULAR BIOLOGY	14 MOLECULAR BIOLOGY	15 MOLECULAR BIOLOGY	16 MOLECULAR BIOLOGY	
	20 ANIMAL MODELING	21 ANIMAL MODELING	22 ANIMAL MODELING	23 ANIMAL MODELING	
	27 ANIMAL MODELING	28 ANIMAL MODELING	29 ANIMAL MODELING	30 ANIMAL MODELING	
NOVEMBER 2025	3 ANIMAL MODELING	4 ANIMAL MODELING	5 ANIMAL MODELING	6 ANIMAL MODELING	
	10 TRANSLATIONAL MEDICINE	11 TRANSLATIONAL MEDICINE	12 TRANSLATIONAL MEDICINE	13 TRANSLATIONAL MEDICINE	
	17 TRANSLATIONAL MEDICINE	18 TRANSLATIONAL MEDICINE	19 TRANSLATIONAL MEDICINE	20 TRANSLATIONAL MEDICINE	
	24 TRANSLATIONAL MEDICINE	25 TRANSLATIONAL MEDICINE	26 TRANSLATIONAL MEDICINE	27 TRANSLATIONAL MEDICINE	
DECEMBER 2025	1 TRANSLATIONAL MEDICINE	2 TRANSLATIONAL MEDICINE	3 TRANSLATIONAL MEDICINE	4 TRANSLATIONAL MEDICINE	
	8 HOLIDAY	9 M2 ANIMAL MODELING EXAM	10 TRANSLATIONAL MEDICINE	11 TRANSLATIONAL MEDICINE	
	15 TRANSLATIONAL MEDICINE	16 TRANSLATIONAL MEDICINE	17 SHORT ORAL PRESENTATIONS	18 SHORT ORAL PRESENTATIONS	
	22 SHORT ORAL PRESENTATIONS	23 Christmas Holidays	24 Christmas Holidays	25 Christmas Holidays	
	29 Christmas Holidays	30 Christmas Holidays	31 Christmas Holidays	1 Christmas Holidays	
JANUARY 2026	5 Christmas Holidays	6 Christmas Holidays	7 Christmas Holidays	8 M3 - TRANSLATIONAL MEDICINE EXAM (LLOVET/PINYOL)	
	12 BIOMARKERS	13 BIOMARKERS	14 BIOMARKERS	15 BIOMARKERS	
	19 BIOMARKERS	20 BIOMARKERS	21 BIOMARKERS	22 BIOMARKERS	
	26 BIOMARKERS	27 BIOMARKERS	28 BIOMARKERS	29 BIOMARKERS	
FEBRUARY 2026	2 CLINICAL MEDICINE (OPT.)	3 CLINICAL MEDICINE (OPT.)	4 CLINICAL MEDICINE (OPT.)	5 CLINICAL MEDICINE (OPT.)	
	9 CLINICAL MEDICINE (OPT.)	10 CLINICAL MEDICINE (OPT.)	11 Animal Exp. Course (optional)	12 Animal Exp. Course (optional)	13 Animal Exp. Course (optional)
	16 CLINICAL MEDICINE (OPT.)	17 CLINICAL MEDICINE (OPT.)	18 M4 BIOMARKERS EXAM (Londoño/Rodríguez)	19 BIOINFORMATICS (OPT.)	
	23 BIOINFORMATICS (OPT.)	24 BIOINFORMATICS (OPT.)	25 BIOINFORMATICS (OPT.)	26 BIOINFORMATICS (OPT.)	
MARCH 2026	2 BIOINFORMATICS (OPT.)	3 BIOINFORMATICS (OPT.)	4 BIOINFORMATICS (OPT.)	5 M5 CLINICAL MEDICINE EXAM (Hernández/Lens)	
	9 M1 MOLECULAR BIOLOGY RESEARCH PROJECT PRESENTATION	10 IMAGING (OPT.)	11 IMAGING (OPT.)	12 IMAGING (OPT.)	
	16 IMAGING (OPT.)	17 IMAGING (OPT.)	18 IMAGING (OPT.)	19 IMAGING (OPT.)	
	23 IMAGING (OPT.)	24 PUBLIC HEALTH (OPT.)	25 PUBLIC HEALTH (OPT.)	26 PUBLIC HEALTH (OPT.)	
	30 EASTER HOLIDAYS	31 EASTER HOLIDAYS	1 EASTER HOLIDAYS	2 EASTER HOLIDAYS	
APRIL 2026	6 EASTER HOLIDAYS	7 PUBLIC HEALTH (OPT.)	8 PUBLIC HEALTH (OPT.)	9 PUBLIC HEALTH (OPT.)	
	13 PUBLIC HEALTH (OPT.)	14 PUBLIC HEALTH (OPT.)	15 STEM CELLS (OPT.)	16 STEM CELLS (OPT.)	
	20 STEM CELLS (OPT.)	21 STEM CELLS (OPT.)	22 STEM CELLS (OPT.)	23 HOLIDAY	
	27 STEM CELLS (OPT.)	28 STEM CELLS (OPT.)	29 STEM CELLS (OPT.)	30 M8 PUBLIC HEALTH PRESENTATION	
MAY 2026	4 CLINICAL TRIAL (OPT.)	5 CLINICAL TRIAL (OPT.)	6 CLINICAL TRIAL (OPT.)	7 CLINICAL TRIAL (OPT.)	
	11 CLINICAL TRIAL (OPT.)	12 CLINICAL TRIAL (OPT.)	13 CLINICAL TRIAL (OPT.)	14 CLINICAL TRIAL (OPT.)	
	18 RR/ENTREPRENEURSHIP (OPT.)	19 RR/ENTREPRENEURSHIP (OPT.)	20 RR/ENTREPRENEURSHIP (OPT.)	21 RR/ENTREPRENEURSHIP (OPT.)	
	25 HOLIDAY	26 RR/ENTREPRENEURSHIP (OPT.)	27 RR/ENTREPRENEURSHIP (OPT.)	28 RR/ENTREPRENEURSHIP (OPT.)	
JUNE 2026	1 RR/ENTREPRENEURSHIP (OPT.)	2 M10 CLINICAL TRIAL (OPT.) PRESENTATION	3 M11 RRI ORAL PRESENTATION	4 MASTER THESIS SUBMISSION	
	8	9	10	11	
	15 TFM Oral Presentations	16 TFM Oral Presentations	17 TFM Oral Presentations	18 TFM Oral Presentations	
	22	23	24 HOLIDAY	25	

DEADLINES

- ✓ Pre-registration process:
February 2025 to August 2025
- ✓ Registration process:
From September 15th, 2025 to October 10th, 2025
- ✓ Course start:
The introductory class will be on Monday, September 29th, at 16:00 in Classroom 14 (5th floor of the Faculty of Medicine), followed by Module 1 lessons.
- ✓ Deadline for acceptance to a research group:
November 28th, 2025
Available positions:
<https://docs.google.com/presentation/d/1wDAEKaFCVp9OrRZRjCxEZgHVeF1hF0aiQxbYiZvUpl8/edit?usp=sharing>
- ✓ Master Thesis short evaluation: (5 minutes oral presentation)
December 17th to 22nd, 2025
Structure:
 1. Introduction (main ideas)
 2. Working Hypotheses and Objectives
 3. Material and Methods (planned)
 4. Results (expected)
- ✓ Deadline to send your Master Thesis written report:
June 4th, 2025
- ✓ Master Thesis oral presentation: (10 minutes oral presentation + 5 minutes questions & answers)
From June 16th to June 19th, 2025

Mentoring Program from the Official Master in Translational Medicine

In today's European Higher Education Area (EHEA), students are expected to play a more active role in their education. To meet this challenge, mentoring emerges as a powerful tool to guide students as they embark on their university journey and actively participate in developing their competencies with the support of a mentor.

Our Mentoring Program is an integral part of our Master's curriculum, and has been designed to achieve several key objectives:

Skills Enhancement: The program helps students acquire essential skills that complement their formal education.

Failure Prevention: We aim to proactively prevent academic setbacks through timely guidance and support.

Personalized Guidance: Every student receives personalized guidance tailored to their unique needs and goals.

Various strategies have been incorporated to provide feedback and guidance, designed to help students unlock their full potential. Specifically, our Mentoring Program includes:

- **Orientation session:** At the outset of the program, the Director of the Master's program conducts a comprehensive orientation session. During this session, students receive a general overview of the Master's program, including rules, available support, and subject content.
- **Individual Assessment Session:** Around mid-December, we conduct individual assessment sessions to assess each student's readiness for their Master's Final Project. In these sessions, students present a brief overview of their thesis to a panel of expert faculty members. This panel offers invaluable guidance and advice to address any challenges students may encounter during the development of their Master's thesis.
- **Monitoring:** Our dedicated secretariat monitors students' evaluations to track progress and provide guidance whenever necessary. In addition, the secretariat is always available to support students throughout their time in the program.
- **Extra-curricular sessions:** We encourage students to complement their academic journey by participating in extra-curricular sessions or courses in the campus, which allow them to stay current with the latest developments in their field. Also, we ensure they have access to the Animal Experimentation Course, and reserve specific days in the Master's calendar for students to attend the practical sessions of the course. We believe that our Mentoring Program is an essential cornerstone of our commitment to providing an enriching educational experience for our Master's students.

Prof. Josep M Llovet, Departament de Medicina, Facultat de Medicina i Ciències de la Salut
Coordinator of the Mentoring Program of the Official Master of Translational Medicine

CONTACT DETAILS

FACULTY OF MEDICINE'S SECRETARIAT



Address: Casanova, 143
Phone: 93-4055250/51/52
secretariamedicina@ub.edu

MASTER'S SECRETARIAT



Ariadna Farré & Laura Brescó
Address: Rosselló, 153 3rd floor
Phone: 93-2279155
93-3129499
traslacional@ub.edu

STUDY PLANS & PROGRAMS

COMPULSORY SUBJECTS (24 ECTS)..... 24 ECTS

1. Molecular Biology in Human Diseases
2. Animal Modeling in Translational Research
3. Translational Medicine
4. Biomarker Discovery and Validation. Sample Management and Biobanks

OPTIONAL SUBJECTS (3 ECTS EACH; 4 SUBJECTS x 3 ECTS=12 ECTS)..... 12 ECTS

5. Principles of Clinical Medicine
6. Bioinformatics in Translational Research
7. Imaging in Translational Research
8. Translational Research in Public Health
9. Stem Cell Research
10. Clinical Trials Design and Evaluation of Molecular Therapies
11. Responsible Research, Innovation and Entrepreneurship

MASTER THESIS (24 ECTS)..... 24 ECTS

TOTAL NUMBER OF CREDITS..... 60 ECTS

SUBJECT 1 – MOLECULAR BIOLOGY IN HUMAN DISEASES

STUDY PLAN 2025-2026

Coordinated by:

Dr. Manuel Morales and Dr. Mariona Pascal Hospital Clínic, IDIBAPS

GENERAL INFORMATION

Subject Name	Molecular Biology in Human Diseases
Code	566658
Type	Compulsory
Teaching	First semester
Coordinators	Drs. Manuel Morales and Mariona Pascal
Contact details	morales@clinic.cat ; mpascal@clinic.cat
ECTS credits	6

OBJECTIVES

The overall objective of the subject is to provide an interdisciplinary, profound and updated background on the fundamental mechanisms involved on the reparation and maintenance of tissues. In that way, four key biological processes are addressed whose interrelationship determine the presence of diseased or normofunctional tissue: 1) inflammation 2) angiogenesis/vascular dysfunction 3) tissue remodeling and 4) cancer.

Specifically, the dual objective pursued on this subject is:

- To gain knowledge about the commonly used concepts in biomedical research, inflammation, angiogenesis, tissue remodeling and theoretical cancer.
- To adopt a holistic view of all the above mentioned processes, addressing their interrelations in different pathophysiological contexts and explore the therapeutic utility of this approach.

COMPETENCES TO BE GAINED DURING THE STUDY

General

G1: Understand the fundamental basic, clinical and therapeutic principles of pathologies with abnormalities in the mechanisms of inflammation, angiogenesis, tissue remodeling and cancer.

