

Master of Science Program in Translational Bioclinical Sciences and Innovation (International Program)

1. Program Name

Master of Science Program in Translational Bioclinical Sciences and Innovation
(International Program)

2. Degree Awarded

Master of Science (Translational Bioclinical Sciences and Innovation)

3. Philosophy

The Master of Science Program in Translational Bioclinical Sciences and Innovation (International Program) was developed to produce highly qualified and competent scientists, researchers, and academic faculty specializing in translational bioclinical sciences and innovation. The program aims to equip graduates with the ability to identify and address nationally important research challenges in a field that faces a critical shortage of skilled professionals relative to the country's needs. Graduates are expected to serve as a vital part of the workforce, contributing to the nation's scientific advancement and sustainable development.

4. Program Education Objectives (PEOs)

The program aims to produce graduates with the following characteristics:

- 1) Possess internationally recognized knowledge and expertise in translational bioclinical sciences and innovation, with the capacity for continuous professional development to keep pace with advances in bioclinical sciences and medical technology.
- 2) Demonstrate the knowledge and competencies in translational bioclinical sciences and innovation necessary to address the national shortage of qualified clinical bioscience professionals, including university faculty members and researchers in both public and private research institutions.
- 3) Exhibit vision, integrity, and ethical responsibility, while demonstrating academic leadership at the international level.

5. Career Opportunities

Graduates of the program may pursue careers such as:

- 1) Faculty members or lecturers in higher education institutions.
- 2) Academics, researchers, or scientists in academic, research, or healthcare organizations.
- 3) Entrepreneurs or professionals in the health and wellness sector, in both public and private organizations.
- 4) Independent practitioners or self-employed professionals.

6. Program Learning Outcomes (PLOs)

Knowledge

PLO1 Explain the fundamental theories and principles of Translational Bioclinical Sciences and Innovation.

PLO2. Apply knowledge to research and professional practice.

PLO3 Disseminate research findings or innovations at the national and international levels.

Skills

PLO4 Plan and conduct research projects.

PLO5 Analyze and interpret research data.

PLO6 Communicate knowledge and research outcomes effectively.

Ethics

PLO7 Adhere to the principles of research ethics and professional conduct.

PLO8 Demonstrate honesty and integrity.

PLO9 Demonstrate responsibility and accountability for assigned tasks.

Character

PLO10 Work effectively and collaboratively with individuals at all levels.

PLO11 Analyze complex problems and make sound, evidence-based decisions to resolve them.

7. Curriculum Structure

The program requires a minimum of 36 credits for completion, as detailed below.

Plan 1

- Thesis Only

Thesis	36	credits
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- Coursework and Thesis

Core subject	5	credits
Compulsory subject	2	credits
Elective subject	2	credits
Thesis	27	credits

8. Study Plan (Credit distribution by study year)

Plan 1 (Thesis Only)			
<u>First Year</u>			
First Semester	Credits	Second Semester	Credits
CMB 803 Thesis	6	CMB 803 Thesis	6
Total	6	Total	6
<u>Second Year</u>			
First Semester	Credits	Second Semester	Credits
CMB 803 Thesis	12	CMB 803 Thesis	12
Total	12	Total	12

Plan 1 (Coursework and Thesis)			
<u>First Year</u>			
First Semester	Credits	Second Semester	Credits
CMB 600 Responsible Research and Ethics in Translational Bioclinical Sciences and Innovation	2	CMB 807 Thesis	12
CMB 601 Statistical Methods in Translational Bioclinical Sciences and Innovation	1		
CMB 602 Research Methodology in Translational Bioclinical Sciences and Innovation	1		
CMB 671 Seminar in Translational Bioclinical Sciences and Innovation	1		

Compulsory subject	2		
Elective subject	2		
Total	9	Total	12
Second Year			
First Semester	Credits	Second Semester	Credits
CMB 807 Thesis	9	CMB 807 Thesis	6
Total	9	Total	6

9. Course List

1) Core subject

Subject ID	Subject Name	Credits
CMB 600	Responsible Research and Ethics in Translational Bioclinical Sciences and Innovation	2 (2-0-6)
CMB 601	Statistical Methods in Translational Bioclinical Sciences and Innovation	1 (1-0-3)
CMB 602	Research Methodology in Translational Bioclinical Sciences and Innovation	1 (1-0-3)
CMB 671	Seminar in Translational Bioclinical Sciences and Innovation	1 (1-0-3)

2) Compulsory subject

Product Development and Innovation in Health Sciences Track

Subject ID	Subject Name	Credits
CMB 611	Current Concepts in Product Development	2 (2-0-6)
CMB 612	Current Concepts and Techniques in Innovation in Health Sciences	2 (2-0-6)
CMB 602	Entrepreneurship in Translational Bioclinical Sciences and Innovation	1 (1-0-3)

Product Translational Medicines Track

Subject ID	Subject Name	Credits
CMB 621	Current Concepts in Translational Medicines	2 (2-0-6)
CMB 622	Current Concepts in Molecular Translational Bioclinical Sciences and Innovation	2 (2-0-6)
CMB 623	Current Concept in Precision Medicine	1 (1-0-3)