G2: Understand, interpret and discuss with clinicians pathogenic aspects.

G3: Meet the analytical procedures used in the translational study of these biological processes.

G4: Become familiar with advances in biomedical and interdisciplinary research.

Specific

S1: Be able to design experimental protocols in vitro and in vivo to study processes related to translational medicine.

S2: Know how to properly formulate hypotheses and research objectives.

S3: Be able to design research projects potentially applicable.

S4: Be able to integrate the acquired knowledge on basic research and clinical research.

S4: Be able to identify public health problems and communicate them to the project rating agencies.

Transverse

T1: Reflection, synthesis and release of trials.

T2: Ability to disseminate the acquired knowledge.

T3: Be able to interact with professionals from different medical specialties resolutely.

T4: Use of English as a global language in science.

THEMATIC BLOCKS

1. Introduction and holistic view of biological mechanisms
2. Inflammation
3. Angiogenesis and vascular dysfunction
4. Tissue remodeling
5. Biologics and advanced cellular therapies
6. Immunoresponse and hypersensitivity
7. Nanotechnology
8. Research project proposal

METHODOLOGY

Total training hours: 6 credits ECTS x 25h/credit = 150h

a) Teaching: face-to-face format (48h):

- Lectures
- Research projects presentation
- Seminars
- Visit to Research Centers and laboratories

b) Home training (102h): - Individual work

The home training time is intended to design research projects and doubt resolution.

EVALUATION

To pass the module, students must obtain a minimum of 50 points. The score will be established as follows:

• **Attendance:** 50% of the overall grade.

Attendance will be evaluated as:

100% - 95% → 50 points

94% - 80% → 40 points

79% - 60% → 30 points

59% - 40% → 20 points

< 40% → Subject Failure

• **Research project 50% of the score**

- Minimum requested= 20 points
- Design a research project that addresses a translational problem in the specific areas of angiogenesis, tissue remodeling, inflammation or cancer. Students are required to give a short oral defense of their research project proposal with the assistance of slides.
- Projects defended in English will be able to qualify for higher ratings.
- The day of the oral presentation will be announced by the coordinator and posted on the Virtual Classroom.

To pass the subject, students will have to fulfill three requisites: Attendance-score $\geq 20/50$, Research project-score $\geq 20/50$, and overall score (attendance + RP) $\geq 50/100$.

Reevaluation: In case of failing the ordinary evaluation, students will have to critically appraise 2 scientific articles and present the analysis in form of an oral presentation. The re-evaluation final score will never get over 50 points. English will be preferred in the presentation, but Catalan or Spanish will be also accepted.

REFERENCES

1. <https://researchertoolkitdotcom.files.wordpress.com/2014/05/parrishfull.pdf>

2. Johnson A, DiPietro LA. Apoptosis and angiogenesis: an evolving mechanism for fibrosis. *FASEB J.* 2013 Oct;27(10):3893-901. doi: 10.1096/fj.12-214189. Epub 2013 Jun 19. Review. PubMed PMID: 23783074.
3. Zeisberg M, Kalluri R. Cellular mechanisms of tissue fibrosis. 1. Common and organ-specific mechanisms associated with tissue fibrosis. *Am J Physiol Cell Physiol.* 2013 Feb 1;304(3):C216-25. doi: 10.1152/ajpcell.00328.2012. Epub 2012 Dec 19. Review. PubMed PMID: 23255577; PubMed Central PMCID: PMC3566435.
4. <https://www.nature.com/collections/qnjyddmnjf>
5. Morales-Ruiz M, Agrin M. Molecular basis of inflammation, immunity, tissue remodeling, angiogenesis. *Handbook of Translational Medicine.* Pag. 102-108, Ed. Llovet JM, Medical UB. ISBN: 978-84-475-4030-3. 2016.
6. Juan ML, Righini M, Quidant R. Plasmon nano-optical tweezers. *Nature Photonics.* 2011; 5, 349-356.
7. Oiseth SJ, Aziz MS, Cancer immunotherapy: a brief review of the history, possibilities, and challenges ahead. *J. Cancer Metastasis Treat* 2017; 3: 250-261
8. Weber EW, Maus MV, Mackall CL. The Emerging Landscape of Immune Cell Therapies. *Cell.* 2020 Apr 2;181(1):46-62.
9. Lv B, Wang Y, Ma D, Cheng W, Liu J, Yong T, Chen H, Wang C. Immunotherapy: Reshape the Tumor Immune Microenvironment. *Front Immunol.* 2022 Jul 6;13:844142. doi: 10.3389/fimmu.2022.844142.

ANIMAL MODELING IN TRANSLATIONAL RESEARCH

STUDY PLAN 2025-2026

Coordinated by:

Dr Joan Clària, Senior Consultant at the Department of Biochemistry and Molecular Genetics, Biomedical Diagnostic Center, Hospital Clínic, – Tenure-track Professor, Department of Biomedical Sciences, Faculty of Medicine, University of Barcelona and **Dr Cristina Fillat**, Group leader at the Gene Therapy and Cancer Research Group, IDIBAPS.

GENERAL INFORMATION

Subject Name	Animal Modeling in Translational Research
Code	566657
Type	Compulsory
Teaching	First semester
Coordinator	Dr. Joan Clària & Dr. Cristina Fillat
Contact Details	jclaria@clinic.cat
ECTS credits	6

OBJECTIVES

Upon completion of this subject students will be able to:

1. Identify the most appropriate experimental model to investigate mechanisms of a specific disease.
2. Identify the most appropriate methodology of laboratory employed in animal research studies.
3. Describe the strengths and weaknesses of a particular model of experimental disease.
4. Define the value and limitations of in vivo, ex vivo, in situ and in vitro experiments.
5. Understand the technicalities of the cellular and molecular biology methods most frequently used in experimental research.
6. Translate the results obtained in basic research to the diagnosis, prevention and therapy of particular diseases.
7. Understand offspring basic techniques used in genetic engineering of animal laboratories.
8. Understand fundamental aspects of the generation and husbandry of knockouts and transgenic models
9. Appreciate the main advantages and disadvantages of the most common experimental models of prevalent diseases.

10. Know the basic technical aspects of proper handling in animal laboratories
11. Understand the ethical and legal provisions of the experimental research
12. Design organ functioning studies (kidney, heart, lung, etc.) and vascular and hemodynamics function
13. Correctly design pathophysiological studies ex vivo and in situ
14. Learn the basic principles of cell culture and manipulation
15. Design studies in isolated cells, in vitro cell lines and primary cells
16. Interpret pre-clinical studies and their use in the pharmaceutical industry
17. Get acquainted with non-mammalian model systems

COMPETENCES TO BE GAINED DURING THE STUDY

General

G1: Knowledge of the main tools for translational research

G2: Knowledge of the scientific biochemical, molecular and genetic basis used in translational research

Specific

S1: Acquire the necessary skills to properly interpret the results obtained with experimental models

S2: Develop the required skills to design a translational study in experimental models of a particular disease

S3: Complement the knowledge and skills acquired in the course of 'Animal Experimentation at the Laboratory'

THEMATIC BLOCKS

1. Introduction and basic principles of experimental models
2. Ethical and legal dispositions in experimental research
3. Genetic engineered transgenic and knockout mice
4. Mice colony management: breeding, assisted reproduction techniques and cryopreservation
5. Research studies in large animals
6. Zebra fish and other non-mammalian models
7. Pre-clinical studies in biomedical research
8. Experimental models for respiratory diseases
9. Experimental models for neuroscience
10. Experimental models for renal diseases
11. Experimental models for gastrointestinal diseases
12. Experimental models for cancer
13. Experimental models in cardiovascular diseases

14. Experimental models for obesity and diabetes
15. Gene therapy for liver diseases
16. Gene therapy for rare diseases
17. Analytical methods
18. Methods and Models for cell biology
19. Methods and Models in microbiology
20. Methods and models in immunology
21. Methods and models for cell trafficking
22. Mathematical models in translational research
23. Organoids and iPS for in vitro disease modeling
24. When science meets industry

METHODOLOGY

Total training hours: 6 credits ECTS x 25h/credit = 150h

All lessons will be face-to-face.

- a) Face-to-face training (48h):
 - Lectures
 - Journal clubs
 - Seminars/Group discussion
 - Experimental project presentation
- b) Home training (102h):
 - Individual and group work
 - Preparation of journal clubs
 - Preparation of experimental project presentations

EVALUATION

To pass the subject, students must obtain a minimum of 50 points. The score will be established as follows:

- **Attendance:** 50% of the overall grade.

Attendance will be evaluated as:

- 100% - 95% → 50 points
- 94% - 80% → 40 points
- 79% - 60% → 30 points

59% - 40% → 20 points
< 40% → Subject Failure

- **Exam:** 40% of the overall grade. The exam is on site and consists of 25 questions with multiple choices (5, only 1 is correct; each mistake subtracts 0.2 points).
- **Experimental project oral presentation:** 10% of the overall grade.

To pass the subject, students will have to fulfill three requisites: Attendance-score $\geq 20/50$, exam-score $\geq 20/50$, and overall score (attendance + exam/project oral presentation) $\geq 50/100$.

Reevaluation: In case of failing the ordinary evaluation, students will have to send the coordinator a written report dissecting two different experimental models appearing in the same scientific article. The re-evaluation final score will never get over 50 points.

REFERENCES

Bibliography:

- González de Buitrago. Técnicas y métodos de laboratorio clínico. Elsevier España, 2004
- González Hernández, A. Principios de bioquímica clínica y patología molecular, Elsevier España, 2007
- Zhan X, Wang F, Bi Y, Ji B. Animal models of gastrointestinal and liver diseases. Animal models of acute and chronic pancreatitis. Am J Physiol Gastrointest Liver Physiol. 2016; 311:G343-55.
- Gopinath C, Nathar TJ, Ghosh A, Hickstein DD, Remington Nelson EJ. Contemporary Animal Models For Human Gene Therapy Applications. Curr Gene Ther. 2015;15:531-4
- Jennings P. "The future of in vitro toxicology". Toxicol In Vitro. 201;29:1217-21.
- Alqahtani S, Mohamed LA, Kaddoumi A. Experimental models for predicting drug absorption and metabolism. Expert Opin Drug Metab Toxicol. 2013;9:1241-54.
- Liu W, Deng Y, Liu Y, Gong W, Deng W. Stem cell models for drug discovery and toxicology studies. J Biochem Mol Toxicol. 2013;27:17-27.
- Picher-Martel V, Valdmanis PN, Gould PV, Julien JP, Dupré N. From animal models to human disease: a genetic approach for personalized medicine in ALS. Acta Neuropathol Commun. 2016;4:70.
- Loewa A, Feng JJ, Hedtrich S. Human disease models in drug development. Nat Rev Bioeng. 2023; 11:1-15.

Webography

- www.jax.org/
- www.informatics.jax.org/
- <https://genetics.hms.harvard.edu/>
- www.complextait.org/
- www.ncbi.nlm.nih.gov/pubmed/
- www.ncbi.nlm.nih.gov/omim

TRANSLATIONAL MEDICINE

STUDY PLAN 2025-2026

Coordinated by:

Dr. Josep M Llovet, Full Professor of Medicine-Hepatic Oncology (Department of Medicine, Faculty of Medicine, University of Barcelona); Director of the Master in Translational Medicine; ICREA Research Professor; Group Leader at IDIBAPS-Hospital Clínic Barcelona. Professor of Medicine & Director of the Liver Cancer Program of the Icahn School of Medicine at Mount Sinai (NY-USA).

Dr. Roser Pinyol, Assistant Researcher, Liver Cancer Translational Research Group, IDIBAPS - Hospital Clínic. Assistant Professor, Department of Medicine, Faculty of Medicine, University of Barcelona.

GENERAL INFORMATION

Subject Name	Genomics and Translational Medicine
Code	573669
Type	Compulsory
Teaching	First semester
Coordinator	Prof. Josep M Llovet, Dr. Roser Pinyol
Contact Details	jmllovet@recerca.clinic.cat, rpinyol@recerca.clinic.cat
ECTS credits	8

OBJECTIVES

The purpose of this subject is to provide students with scientific, conceptual, methodological and practical knowledge about translational medicine. Specifically, the genomics and epigenomic bases will be assessed, as well as their applications in translational research. These concepts will be integrated with the study of the signaling pathways involved in various diseases and their functional role.

The overall objective is to provide a scientific basis for the design and implementation of translational research, and the knowledge related to relevant methods, techniques and applications in biomedicine.

COMPETENCES TO BE GAINED DURING THE STUDY
Generic

G1: Capacity for learning and responsibility (capacity for analysis and synthesis, to adopt global perspectives and to apply the knowledge acquired/capacity to take decisions and adapt to new situations).

G2: Learning skills that are necessary to undertake further research studies with a high degree of autonomy.

Specific

S1: Understand the basic, clinical and therapeutic principles of different pathologies

S2: Learn the procedures and methodologies used in translational studies.

S3: Become familiar with the development of biomedical research and learn the basic tools for translational research.

S4: Ability to explain the basic molecular principles underlying pathologies, ability to understand the role of genes in human cancer and the basic concepts of oncogenes and targeted therapies.

THEMATIC BLOCKS
1. Basic Principles

- Role of epigenetics in human diseases
- Personalized medicine in oncology
- Molecular pathology in oncology
- Principles of genetic engineering
- Immunology and cancer
- Principles of experimental Design
- Bioinformatics and Managing of Big Data

2. High throughput technologies

- Gene expression
- SNP array, CNVs and GWAS
- Exome sequencing
- Methylome analysis
- Single Cell Genomics
- Proteomics

3. Signaling pathways

- Signaling pathways
- Resistance to molecular therapies
- TGF-beta signaling in liver cancer

4. Genomics in cancer and immunotherapies

- Molecular classification of hepatocellular carcinoma
- Targets for therapies in pancreatic cancer
- miRNA in human diseases and digestive cancer

- Angiogenesis: Drugs & mechanisms of resistance
- Colorectal cancer: genetics and genomics
- Molecular classification of breast cancer
- Molecular therapies and immunotherapy in melanoma

- Immunotherapies in cancer
- CAR T cells in cancer
- Role of adult stem cells in cancer

5. Genomics in other diseases

- Next generation sequencing in hematological diseases
- Pluripotent cells in translational medicine: recent advances and open problems
- Chronic Hepatitis C: from genotyping to therapies
- Liver portal hypertension and fibrosis
- Inflammatory disease / Crohn's disease
- Inflammatory bowel disease (IBD)
- Translational medicine in Alzheimer disease
- Translational medicine in Parkinson disease
- Translational research in psychiatric disorders
- Genomics in Multiple Sclerosis
- Genomics in autoimmune encephalitis
- Genomics in autoimmune diseases
- Endocrinology
- Translational medicine in renal diseases

- Fetal and perinatal translational medicine
 - Translational research in cardiovascular diseases
 - System biology in lung diseases
 - Innovation in translational medicine
 - Translational medicine: implications in trial design
 - Statistical principles for clinical trials
 - Trial design and innovation
 - From Bench to Spin off
6. Trial design and Biomarkers

METHODOLOGY

Total training hours: 8 credits ECTS x 25h/credit = 200h

- a) Face-to-face (72h): Lectures and Seminars
- b) Home training (128h): Individual and group work

EVALUATION

Evaluation criteria:

Attendance: The attendance will count 50% of the overall grade, and it will be evaluated as follows:

- 100% - 95% → 50 points
- 94% - 80% → 40 points
- 79% - 60% → 30 points
- 59% - 40% → 20 points
- < 40% → Subject Failure

Written exam: The score obtained in the written test will count 50% of the final score. The written exam will be based on a multiple option test.

To pass the subject, students will have to fulfill three requisites:

- a) Attendance-score $\geq 20/50$ points,
- b) exam-score $\geq 20/50$ points,
- c) and an overall score (attendance + exam) of $\geq 50/100$ points.

Reevaluation: In case of failing the ordinary evaluation (overall-score $\leq 50/100$), students that have a minimum of 1/3 of the exam questions correct will have the chance to be re-evaluated. For that, they will need to present a critical appraisal of 3 scientific articles in front of an evaluation committee. The re-evaluation final score will never get over 50 points.

REFERENCES

Books

- Handbook of Translational Medicine. Edicions de la Universitat de Barcelona, Barcelona-B-16.985-2016. ISBN: 978-84-475-4030-3. Ed: Josep M Llovet.
- Translational Medicine: The Future of Therapy?
Autors: James Mittra and Christopher-Paul Milne
Date: Apr 17, 2013
- Genomic and Personalized Medicine, Second Edition: V1-2
Autors: Geoffrey S. Ginsburg and Huntington F Willard PhD
Date: Nov 29, 2012
- Translational Medicine and Drug Discovery
Autors: Bruce H. Littman MD and Rajesh Krishna PhD FCP
Date: Oct 15, 2014

Articles

- Albani S, Prakken B. Nat Med. 2009;15:1006-9.
- Berger B, Peng J, Singh M. Computational solutions for omics data. Nat Rev Genet. 2013;14(5):333-46.
- Garraway LA, Lander ES. Lessons from the cancer genome. Cell. 2013;153(1):17-37.
- Hanahan D, Weinberg RA. Hallmarks of cancer: the next generation. Cell. 2011;144(5):646-74.
- Vogelstein B, Papadopoulos N, Velculescu VE, Zhou S, Diaz LA Jr, Kinzler KW. Cancer genome landscapes. Science. 2013;339:1546-58.
- Koh, G., Degasperi, A., Zou, X. et al. Mutational signatures: emerging concepts, caveats and clinical applications. Nat Rev Cancer (2021).
- Díaz-Gay M, Alexandrov LB. Unraveling the genomic landscape of colorectal cancer through mutational signatures. Adv Cancer Res. 2021
- Llovet JM et al., Hepatocellular carcinoma. Nat Rev Dis Primers 2021.
- Llovet JM et al., Immunotherapies for hepatocellular carcinoma. Nat Rev Clin Oncol. 2021
- Heyn H, Esteller M. DNA methylation profiling in the clinic: applications and challenges. Nat Rev Genet. 2012;13(10):679-92
- McGranahan N, Swanton C. Biological and therapeutic impact of intratumor heterogeneity in cancer evolution. Cancer Cell. 2015;27(1):15-26.
- Pardoll DM. The blockade of immune checkpoints in cancer immunotherapy. Nat Rev Cancer. 2012;12(4):252-64

- Imbeaud S, Letouzé E, Alexandrov LB, Calderaro J, Rebouissou S, et al. Exome sequencing of hepatocellular carcinomas identifies new mutational signatures and potential therapeutic targets. *Nat Genet.* 2015;47(5):505-11
- Sia D, Hoshida Y, Villanueva A, Roayaie S, Ferrer J, Tabak B, et al. Integrative molecular analysis of intrahepatic cholangiocarcinoma reveals 2 classes that have different outcomes. *Gastroenterology.* 2013;144(4):829-40.
- Wan L, Pantel K, Kang Y. Tumor metastasis: moving new biological insights into the clinic. *Nat Med.* 2013;19:1450-64.
- Camp, Platt, Treutlein. Mapping human cell phenotypes to genotypes with single-cell genomics. *Science.* 2019, 365(6460):1401-1405.
- Stratton MR, Campbell PJ, Futreal PA. The cancer genome. *Nature.* 2009
- Baxi et al., Digital pathology and artificial intelligence in translational medicine and clinical practice. *Modern Pathology* 2022, 35, 1, Pages 23-32.
- Bhinder et al., Artificial Intelligence in Cancer Research and Precision Medicine. *Cancer Discov* 2021; 11: 900–915.
- Denny et al., Precision medicine in 2030 - seven ways to transform healthcare. *Cell* 2021, 184, 6, 1415-1419.

BIOMARKER DISCOVERY AND VALIDATION. SAMPLE MANAGEMENT AND BIOBANKS

STUDY PLAN 2025-2026

Coordinated by:

Dr. Aina Rodríguez, PhD, head of Core Facilities and Biobank Coordinator at IDIBAPS and **Dr. Maria Carlota Londoño**, MD, PhD, senior specialist in Hepatology, Hospital Clínic Barcelona, IDIBAPS, CIBEREHD.

GENERAL INFORMATION

Subject Name	Biomarker discovery and validation. Sample management and biobanks.
Code	573670
Type	Compulsory
Teaching	Second semester
Coordinator	Dr. Aina Rodriguez and Dra. Maria Carlota Londoño
Contact Details	arodr@recerca.clinic.cat/mlondono@clinic.cat
ECTS credits	4

OBJECTIVES

- To provide students with scientific, conceptual and methodological knowledge on the design of translational studies for biomarkers discovery and validation and introduce the concept of precision medicine.
- To deeply understand the ethical and legal framework in sample management and the role of biobanks and their possible applications in Biomedicine.

COMPETENCES TO BE GAINED DURING THE STUDY

- S1: Design of studies on predictive, prognostic, diagnostic or pharmacodynamic biomarkers (BKs).
- S2: Knowledge in the clinical usefulness of pharmacogenetic and pharmacodynamic biomarkers to achieve personalized pharmacological treatments.
- S3: Understanding of the clinical benefit to integrate in clinical practice valid biomarkers for patient stratification and clinical care improvement.
- S4: Know the legal and ethical principles of compliance.
- S5: Appreciate the main advantages of Biobanks as a tool to achieve quality compliance.

S6: Manage biological sample collections for research studies.

S7: Translate analytical data resulting from studies through statistical packages.

THEMATIC BLOCKS

1. Biomarker discovery and validation. Predictive and prognostic biomarkers in transplantation and immune mediated inflammatory diseases.
2. Prognostic and predictive biomarkers of cardiovascular risk and treatment response.
3. Predictive Biomarkers of vaccines response.
4. Genetic and Pharmacogenetic Biomarkers: patient stratification and individual treatment.
5. Legal and ethical principles. Quality and security in the laboratory.
6. Sample management and biobanks.
7. Analysis and interpretation of the results.

METHODOLOGY

Total training hours: 4 credits ECTS x 25h/credit = 100h

a) Face-to-face (48h):

- Lectures and practical cases
- Exam

b) Home training (52h):

- Individual and group work

EVALUATION

To pass the subject, students must obtain a minimum of 50 points. The score will be established as follows:

Evaluation criteria:

Attendance: 50% of the overall grade.

Attendance will be evaluated as:

100% - 95% → 50 points

94% - 80% → 40 points

79% - 60% → 30 points

59% - 40% → 20 points

< 40% → Subject Failure

Written exam: 50% of the overall grade. Students must answer correctly 40% of the questions in each section of the exam in order to pass the exam.

To pass the subject, students will have to fulfill three requisites: Attendance-score $\geq 20/50$, exam-score $\geq 20/50$, and overall score (attendance + exam) $\geq 50/100$. 0,25 points will be deducted for every wrong answer.

Reevaluation: In case of failing the ordinary evaluation, students will have to critically appraise 2 scientific articles and send the analysis by email to the coordinators. The re-evaluation final score will never get over 50 points.

REFERENCES

References will be provided at the beginning of the course by each of the lecturers.

PRINCIPLES OF CLINICAL MEDICINE

STUDY PLAN 2025-2026

Coordinated by:

Dr Sabela Lens and Dr. Virginia Hernández-Gea, hepatologists at Hospital Clínic of Barcelona, CIBERehd, IDIBAPS, University of Barcelona.

GENERAL INFORMATION

Subject Name	Principles of Clinical Medicine
Code	573671
Type	Optional Subject
Teaching	Second semester
Coordinator	Dr. Sabela Lens and Dr. Virginia Hernández-Gea
Contact Details	slens@clinic.cat , vihernandez@clinic.cat
ECTS credits	3 credits

OBJECTIVES

The purpose of this subject is to provide students with scientific and practical knowledge about the principles of clinical medicine. Specifically, the bases of the homeostatic mechanisms of the human body will be assessed, as well as their imbalance during illness. These concepts will be integrated with the study of the anatomical and physiopathological mechanisms involved in various organ-specific diseases for the design and implementation of translational research. There will be practical seminars to gain insights into real-life clinical practice. The overall objective is to provide the knowledge and a scientific basis in the setting of clinical medicine in order to explore areas of interest in clinical research.

COMPETENCES TO BE GAINED DURING THE STUDY

Generic:

G1. Learn the principles of general internal medicine balanced with a comprehensive and practical exposure (seminars and visits) to the medical subspecialties.

G2. Adopt the learning skills that are necessary to undertake further translational research studies in medicine.

Specific:

- S1.** To understand and to recognize the normal structure-function of the human body, at molecular, cellular, tissue, organ and system levels.
- S2.** Gain an adequate knowledge of the sciences on which medicine is founded, and the translational perspective of the research based upon molecular medicine.
- S3.** Receive a balanced exposure of the physiopathological mechanisms involved in organ-specific diseases.

THEMATIC BLOCKS

1. Principles of Internal Medicine
 - Principles of Internal Medicine
 - Autoimmune Diseases
 - Intensive Care Medicine
 - Infectious Diseases
 - Nephrology and Dialysis
 - Dermatology
 - Ophthalmology
 - Homeostasis and Thrombosis
2. Cardiovascular and Lung diseases
 - Cardiology
 - Lung Diseases
3. Digestive and Metabolic Diseases
 - Hepatology
 - Gastroenterology
 - Endoscopy
 - Endocrinology
4. Oncology and Hematopoietic diseases
 - Malignant Hematology
 - Radiotherapy
5. Principles of Surgery, Organ Transplantation and Anesthesiology
 - Anesthesiology
 - Abdominal Surgery
 - Solid Organ Transplantation
6. Principles of Radiology
 - Principles of Radiology
 - Interventional Radiology
7. Public Health and Infectious Diseases
 - Infectious Diseases
 - Prevention and Public Health
8. Nervous System Diseases
 - Neurology
 - Psychiatry
 - Neuroscience: Brain Health
 - Addictions
9. Obstetrics and Gynecology
 - Obstetrics and Gynecology

METHODOLOGY

Total face to face training hours: 3 credits ECTS x 25h/credit = 75h

EVALUATION

Evaluation criteria: 50% of the final score will depend on the attendance and active participation in class.

Attendance will be evaluated as:

100% - 95% → 50 points

94% - 80% → 40 points

79% - 60% → 30 points

59% - 40% → 20 points

< 40% → Subject Failure

The remaining 50% will be obtained through a written exam. The written exam will be based on a multiple option test with 50 questions. To pass the subject, students will have to fulfill three requisites: Attendance-score > 20, exam score > 20, and overall score (attendance + exam) > 50.

Reevaluation: In case of failing the ordinary evaluation, students will have to critically appraise 3 scientific articles and present the analysis in form of oral presentation in front of an evaluation committee. In the re-evaluation the final score will never get over 50 points. English should be the language for the oral presentation.

REFERENCES

Books:

Farreras/Rozman. Internal Medicine.

Authors: P. Farreras Valenti, C. Rozman

Editorial: Elsevier, May 2016

Harrison Principles of Internal Medicine.

Authors: Kasper, Fauci, Hauser, Longo, Jameson, Loscalzo

Editorial: McGraw-Hill Medical. 20th edition

Guyton and Hall. Textbook of Medical Physiology.

Authors: John E.Hall

Editorial: Elsevier, 13th edition.

<http://ipkc.hactcm.edu.cn/2012yxslx/file/Textbook%20of%20Medical%20Physiology.pdf>

BIOINFORMATICS AND HIGH-THROUGHPUT DATA ANALYSIS

STUDY PLAN 2025-2026

Coordinated by:

Dr David Tamborero, Associate Professor, Karolinska Institutet, Sweden

Dr Núria López-Bigas, IRB group Leader, ICREA Research Professor, UPF Assistant Professor, ERC Consolidator Grant

GENERAL INFORMATION

Subject Name	Bioinformatics and high-throughput data analysis
Code	566660
Type	Optional
Teaching	Second semester
Coordinator	Prof. Nuria Lopez-Bigas, Dr. David Tamborero
Contact Details	nuria.lopez@irbbarcelona.org, david.tamborero@scilifelab.se
ECTS credits	3

OBJECTIVES

Current technologies enable the examination of biological systems in unprecedented detail. While the use of these technologies has become widely available in clinical and research settings, the interpretation of these data remains an important bottleneck with a diversity of technological and scientific challenges. This module is aimed to review the main computational methods and available resources to analyze high-throughput data generated in biological experiments. We will alternate theoretical concepts with practical exercises in which we will use bioinformatics tools to address specific questions related with the biology of human diseases.

COMPETENCES TO BE GAINED DURING THE STUDY

Specific

- S1: General knowledge on how molecular data can address questions related with human diseases.
- S2: Understand the principles behind high throughput assays and their results.
- S3: Learn how to use computational methods to analyze molecular data.
- S4: Develop critical thinking about bioinformatic analyses.

THEMATIC BLOCKS

1. Introduction
2. High throughput assays
3. Genomics and diseases
4. Drugs for precision medicine
5. Variant data analyses
6. Quantitative data analyses
7. Cancer genomics and clinical decision support systems
8. Computer assisted drug design
9. Network analyses
10. Introduction to coding

METHODOLOGY

Total training hours: 3 credits ECTS x 25h/credit = 75h

a) Face-to-face (32h):

- Lectures
- Hands-on
- Integrative work

b) Home training (43h):

- Individual and group work

EVALUATION

Evaluation criteria:

To pass the subject, students must obtain a minimum of 50 points. The score will be established as follows:

Attendance: 50% of the overall grade.

Attendance will be evaluated as:

100% - 95% → 50 points

94% - 80% → 40 points

79% - 60% → 30 points

59% - 40% → 20 points

< 40% → Subject Failure

Teamwork Presentation: 50% of the overall score

To pass the subject, students will have to fulfill three requisites:

Attendance-score $\geq 20/50$, Team work presentation $\geq 20/50$, and overall score (attendance + Teamwork presentation) $\geq 50/100$.

Reevaluation: In case of failing the ordinary evaluation, students will have to agree in the delivery of an additional work with the coordinators. The re-evaluation final score will never get over 50 points.

REFERENCES

References will be provided during the course.

IMAGING IN TRANSLATIONAL RESEARCH

STUDY PLAN 2025-2026

Coordinated by:

Dr. Anna Planas IIBB-CSIC-IDIBAPS Researcher at the team Brain ischemia: Clinical and experimental studies.

Dr. Guadalupe Soria Assistant Professor at the Laboratory of Surgical Neuroanatomy, Human Anatomy Unit, Health and Life Sciences Faculty, UB.

GENERAL INFORMATION

Subject Name	Imaging in translational research
Code	566667
Type	Optional
Teaching	Second semester
Coordinator	Dr. Anna Planas and Dr. Guadalupe Soria
Contact Details	anna.m.planas@gmail.com ; gsoria@ub.edu
ECTS credits	3

OBJECTIVES

The purpose of this subject is to provide students scientific, conceptual, methodological and practical knowledge on biomedical imaging. Students must acquire basic knowledge of a wide range of different imaging modalities applicable in humans and experimental animals. They will be guided by expert teachers through different technologies in order to acquire basic knowledge about imaging techniques and modalities and image analysis. The overall objective of this subject spans from imaging techniques including biological samples for use in microscopy (optical, fluorescence, confocal, and electron microscopy) calcium imaging and flow cytometry, to *in vivo* imaging including different types of MRI, nuclear medicine techniques (PET and SPECT), optical imaging, computed tomography, ultrasounds and laser. These techniques will show students the different available tools for clinical and biological imaging, from structural to molecular imaging.

COMPETENCES TO BE GAINED DURING THE STUDY**General**

G1: Understand, interpret and discuss issues with clinicians

G2: Become familiar with bioimaging research progress and learn the tools necessary to access the continuous training

G3: Read, understand and discuss scientific texts

G4: Use of spoken and written English

Specific

S1: Understand the major diagnostic and therapeutic imaging techniques.

S2: Know the latest imaging technology techniques and applications for clinical and basic research as well as their advantages and limitations.

S3: Distinguish, use, and analyze various microscopy and biomedical imaging techniques.

S4: Gain knowledge on processing, quantification and optimization of various types of biomedical images.

S5: Visit experimental units, confocal microscopy, electron microscopy, MRI, and practical demonstration.

THEMATIC BLOCKS

1. Introduction to Imaging Techniques and Analyses
2. Microscopy
 - 2.1. Confocal microscopy
 - 2.2. Microscopic analysis of living cells
 - 2.3. Electron microscopy
 - 2.4. Intravital microscopy
 - 2.5. Microscopy image processing, optimization, and quantification
3. Optical imaging in living animals and humans: laser technology
4. Flow Cytometry: technical description and applications
5. Calcium Imaging
6. Computed tomography (CT)
7. Magnetic Resonance Imaging (MRI)
8. Positron Emission Tomography (PET) and Single Photon Emission Computed Tomography (SPECT)
9. PET and MRI image analyses
10. Advances in ultrasound imaging

METHODOLOGY

Total training hours: 3 credits ECTS x 25h/credit = 75h

- a) Face-to Face (32h):
 - Lectures
 - Seminars
- b) Home training (43h):
 - Individual and group work

EVALUATION

Evaluation criteria:

To pass the subject, students must obtain a minimum of 50 points. The score will be established as follows:

Attendance: 50% of the overall grade (face-to-face classes).

Attendance will be evaluated as:

100% - 95% → 50 points

94% - 80% → 40 points

79% - 60% → 30 points

59% - 40% → 20 points

< 40% → Subject Failure

Research Project: 50% of the overall score

To pass the subject, students will have to fulfill three requisites: Attendance-score $\geq 20/50$, research project-score $\geq 20/50$, and overall score (attendance + research project) $\geq 50/100$.

Reevaluation: In case of failing the ordinary evaluation, students will have to critically appraise 2 scientific articles and send the analysis by email to the coordinators. The re-evaluation final score will never get over 50 points.

REFERENCES

Books

- Foundation of Medical Imaging, Zang-Hee Cho, J.P. Jones and M. Singh, John Wiley & Sons, Inc, NY, 1993.
- Gonzalez, Woods, Digital image processing. Addison-Wesley
- Confocal Microscopy: Methods and Protocols. Series: Methods in Molecular Biology, Vol. 122. Paddock, Stephen W. (Ed.) Softcover reprint of hardcover 1st ed. 1999, XII, 446 p. A product of Humana Press. ISBN 978-1-59259-722-2

- Electron Microscopy: Methods and Protocols. Ed. John Ku. ISBN 978-1-59745-294-6
- Electron Microscopy and Analysis, Third Edition. Peter J. Goodhew, John Humphreys, Richard Beanland
- Radiation detection and measurements, G.F. Knoll, John Wiley and sons (1989)
- Current Protocols in Cell Biology. John Wiley and Sons. Somerset, NJ. ISSN 1934-3639. 2012.<http://www.currentprotocols.com/WileyCDA/Section/id-810292.html>

Publications

- James ML, Gambhir SS. A molecular imaging primer: modalities, imaging agents, and applications. *Physiol Rev.* 2012 Apr;92(2):897-965.
- Lopci E, et al. PET radiopharmaceuticals for imaging of tumor hypoxia: a review of the evidence. *Am J Nucl Med Mol Imaging.* 2014 Jun 7;4(4):365-84.
- Czernin J, Ta L, Herrmann K. Does PET/MR Imaging Improve Cancer Assessments? Literature Evidence from More Than 900 Patients. *J Nucl Med.* 2014 May 8;55(Supplement 2):59S-62S.
- Wong FC, Kim EE. A review of molecular imaging studies reaching the clinical stage. *Eur J Radiol.* 2009 May;70(2):205-11
- De Kemp RA et al. Small-animal Molecular imaging methods. *J Nucl Med.* 2010 May 1;51 Suppl 1:18S-32S.
- Niu G, Chen X. Molecular imaging with activatable reporter systems. *Theranostics.* 2012;2(4):413-23.
- Wu JC, et al. Noninvasive optical imaging of firefly luciferase reporter gene expression in skeletal muscles of living mice. *Mol Ther.* 2001 Oct;4(4):297-306.
- Price SJ et al. Methodology of diffusion-weighted, diffusion tensor and magnetisation transfer imaging. *Br J Radiol.* 2011 Dec;84 Spec No 2:S121-6.
- Kamali A et al. Distinguishing and quantification of the human visual pathways using high-spatial-resolution diffusion tensor tractography. *Magn Reson Imaging.* 2014 Apr 13. pii: S0730-725X(14)00126-X. doi: 10.1016/j.mri.2014.04.002
- Walhovd KB et al. Unravelling the secrets of white matter - bridging the gap between cellular, animal and human imaging studies. *Neuroscience.* 2014 Jul 5. pii: S0306-4522(14)00543-0. doi: 10.1016/j.neuroscience.2014.06.058.

Links

- <http://www.bdbiosciences.com/>
- <http://www.leica-microsystems.com/>
- <http://health.siemens.com/>
- <http://www.olympus-global.com/en/corc/history/story/micro/measure/>
- <http://www.olympusmicro.com/primer/techniques/fluorescence/fluorhome.html>
- <http://www.microscopyu.com/articles/fluorescence>
- <http://www.med.harvard.edu/aanlib/home.html>
- <http://www.cis.rit.edu/htbooks/mri/>
- <http://www.imaios.com/en/e-Courses/e-MRI>

- <http://www.humanconnectomeproject.org>
- <http://www.d.umn.edu/~biomed/flowcytometry/introflowcytometry.pdf>

Software

- Image Processing and Analysis in Java (<http://imagej.nih.gov/ij/>)
- FMRIB Software Library v5.0 (<http://fsl.fmrib.ox.ac.uk/fsl/fslwiki/>)
- Statistical Parametric Mapping (<http://www.fil.ion.ucl.ac.uk/spm/>)
- AFNI (<http://afni.nimh.nih.gov/afni>)
- The Brain Imaging Software Toolbox (<http://www.bic.mni.mcgill.ca/software/>)
- Talairach software (<http://www.talairach.org/>)

TRANSLATIONAL RESEARCH IN PUBLIC HEALTH

STUDY PLAN 2025-2026

Coordinated by:

Prof. Maria Grau Magaña, Serra Hunter Professor, Medicine Department, Faculty of Medicine and Health Sciences, University of Barcelona.

GENERAL INFORMATION

Subject Name	Translational Research in Public Health
Code	566665
Type	Optional
Teaching	Second semester
Coordinator	Dr. Maria Grau Magaña
Contact Details	mariagrau@ub.edu
ECTS credits	3

OBJECTIVES

At the end of this Module, students must be able to:

- Explain the terms cluster, outbreak and epidemic
- Interpret and describe the value of an epidemic curve
- Develop a case definition for an outbreak investigation
- Explain how hypotheses can be generated and tested in an outbreak investigation
- Discuss some of the biases that might affect case-control studies
- Discuss some of the biases that might affect cohort studies
- Calculate the proportion of attributable risk in the exposed
- Calculate the proportion of attributable risk in the population
- Discuss what does the proportion of attributable risk in the exposed and the proportion of attributable risk in the population imply for the practice of public health
- Discuss the criteria for causation in an observational study
- Describe the applications and limitations of matching in case-control studies
- Describe the method to analyze matched case-control data
- Calculate the odds ratio for triplets and quadruplets in a matched case-control study
- Calculate the predictive value of the two sequence tests in a screening program
- Discuss the criteria considered in evaluating a screening program in public health practice
- Define public health surveillance and identify the key features of a surveillance system
- Discuss the advantages and disadvantages of using a sensitive and/or specific case

definition in an epidemic investigation

- List the factors that can account for a change in the reported incidence of a disease
- Discuss the effect of a different case definition on the sensitivity of a surveillance system
- Calculate the vaccination effectiveness and discuss its interpretation

COMPETENCES TO BE GAINED DURING THE STUDY

General

G1: Be able to design, plan and properly interpret experimental protocols in the field of Translational Medicine.

G2: Be able to dynamically integrate modern knowledge and techniques developed within the field of Translational Medicine.

G3: Be able to interact with professionals from other medical specialties in a creative and decisive way.

G4: Have a clear appreciation of disciplinary actions and communications necessary to establish the link between basic science and clinical medical research.

Specific

S1: To be capable of teaching and divulging knowledge in the social environment for expert and non-expert people.

S2: To be capable of integrating knowledge and ways to do in front complex situations and to formulate a judgment with a limited information, but in a reflexive way and taking into account the social and ethical repercussions of them.

S3: To be capable of knowing the bioethical and legal principles of research and professional activities in the field of translational research.

S4: To be capable of using adequate technologies for the design, analysis and interpretation of epidemiological data.

S5: To be capable of identifying problems of public health, to design epidemiological studies and to interpret the results.

Pre-requirements

All oral sessions, presentation of lectures and practical sessions will be offered in English, thus students should have a good comprehension and oral English level.

THEMATIC BLOCKS

1. Introduction to Global Public Health
2. Bioethics
3. Fundamentals of outbreak investigations. Case study: Gastroenteritis at a University in Texas
4. Investigation of transmission in infectious diseases. Case study: Suspected Legionnaires' disease in Bogalusa
5. Sensitivity of a surveillance system. Case study: Paralytic illness in Ababo
6. Design of observational studies. Case study: Smoking and lung cancer

7. Prevention impact assessment. Case study: Texarkana-Vaccine efficacy
8. Unmatched and matched case-control studies. Case study: Toxic shock syndrome
9. Screening programs in public health practice. Case study: Screening for antibody to the human immunodeficiency virus

METHODOLOGY

Total training hours: 3 ECTS credits x 25h/credit = 75h

Classroom activities will consist in sessions which firstly show the conceptual aspects needed for the different types of epidemiological studies and secondly, problem solving using different Case studies. In this way, the students will acquire knowledge and skills to apply translational research to public health and the basics of epidemiology by means of the analysis of real situations.

Face-to-face training (32 hours) will consist in Lectures and Case studies.

Home training: Students should prepare the Case studies before each session, study the concepts explained in the classroom, read the recommended reading material and prepare the oral presentation to complete 75 hours corresponding to the 3 ECTS credits of the subject. Development of activities of the subject will consider the Sustainable Development Goals (SDGs), with special reference to SDG 3 on Good health and Well-being and to SDG 5 on Gender Equality.

EVALUATION

Evaluation criteria:

To pass the module, students must obtain a minimum of 50 points. The score will be established as follows:

Attendance: 50% of the overall grade.

Attendance will be evaluated as:

100% - 95% → 50 points

94% - 80% → 40 points

79% - 60% → 30 points

59% - 40% → 20 points

< 40% → Subject Failure

Oral presentation: 50% of the overall score.

To pass the subject, students will have to fulfill three requisites: Attendance-score $\geq 20/50$, research project-score $\geq 20/50$, and overall score (attendance + research project) $\geq 50/100$.

Oral presentation: Students will have to present in class an observational study dealing with the association between risk factors or preventive measures (primary prevention or secondary prevention) and a specific communicable or non-communicable disease. Students should select an article from the options listed in the Virtual Campus task consultation.

The oral presentation must include an introduction to the topic, as well as the research question, objectives, methodology (describing the design of the study and the variables included and the ethical aspects), results, a discussion (including limitations and possible biases of the study) and conclusions. Students should also make recommendations in relation to the author's conclusions. A pdf file containing the PowerPoint slideshow supporting the oral presentation must be submitted to the lecturer after the presentation. Slideshows will be posted on the Virtual Campus.

Re-evaluation: After the final grades have been posted, a multiple-choice examination is set for students who have not met the assessment criteria. There is only one correct answer out of four options per question. Incorrect answers incur a penalty of 25% of the mark given for each correct answer. The re-evaluation final score will never get over 50 points.

REFERENCES

- American Academy of Family Physicians (2017). Summary of Recommendations for Clinical Preventive Services.
Clinical recommendations update 2023 available at: <https://www.aafp.org/family-physician/patient-care/clinical-recommendations.html>
- Ballard S-B, Blazes DL (2020). Applied epidemiology for the infectious disease physician. In: Bennet JE, Dolin R, Blaser MJ, editors. Principles and Practice of Infectious Diseases. 9th ed. Philadelphia: Elsevier 154-163.
- Bhopal RS (2016). Concepts of epidemiology. 3rd ed. Oxford: Oxford University Press.
- Calentano DD, Szklo M, Farag Y (2023). Gordis Epidemiology. 7th ed. Philadelphia: Saunders- Elsevier.
- Coviello J (2020). Health promotion and disease prevention in clinical practice. 3rd ed. Philadelphia: Wolters Kluwer.
- El Sadr WM, Wasserheit J, Wiener B, Howard A, Hankins C, Culligan PJ, Harripersaud K (2021). Implementation science and translational public health. In: Detels R, Karim QA, Baum F, Li L, Leyland AH, editors. Oxford Textbook of Global Public Health. 7th ed. Vol 2. Oxford: Oxford University Press: Oxford University Press: 409-418.
- Elmore JG, Wild DMG, Nelson HD, Katz DL (2020). Jekel's Epidemiology, Biostatistics, Preventive Medicine and Public Health. 5th ed. St. Louis Missouri: Elsevier Saunders.
- Fletcher GS (2021). Clinical epidemiology. The essentials. 6th ed. Philadelphia: Wolters Kluwer.
- Friis RH, Sellers TA (2021). Epidemiology for public health practice. 6th ed. Burlington: Johns & Bartlett.
- Giesecke J (2017). Modern infectious disease epidemiology. 3rd ed. Boca-Raton: CRC Press.
- Griffiths S, Fenton KA. Strategies and structures for public health intervention (2021). In: Detels R, Karim QA, Baum F, Li L, Leyland AH, editors. Oxford Textbook of Global Public Health. 7th ed. Vol 3. Oxford: Oxford University Press: 659-684

- Hien NT, Buehler JW, Kimball AM (2022). Public health surveillance. In: Detels R, Karim QA, Baum F, Li L, Leyland AH, editors. Oxford Textbook of Global Public Health. 7th ed. Vol 2. Oxford: Oxford University Press: 259-274.
- Iamsirithaworn S, Thammawijaya P, Ungchusak K (2021). Principles of outbreak investigation. In: Detels R, Karim QA, Baum F, Li L, Leyland AH, editors. Oxford Textbook of Global Public Health. 7th ed. Vol 2. Oxford: Oxford University Press: 59-74
- Lash TL, VanderWeele TJ, Haneuse S, Rothman KJ, editors (2021). Modern Epidemiology. 4th ed Philadelphia: Wolters Kluwer.
- McNabb SJN, Conde JM, Ferland L, MacWright W, Memish ZA, Okutani S, Park MM, Ryland P, Shaikh AT, Singh V, editors (2017). Transforming public health surveillance. 1st ed. Jordan: Elsevier.
- Miettinen OS (2011). Epidemiological research: terms and concepts. Heidelberg: Springer.
- Porta M, editor (2024). A dictionary of epidemiology. 7th ed. Oxford: Oxford University Press.
- Nolan MB, Wegner MV, and Remington PL (2023). Chronic disease epidemiology, prevention, and control. 5th ed. Washington: American Public Health Association.
- Savitz DA, Wellenius GA (2016). Interpreting epidemiologic evidence. Connecting Research to Applications. 2nd ed. Oxford: Oxford University Press.
- Szklo M, Nieto J (2019). Epidemiology. Beyond the basics. 4th ed. Massachusetts: Jones and Bartlett Learning.
- United Nations Resource Information Center (UNRIC). Sustainable Development Goals (SDGs) Selected online resources. Available at: <https://unric.org/en/unric-library-backgroundunder-sdgs/>
- United Nations Sustainable Development Goals. Full list with targets. Available at: <http://www.un.org/sustainabledevelopment/sustainable-development-goals/>
- United Nations Sustainable Development Goals Report 2023:Special Edition. Available at: <https://unstats.un.org/sdgs/report/2023/>
- US Preventive Services Task Force. Available at: https://www.uspreventiveservicestaskforce.org/uspstf/topic_search_results?topic_status=P
- Vandembroucke JP, von Elm E, Altman SG, et al. (2007). Strengthening the reporting of observational studies in epidemiology (STROBE): Explanation and elaboration. PLOS Medicine 4: e297.
- Weiss NS, Koepsell TD (2014). Epidemiologic methods, 2nd ed. Oxford: Oxford University Press.

STEM CELL RESEARCH

STUDY PLAN 2025-2026

Coordinated by:

Dr Roger Gomis, ICREA Professor and Researcher at the IRB Barcelona

GENERAL INFORMATION

Subject Name	Regenerative medicine and stem cells
Code	566661
Type	Optional
Teaching	Second semester
Coordinator	Dr. Roger Gomis
Contact Details	roger.gomis@irbbarcelona.org
ECTS credits	3

OBJECTIVES

The overall objective of this module is to offer next generation scientists a meticulous training in regenerative medicine and stem cell so they can contribute to the stem cells biology knowledge with its clinical and therapeutic applications.

PRE-SKILLS AND REQUIREMENTS

General

The program proposes basic training in cancer biology and its development. The offered methodology intends to provide the necessary knowledge to create study and apply stem cells and its surroundings to experimental treatments in human beings.

Specific

Stem cell biology and methods used for identification. Types of stem cells: adult; hemopoietic: mesenchymal somatic and iPS. Regeneration and homeostasis: cellular therapies expectations. Development of advanced therapies, from the hypothesis to the patient.

THEMATIC BLOCKS

1. Introduction
2. Stem cell Biology

3. Methods for stem cells identification
4. Generating iPS cells
5. Adult stem cell
6. Progenitors and endothelial cells: angiogenesis
7. Production techniques: apheresis
8. Production factory in cell therapy
9. Regulation of the procurement, processing and administration of advanced therapies
10. Stem cell, cancer and development
11. Senescence, aging and reprogramming
12. Intestinal epithelium and Colorectal Cancer Stem Cells
13. Regeneration of hematopoiesis by progenitors transplantation
14. Platelet lysate as a source of cell growth factors
15. Lung Regeneration: pneumocytes transplant
16. Therapeutic vaccines generation: dendritic cell and infectious diseases
17. Mesenchymal cell: regeneration, immunosuppression and tumors
18. Gene Therapy
19. Chimeric antigen receptors generation
20. Future applications in cell therapy

METHODOLOGY

Total training hours: 3 credits ECTS x 25h/credit = 75h

- a) Face-to-face (32h)
 - Lectures
 - Computer sessions
 - Seminars
 - Laboratory Practices
- Presentation of research projects

- b) Home training (43h)
 - Individual and group work

EVALUATION

Evaluation criteria:

To pass the module, students must obtain a minimum of 50 points. The score will be established as follows:

Attendance: 50% of the overall grade.

Attendance will be evaluated as:

100% - 95% → 50 points

94% - 80% → 40 points
79% - 60% → 30 points
59% - 40% → 20 points
< 40% → Subject Failure

Oral presentations: 50% of the overall score. (*Based on continuous evaluation during Journal Clubs*)

To pass the subject, students will have to fulfill three requisites: Attendance-score $\geq 20/50$, research project-score $\geq 20/50$, and overall score (attendance + research project) $\geq 50/100$.

Reevaluation: In case of failing the ordinary evaluation students will have to submit 2 critical appraisals. The re-evaluation final score will never get over 50 points.

REFERENCES

References will be recommended by each of the lecturers.

CLINICAL TRIALS DESIGN AND EVALUATION OF MOLECULAR THERAPIES

STUDY PLAN 2025-2026

Coordinated by:

Dr. Virginia Hernández-Gea Hepatologist at Hospital Clínic of Barcelona, CIBERehd, IDIBAPS, University of Barcelona

Dr. Marco Pavesi Principal Biostatistician at Cytel

GENERAL INFORMATION

Subject Name	Clinical Trials Design and Evaluation of Molecular Therapies
Code	572714
Type	Optional
Teaching	Second semester
Coordinator	Dr Virginia Hernández-Gea
Contact Details	vihernandez@clinic.cat
ECTS credits	3

OBJECTIVES

The purpose of this module is to gain knowledge on the drug development process, and be able to understand the basics of clinical trial design within a product development program.

At the end of this subject, students must be able:

- To list the phases of product development of new chemical entities and understand their objectives.
- To interpret and the type of evidence coming from each phase of product development.
- To understand basic concepts of pharmacokinetics relevant for drug development.
- To discuss the key features of clinical trial design.
- To discuss basic aspects of statistical considerations in clinical trials, including statistical reasoning, sample size, protection against errors and multiplicity issues.
- To interpret results for comparison of proportions, means and survival analyses.
- To understand the concepts of superiority, equivalence and non-inferiority.
- To explain the terms exploratory, confirmatory, biomarker and validation.

- To explain the main steps to reach a marketing application approval in Europe.
- To know the different interactions with regulatory agencies during a product development process, and their objectives.
- To have notions on post-marketing surveillance and the adaptive licensing initiatives.

COMPETENCES TO BE GAINED DURING THE STUDY

To be able to design, plan and properly interpret clinical protocols in the field of Translational Medicine

To be able to dynamically integrate modern knowledge & techniques developed within the field of Translational Medicine

To be able to interact with professionals from other medical specialties in a creative and decisive way

To have a clear appreciation of disciplinary actions and communications necessary to establish the link between basic science and clinical medical research

Pre-requirements

All oral sessions, presentation of lectures and practical sessions will be offered in English, thus students should have a good comprehension and oral English level.

THEMATIC BLOCKS

A) Design of Clinical trials

A.1 Basic applied statistics. Type of Studies. Observational studies and Randomised Clinical Trials (RCT)

- Basic statistics applied to clinical trials. Population and samples. Bias and random errors. Statistical errors.
- Statistical inference: p-values and confidence intervals. Sample Size determinants.
- Study types. Observational vs Experimental designs. Non-Randomised studies.
- Basics of clinical trials. Methods for handling bias. Randomisation. Blinding. Control group. Study populations. Estimating Clinical Effects: end-points.

A.2 Statistical issues in the Analysis and interpretation of RCT

- Analysis and interpretation of RCT. Handling of Multiplicity. Subgroups.
- Surrogate end-points and biomarkers. Predictive and prognostic factors.
- Superiority, Equivalence and Non-Inferiority Designs. Selection of the non-inferiority margin. Impact of different end-points types.
- Assessment of events: count, recurrence and censoring. Survival Analysis.

A.3 Practical planification of RCT. Sample size. Alternative designs

- Planification of a clinical trial. Regulatory and scientific sources.

- Sample Size predetermination for continuous, binary, count and survival end-points in superiority and non-inferiority trials.
- Basic designs: Factorial, crossover, multi-Arm trials.
- Alternatives to traditional for trial optimisation: adaptive, Bayesian, repeated measurements, withdrawal, enrichment, simultaneous multiple end-points. Umbrella and basket trials.
- Handling of missing data.

A.4. Meta-analysis. Data management. Reporting of Clinical Trials.

- Meta-analysis of observational and experimental studies
- Reporting of clinical trials
- Data Collection, data quality, data management and Database

B. Clinical trials – from Phase I to III

B.1 Overview of trial design. Phase I trials

- Overview of trial design, levels of evidence, end-points and magnitude of benefit
- Regular vs accelerated approval
- Phase I –
- Phase I- Examples

B.2 Phase II trials

- Phase II and randomized Phase II –
- Phase II- Examples

B.3 Phase III trials

- Phase III –
- Phase III- Examples

C. Drug development, regulatory issues and safety

C.1 Product development plan. Drug Discovery. Non-Clinical development

- Product development plans and target product profile.
- Drug discovery process, from bench to bed.
- Non-Clinical development and early safety tests.

C.2 Good Clinical Practice. Marketing Authorization Procedures

- Fundamentals of clinical research. International Council for Harmonization, Good Clinical Practice: What do I need to know as a clinical investigator?
- Regular process for Marketing Authorization Procedure. EMA, other drug agencies.

C.3 Real-world data. Safety

- Effectivity assessment and real-world data
- Safety data reporting in clinical trials. Concepts of Adverse Event, Adverse Drug Reaction, SAEs and related safety topics

METHODOLOGY

Total training hours: 3 credits ECTS x 25h/credit = 75h

Face to face lectures: (48h) will include lectures and case studies.

Home training (27h): In order to complete 3 ECTS credits of the subject, students will have to prepare and present one case study based on the concepts explained in face-to-face training.

Classroom activities will consist in sessions which firstly show the conceptual aspects and secondly, problem solving using different case studies. In this way, the students will acquire knowledge and skills to apply translational research by means of the analysis of real situations.

EVALUATION

Evaluation criteria:

To pass the subject, students must obtain a minimum of 50/100 points. The score will be established as follows:

- **Attendance:** 50% of the overall grade.

Attendance will be evaluated as:

95% - 100% → 50 points

94% - 80% → 40 points

79% - 60% → 30 points

59% - 40% → 20 points

<40% → Subject Failure

- **Oral Presentation and report:** 50% of the overall score. (This will be described in detail during the first day of class)

To pass the subject, students will have to fulfill three requisites: Attendance-score $\geq 20/50$, oral presentation/report-score $\geq 20/50$, and overall score (attendance + exam) $\geq 50/100$.

Reevaluation: In case of failing the ordinary evaluation, students will perform an oral exam. The re-evaluation final score will never get over 50 points.

REFERENCES

Clinical Trials

- Bakke OM, Carné X, García Alonso F. Ensayos Clínicos con medicamentos. Fundamentos

básicos, metodología y práctica. Barcelona: Doyma, 1994.

- Chow SC, Liu JP. Design and Analysis of Clinical Trials: Concepts and Methodologies. John Wiley & Sons. 2nd Ed. 2004.
- DeMets DL, Furberg CD, Friedman LM. Data Monitoring in Clinical Trials - A Case Studies Approach. Springer, 2006.
- Friedman LM, Furberg CD, DeMets DL. Fundamentals of Clinical Trials. New York: Springer, 1998.
- Geller NL. Advances in Clinical Trial Biostatistics. New York: Marcel Dekker, 2004.
- Machin D, Day S, Green S. Textbook of Clinical Trials - Second Edition. West Sussex, UK: John Wiley & Sons, 2006.
- Piantadosi S. Clinical Trials A Methodologic Perspective Second Edition. Hoboken, NJ: Wiley-Interscience, 2005.
- Pocock SJ. Clinical Trials - A Practical Approach. West Sussex, England: John Wiley & Sons, 1983.
- Spilker B. Guide to Clinical Trials. New York: Raven Press, 1991.
- Senn S. Cross-over Trials in Clinical Research. Chichester: John Wiley, 1993.
- Libro Luces y Sombras en Investigación Clínica: (Chapter 9: Nuevos diseños en investigación clínica), Caridad Pontes, José Ríos, Ferran Torres).

Biomarkers

- Simon R. Genomic Clinical Trials and Predictive Medicine. Cambridge University Press, National Institutes of Health 2013, New York, USA.
- Simon R. Clinical trials for predictive medicine: new challenges and paradigms. Clin Trials. 2010 Oct;7(5):516-24.
- Dancey JE, Bedard PL, Onetto N, et al: The genetic basis for cancer treatment decisions. Cell 148:409-420, 2012.
- Simon R. The use of genomics in clinical trial design. Clin Cancer Res. 2008 Oct 1;14(19):5984-93.
- Freidlin B, Korn EL. Biomarker enrichment strategies: matching trial design to biomarker credentials. Nat Rev Clin Oncol. 2014 Feb;11(2):81-90.
- Catenacci DV. Next-generation clinical trials: Novel strategies to address the challenge of tumor molecular heterogeneity. Mol Oncol. 2015 May;9(5):967-96.
- Freidlin B, McShane LM, Korn EL. Randomized Clinical Trials With Biomarkers: Design Issues. J Natl Cancer Inst 2010;102:152-160.
- Simon R. Clinical trials for predictive medicine. Stat Med. 2012 Nov 10;31(25):3031-40.
- Freidlin B, McShane LM, Polley MY, et al. Randomized phase II trial designs with biomarkers. J Clin Oncol 2012;30:3304-9.
- Simon R. Biomarker based clinical trial design. Chin Clin Oncol 2014;3(3):39.

International Conference of Harmonization (ICH)

- CPMP/ICH/363/96. ICH E9 Statistical Principles for Clinical Trials. URL: http://www.ema.europa.eu/ema/pages/includes/document/open_document.jspx?webContentId=WC500002928, last access: 08-Nov-2010.

- ICHE9. Addendum:
http://www.ich.org/fileadmin/Public_Web_Site/ICH_Products/Guidelines/Efficacy/E9/E9_R1_Final_Concept_Paper_October_23_2014.pdf
- Other ICH guidances can be found
at: www.ich.org/products/guidelines/efficacy/article/efficacy-guidelines.html

EMA Guidelines

- EMEA Scientific Guidelines for Human Medicinal Products, Clinical Efficacy and Safety Guidelines, Biostatistics.
URL: http://www.ema.europa.eu/ema/index.jsp?curl=pages/regulation/general/general_content_000602.jsp&mid=WC0b01ac05807d91a4, last access: 04-09-2016.
- EMEA Scientific Guidelines for Human Medicinal Products, Clinical Efficacy and Safety Guidelines, General.
URL: http://www.ema.europa.eu/ema/index.jsp?curl=pages/regulation/general/general_content_000366.jsp&mid=WC0b01ac0580032ec4, last access: 04-09-2016.

Useful links

- Simon Two-Stage Design:
<http://cancer.unc.edu/biostatistics/program/ivanova/SimonsTwoStageDesign.aspx>
- Sample Size:
GranMo del IMIM:
POWER de Un. IOWA: <http://homepage.stat.uiowa.edu/~rlenth/Power/>
- Power and sample size de Vanderbilt University, by Dupont WD,
Plummer: <http://biostat.mc.vanderbilt.edu/twiki/bin/view/Main/PowerSampleSize>

RESPONSIBLE RESEARCH, INNOVATION AND ENTREPRENEURSHIP

STUDY PLAN 2025-2026

Coordinated by:

Dr. Pastora Martínez Samper, Commissioner for international action at Universitat Oberta de Catalunya and Adjunct Professor at Universitat de Barcelona

GENERAL INFORMATION

Subject Name	Responsible Research, Innovation and Entrepreneurship
Code	572713
Type	Optional
Teaching	Second semester
Coordinator	Dr. Pastora Martínez
Contact details	pmsamper@uoc.edu
ECTS credits	3

OBJECTIVES

Part 1: Responsible Research and Innovation

This subject has two differentiated blocks and the main objectives are:

- A) Scientific communication for a scientific audience
- Improve the student's capacity to communicate and disseminate the results obtained from their research in different formats (oral presentations, posters, scientific papers, CV)
 - Contextualize such communications within the different stages of research
- B) Responsible Research and Innovation (RRI) and Scientific communication for a general public
- Report the key issues from the RRI and Open Science actions promoted by the European Commission within the action research program Horizon Europe
 - Skills to delve deeper in systems and mechanisms

Part 2: Entrepreneurship

The overall objective of the subject is to provide students the basic set of knowledge, know-how and skills to understand the basic policies and procedures to capture value from basic and translational research in Biomedicine and Biotechnology.

COMPETENCES TO BE GAINED DURING THE STUDY**General**

G1: Broader view of biomedicine and biotechnology

G2: Communication, initiative and personal development

Specific

S1: Basic bio-business trends

S2: Learn in a scientific and social context how the research careers develop

S3: Learn how to disseminate research results (audiovisual tools, social networking, scientific databases)

S4: Learn the key aspects in what is called public engagement (education, ethics, dissemination, open science...)

THEMATIC BLOCKSPart 1: Responsible Research and Innovation

1. Introduction
2. Scientific communication for a scientific audience: speaking in public, how to write with impact, etc.
3. Scientific communication to the general public (public engagement)
 - The need for a renewed relationship between science and society: towards responsible research and innovation.
 - Science dissemination 2.0.
 - From the Open Access initiative to the Open Science movement.
 - Diversity in science and technology: Including the gender perspective and more.

Part 2: Entrepreneurship

1. Introduction: how does the sector look like?
2. From discovery to market: the basics.
3. From discovery to market: pitching your idea.

METHODOLOGY

Total training hours: 3 credits ECTS x 25h/credit = 75h

- a) Face-to-face (40h):
 - Lectures
 - Seminars
 - Debates
 - Research projects presentations, elevator pitch
- b) Home training (35h): Individual and group work

EVALUATION

Evaluation criteria:

To pass the module, students must obtain a minimum of 50 points. The score will be established as follows:

Attendance: 50% of the overall grade.

Attendance will be evaluated as:

100% - 95% → 50 points

94% - 80% → 40 points

79% - 60% → 30 points

59% - 40% → 20 points

< 40% → Subject Failure

Oral Presentation (face to face): 50% of the overall score

Reevaluation: In case of failing the ordinary evaluation students will have to contact the subject's coordinator. The re-evaluation final score will never get over 50 points.

REFERENCES

Part 1: Responsible Research and Innovation

Scientific presentations

- Leeming J (2017) [Scientific presentations: A cheat sheet](#)

Responsible Research and Innovation (RRI)

- Richard Owen, Phil Macnaghten, Jack Stilgoe, Responsible research and innovation: From science in society to science for society, with society, *Science and Public Policy*, Volume 39, Issue 6, December 2012, Pages 751–760
- Stilgoe, J., Owen, R., & Macnaghten, P. (2013). 'Developing a framework for responsible innovation', *Research Policy*, 42/9: 1568–1580
- Crowe, S., et al. (2015): «Patients', clinicians' and the research communities' priorities for treatment research: there is an important mismatch», *Research Involvement and Engagement* 1:2.
- Abma, T.A., Broerse, J., (2010) Patient participation as dialogue: setting research agendas. *Health Expectations*, doi: 10.1111/j.1369-7625.2009.00549.x
- [How to set up a participatory research agenda setting](#), RRI Tools website

Open science

- [UNESCO Recommendation on Open Science](#), 2021.

- [Open science: Sharing is caring, but is privacy theft?](#), David Mehler and Kevin Weiner. *PLoS Neuro Community* blog. 2018.
- [Open science is all very well but how do you make it FAIR in practice?](#), Rachel Bruce and Bas Cordewener. JISC blog. 2018.
- [Mapping Open Science Tools](#), Lettie Y. Conrad. *The Scholarly Kitchen* blog. 2018.
- [Open Science: Sharing Your Research with the World](#): MOOC of the University of Delft. 2018.
- [Open Science MOOC](#): MOOC of the University of Leiden. 2018.
- [The Open Science Training Handbook](#). 2018.

Open Access

- Documentary “Paywall - the Business of Scholarship” <https://paywallthemovie.com/>

Citizen Science and Community Based Participatory Research

- [Website on Citizen Science](#) by the EC
- [How to co-create Community Based Participatory Research](#), RRI Tools website
- [European Citizen Science Association](#) website
- [How citizen science can help fight cancer](#), Cancer Research UK

Gender equality in research

- Bunton and Petersen (1997). Foucault, Health and Medicine. London: Routledge.
- Preciado (2007). Biopolítica del género. UBA
- Lancet special on gender and health <https://www.thelancet.com/series/gender-equality-norms-health>

Science dissemination

Altmetrics

- Adams J, Loach T. (2015). [Altmetric mentions and the communication of medical research](#).
- Maggio LA, Leroux T, Meyer HS, Artino AR. (2018). [Exploring the relationship between altmetrics and traditional measures of dissemination in health professions education](#).
- Wooldridge J, King MB. (2018). [Altmetric scores: An early indicator of research impact](#).
- Lemke S., Peters I., Mazarakis A. (2019, March 20). [“If you use social media then you are not working” – How do social scientists perceive altmetrics and online forms of scholarly communication?](#) [Blog post].

Blogging

- LSE Impact Blog. (2012, February 24). [Five minutes with Patrick Dunleavy and Chris Gilson: “Blogging is quite simply, one of the most important things that an academic should be doing right now”](#). [Blog post].
- Dunleavy, P. (2014, December 28). [Shorter, better, faster, free: Blogging changes the nature of academic research, not just how it is communicated](#) [Blog post].

- Dunleavy, P. (2016, January 25). [How to write a blogpost from your journal article in eleven easy steps.](#) [Blog post].
- Carrigan, M. (2016, April 26) [40 reasons why you should blog about your research](#) [Blog post].
- Mollett A., Brumley C., Gilson C., Williams S. (2017, May 25). [So you've decided to blog? These are the things you should write about.](#) [Blog post].

Twitter

- Emily S. Darling et al (2013). [The role of twitter in the life cycle of a scientific publication.](#)
- QingKe, Yong-Yeol Ahn and Cassidy R. Sugimoto (2017). [A systematic identification and analysis of scientists on Twitter.](#)
- Monya Baker (2015). [Social media: A network boost.](#)
- Wheeler, T. (2015, August 21). [Permission to tweet? The underlying principles of good science communication are all about sharing.](#) [Blog post].
- Haustein, S. & Costas, R. (2015). [Identifying Twitter audiences: who is tweeting about scientific papers?](#)
- Ortega, JL. (2017, December 4). [Academic journals with a presence on Twitter are more widely disseminated and receive a higher number of citations.](#) [Blog post].

Sharing

- Gill, J. (2013, 2 January). [Six ways to use Google + Hangouts for academic productivity.](#) [Blog post].
- Noruzi, A. (2017). [YouTube in scientific research: A bibliometric analysis](#)
- Diner E. (2019, 25 January). [Should academics share their presentations?](#)[Blog post]

Part 2: Entrepreneurship

- Innovation and Entrepreneurship in the Healthcare Sector: From Idea to Funding to Launch. Luis Pareras ed. ISBN-10: 0982705530 | ISBN-13: 978-0982705537
- www.biocat.cat
- Nature Biotechnology Journal

MASTER THESIS

STUDY PLAN 2025-2026

Coordinated by:

Dr. Josep M Llovet, Full Professor of Medicine-Hepatic Oncology (Department of Medicine, Faculty of Medicine, University of Barcelona); Director of the Master in Translational Medicine; ICREA Research Professor; Group Leader at IDIBAPS-Hospital Clínic Barcelona. Professor of Medicine & Director of the Liver Cancer Program of the Icahn School of Medicine at Mount Sinai (NY-USA).

GENERAL INFORMATION

Subject Name	Master Thesis
Code	566668
Type	Compulsory
Teaching	Second semester
Coordinator	Prof. Josep M Llovet
Contact details	jmllovet@recerca.clinic.cat
ECTS credits	24

OBJECTIVES

The Master Thesis is compulsory to obtain the Master's Degree (RD 1393/2007). It consists of a research project, with 24 ECTS credits, resulting from the student's individual work during his/her practical training in a research laboratory.

METHODOLOGY

As part of the Master's Program, students are required to conduct a **Research Master Thesis** within a research group at the Campus Clinic. Research groups from other UB campuses, other Universities in Barcelona, and industry placements within the Barcelona area are also accepted. This training must consist of at least 500 hours.

Through the classes of the master, students are introduced to various research groups, and this exposure helps them identify research topics that align with their interests.

The Master Secretariat provides guidance and support in selecting and identifying research groups offering Master Thesis positions. However, it is ultimately the students' responsibility to

take an active role in securing a research group for their Master's thesis **within the deadline (November 28th)**.

Students are strongly encouraged to engage actively in this process from the beginning of the program.

EVALUATION

There will be a mid-term evaluation in December in which students will have to briefly present in form of oral presentation their master thesis. Each student will have 5 minutes to introduce the topic, the working hypothesis and objectives of the research work, materials and methods that he/she is planning to use and a brief description of the expected results.

The final evaluation of the Master Thesis will take place in June. The final score of the Master Thesis will reflect the quality of the master thesis written report, oral defense and practicum assessment.

Language: The written report should be submitted in English and the public defense may be done in Catalan, Spanish or English.

Deadlines: The written report has to be submitted during the first week of June (the exact date will be announced at the start of the Master and will be published on Virtual Campus), with the tutor's approval. The public defense will take place in front of a panel of experts. The oral presentation date will be announced by the Master Secretariat.

The Master Coordination Committee will nominate the Master Evaluation Panels (constituted by professors or researchers) which will evaluate the written report as well as the oral presentation. Evaluation panels may request clarifications from the student or his/her tutor regarding the work submitted before, during and after the oral presentation.

Written Report: Students will have to submit a digital version of their master thesis to the master secretariat in .pdf format. The evaluation panel will take into account the quality of the written report, and whether a) the objectives are well defined, described and achieved, b) the results are clearly presented and c) the discussion includes a correct and consistent interpretation of the result. The correct citation of reference articles will also be evaluated. The written report will count 40% of the final Master Thesis score.

Oral presentation: Students will have defended their work in front of the Evaluation Panel. They might help themselves by using a Power Point presentation (or similar tool). Students will have **10 minutes** to present their work, and **5 minutes** for discussion with the members of the evaluation panel. Defending the master thesis in English will be a plus in the evaluation. The oral presentation will count for 40% of the final Master Thesis score.

Practicum assessment: Students will undertake their practicum in a laboratory. This training, which should consist of at least 500 hours, will be evaluated by the tutor and will count for 20% of the final Master Thesis score.

The written report should have the following sections:

1. Title page (1 page): This page should contain the research title, student's full name, affiliation (Department, Institution or Research Centre where the project is done) and the tutor's name.
 2. Abstract (up to 1/2 page)
 3. Introduction (up to 2 pages): Outlines the background of the topic and sets the research context.
 4. Working Hypotheses and Objectives (up to 1 page): This section should be concise.
 5. Material and Methods (up to 2 pages): This section should be detailed and complete. It is recommended to specify the type of study, sample size, experimental designs, patterns " *in vivo* " or " *in vitro* " (if applicable) , data collection and statistical processing of the results. If appropriate, they should explain the ethical aspects of the study in this section.
 6. Results (5 to 10 pages): In this section results will be described. Tables and figures and its corresponding descriptions have to be included if considered necessary.
 7. Discussion (up to 2 pages): In this section, findings should be discussed and the results should be framed in relation to the known literature in the field.
 8. Conclusions (up to 1 page): Conclusions of the research study have to be written in this section.
 9. References (up to 2 pages): References have to be listed in this section. They have to be updated and focused on the data related to the presented project. It is recommended to avoid long collections or literature not mentioned in the project. The citation rules should follow the Vancouver style (Index Medicus).
- ❶ If you have been involved in a research article, this can be integrated in the "results" section.

Formatting guidelines for written project:

Font: Arial or Calibri / 12pt

Language: English

Spacing: 1 or 1,5

PDF to be submitted to the Virtual Campus by the first week of June (exact date will be announced at the start of the course)

Formatting guidelines for oral presentation:

Supported with a Power Point or similar

Language: English preferred, but Catalan or Spanish will be accepted

Duration: 10 minutes (presentation) + 5 minutes (questions)

Scheduled during June (dates to be confirmed)

Scores will be: from 5 to 6.9, “aprovat”; from 7 to 8.9, “notable” and from 9 to 10, “excel·lent”. To be able to obtain an excellent with distinction, students should have a score above 9.5 and other merits that the evaluation panel and Master Coordination Committee will consider. If students do not obtain a score over 5, they have to register for the subject again. These students may choose whether they want to improve the same project they had presented or rather start a new one. If a student has published an original paper in an indexed journal as first or second author, this work will be considered equivalent to the written report associated to the Master Thesis. However, they will need to present a 1-page-document describing their contribution to the submitted paper. Articles in press will also be accepted.

Since the Master Thesis is individual, each piece of research work presented may only be submitted by a single student. A student who submits a thesis that was not written by himself/herself or who presents as his/her own any research findings (ideas, words, work) of a third party is guilty of plagiarism. Any text, passage, excerpt, etc. from a source other than one's own must be duly and fully identified and acknowledged. Plagiarism will be penalized as stated in the Faculty's Study Regulations.

/!\ Following UB regulation:

- **Students need to pass all master subjects in order to be able to defend their master thesis.**
- **Master Thesis cannot be performed abroad.**

Examples of Practical Stage Locations

The Master includes 24 credits for the Master Thesis which should be conducted in a Laboratory, the student's practicum will last minimum 500 hours.

Below is the list of all the Laboratories assigned to the students which presented the Master Thesis in the past:

1. Institut d'Investigacions Biomèdiques August Pi i Sunyer, IDIBAPS
2. Hospital Universitari de Bellvitge,
3. Bellvitge Biomedical Research Institute, IDIBELL,
4. Hospital Clínic
5. Universitat de Barcelona, Facultat de Medicina i Ciències de la Salut
6. Institut d'Investigacions Biomèdiques de Barcelona, IIBB
7. Hospital Duran i Teynals
8. Consejo Superior de Investigaciones Científicas, CSIC
9. Banc de Sang i Teixits, BST
10. Hospital Sant Joan de Déu
11. Fundació Sant Joan de Déu
12. Vall d'Hebron Institut de Recerca, VHIR
13. Vall d'Hebron Hospital
14. Instituto de Química Avanzada de Cataluña, IQAC
15. Institut de Bioenginyeria de Catalunya, IBEC
16. Banc de Sang i Teixits, BST
17. Institut de Ciències Fotòniques, ICFO
18. Centre Nacional d'Anàlisi Genòmica, CNAG
19. Institute for Research in Biomedicine, IRB
20. FIRHU Vall d'Hebrón
21. Institut Català d'Oncologia, ICO
22. Parc Taulí Sabadell
23. Institut Germans Trias i Pujol, IGTP
24. Industry: Grífols

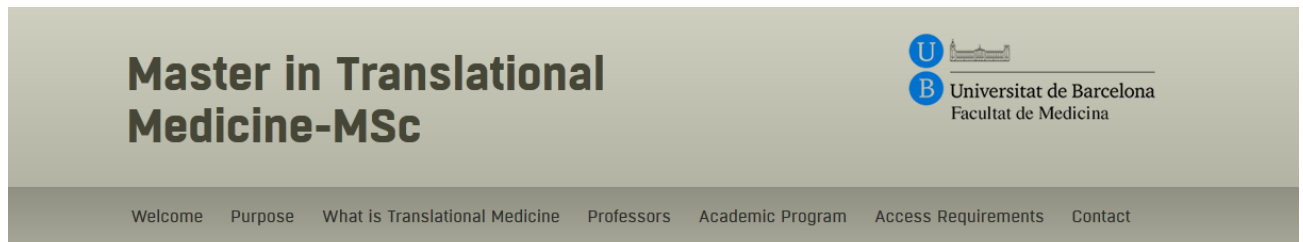
Please find the list of practical stage offers following the link below:

<https://docs.google.com/presentation/d/1wDAEKaFCVp9OrRZRjCxEZgHVeF1hF0aiQxbYiZvUpl8/edit?usp=sharing>


Deadline for acceptance to a research group: **28th November 2025**

MASTER WEBSITE

<http://www.ub.edu/mastertranslationalmedicine/>



Master in Translational Medicine-MSc



U B Universitat de Barcelona
Facultat de Medicina

Welcome Purpose What is Translational Medicine Professors Academic Program Access Requirements Contact



Welcome from the coordinator

The Master in Translational Medicine-MSc from the University of Barcelona offers the opportunity to gain an excellent training both in academia and research.

- **Academic.** The Master provides comprehensive and updated knowledge of the basics, clinical and epidemiological entities associated with major human pathogenesis, examined from a cross-sectional view.
- **Research.** It provides comprehensive access to knowledge and skills necessary to develop research projects related to translational medicine.

The master can be completed in **1 or 2 years**, depending on the needs of the students. Total number of credits of the Master is **60 Credits** (46,5 €/credit for Spanish citizens - 82 €/credit for foreigners) and the official language of the Master is **English**. An important part of the Master is dedicated to **practical training in research**.

[Read more](#)

MASTER'S WEBSITE - UNIVERSITAT DE BARCELONA

<https://www.ub.edu/portal/web/medicina-ciencies-salut/masters-universitaris/-/ensenyaments/detall/6201589>

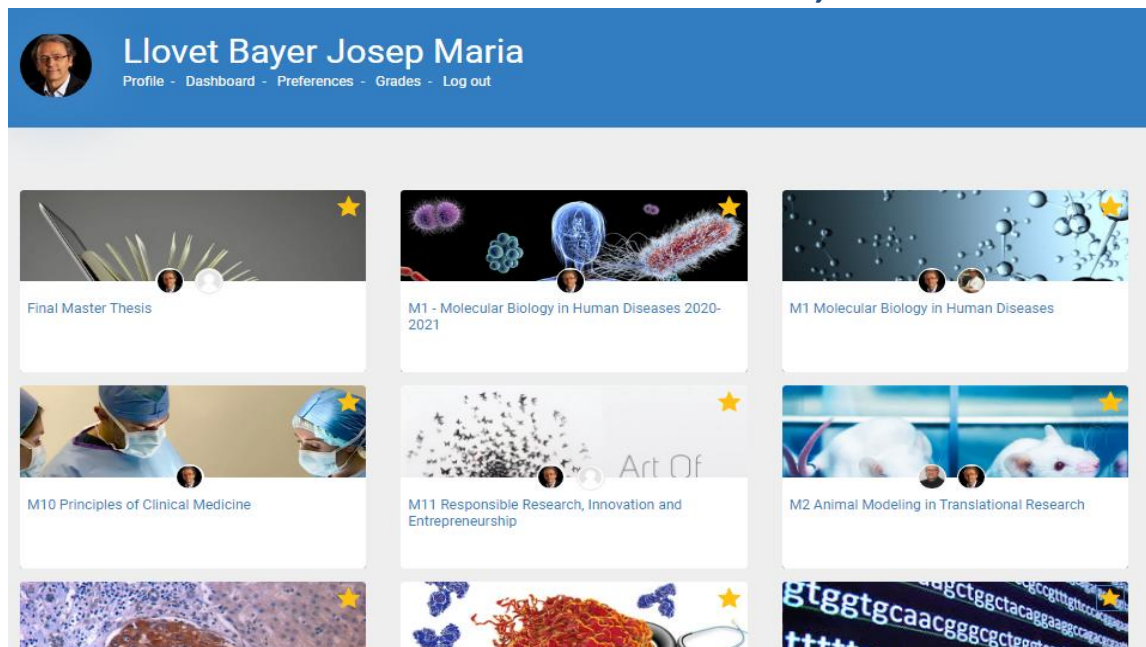
<https://web.ub.edu/web/estudis/w/masteruniversitari-m2804>



The screenshot shows the website for the Master in Translational Medicine at the Faculty of Medicine and Health Sciences, Universitat de Barcelona. The header includes the university logo and the faculty name. A navigation bar contains links for 'La Facultat', 'Els campus', 'Docència', 'Recerca', and 'Mobilitat'. The main content area is titled 'Màster de Medicina Translacional' and features a sidebar with 'Informació del màster' (Presentation, Objectives, Access, Curriculum, Practices, Methodology, Professional Outcomes) and a central 'Presentació' section with a microscopic image and a 'Preinscripció' button. A badge on the right indicates 'Acreditació FAVORABLE' by AQR Catalunya. Below are buttons for 'Més informació' and 'Doctorat'.

<https://web.ub.edu/web/estudis/w/masteruniversitari-m2804>

VIRTUAL CAMPUS – FACULTY OF MEDICINE, UB



The screenshot displays the Virtual Campus interface for Llovet Bayer Josep Maria. The user's profile is shown at the top with navigation options: Profile, Dashboard, Preferences, Grades, and Log out. The main area features a grid of course cards, each with a star icon and a circular profile picture. The cards include: 'Final Master Thesis', 'M1 - Molecular Biology in Human Diseases 2020-2021', 'M1 Molecular Biology in Human Diseases', 'M10 Principles of Clinical Medicine', 'M11 Responsible Research, Innovation and Entrepreneurship', 'M2 Animal Modeling in Translational Research', and a card with a DNA sequence image.