3) Elective subject

Subject ID	Subject Name	Credits
CMB 614	Basic Biomedical Innovation and Technology	2 (2-0-6)
CMB 615	Technologies in Drug Research and Development	2 (2-0-6)
CMB 624	Current Topics in Cancer and Cancer Research	2 (1-2-5)

CMB 625	Techniques in Molecular Translational Bioclinical Sciences and Innovation	2 (1-2-5)
CMB 626	Current Concepts in Epidemiology	2 (2-0-6)
CMB 711	Special Topics in Product Development	2 (2-0-6)
CMB 712	Special Topics in Innovation in Health Sciences	2 (2-0-6)
CMB 713	Current Topics in Dermatological Drug Discovery and Development	2 (2-0-6)
CMB 714	Current Topics in Diagnostic Test and Vaccine Development	2 (2-0-6)
CMB 715	Current Topics in Functional Food and Nutraceuticals	2 (2-0-6)
CMB 721	Special Topics in Translational Medicines	2 (2-0-6)
CMB 722	Special Topics in Molecular Translational Bioclinical Sciences and Innovation	2 (2-0-6)
CMB 723	Clinical Pharmacokinetics	2 (2-0-6)
CMB 724	Special Topics in Microbiology and Immunology	2 (2-0-6)
CMB 731	Computer Application in Pharmacokinetics	2 (2-0-6)
CMB 732	Advanced Statistics in Translational Bioclinical Sciences and Innovation	2 (2-0-6)
CMB 733	Translational Bioclinical Sciences and Innovation Data Management	2 (2-0-6)
CMB 734	Research Protocol Design	2 (2-0-6)

4) Thesis

Plan 1 (Thesis Only)

Subject ID	Subject Name	Credits
CMB 803	Thesis	36

Plan 1 (Coursework and Thesis)

Subject ID	Subject Name	Credits
CMB 807	Thesis	27

10. Course Descriptions

CMB 600 Responsible Research and Ethics in Translational Bioclinical Sciences and Innovation 2 (2-0-6)

Introduction to responsible research; relevant information for initiating research; critical reading and analysis; guidelines for good practices, ethics and regulations in bioclinical sciences; responsible protocol writing; planning and setting up experiment/research; responsible peer review; good data management practice and quality standards; considerations for report and publication; ethical issues in publication; and presentation of research results.

CMB 601 Statistical Methods in Translational Bioclinical Sciences and Innovation 1 (1-0-3)

Principles and application of biostatistics to bioclinical research; types of variable and data; data presentation and summarization; population and sample; probability distribution; research and statistical hypotheses; estimation and hypothesis testing; parametric and non-parametric statistics; statistical test for reliability and diagnosis; estimation of sample size; and application of computer software for statistical analysis.

CMB 602 Research Methodology in Translational Bioclinical Sciences and Innovation 1 (1-0-3)

Basic knowledge on research design procedures including methodological approaches in various aspects of translational bioclinical sciences and innovation: steps of research planning; developing research questions/hypotheses; types of research designs; writing and funding a research proposal; reporting of scientific research; presentation of scientific research; critical evaluation of published research; quality standards in biomedical research; and tests in clinical research (diagnostic test evaluation, validity and cut-point selection, and prognostic test and predictive markers).

CMB 671 Seminar in Translational Bioclinical Sciences and Innovation 1 (1-0-3)

Guidelines for presentation of translational bioclinical sciences and innovation; and formal presentation of current research topics in bioclinical sciences by students under supervision of the course committee.

CMB 611 Current Concepts in Product Development 2 (2-0-6)

Processes of product (medicines, vaccines, medical devices, diagnostics, and healthcare products) discovery and development: application of 'omics' technologies (genomics, transcriptomics, proteomics and metabonomics) and systems biology/pharmacology for target identification; preclinical studies; chemistry manufacturing and control (CMC; clinical development (phases I-IV); and regulatory requirements.

CMB 612 Current Concepts and Techniques in Innovation in Health Sciences 2 (2-0-6)

Existing health care technologies; conceptual framework model for the development, adoption and diffusion of innovations in health care; barriers and promoters of innovations, in particular meta-stability, costs, innovative ability and leadership; application of the framework to medicines, vaccines, diagnostics, medical devices, and healthcare products; and strategic innovation management in healthcare.

CMB 613 Entrepreneurship in Translational Bioclinical Sciences and Innovation 1 (1-0-3)

The process of designing, launching and running a new business relating to innovations in health sciences (medicines, vaccines, diagnostics, medical devices, and healthcare products) by combining management, accounting, finance, and marketing principles; financing resources; and analysis and management of risks and benefits involved in starting and managing a business.

CMB 621 Current Concepts in Translational Medicines

2 (2-0-6)

Principles and composition of translational medicine (translational science); clinical practice applications of the basic science aspects of the biomedical sciences; interdisciplinary and integrative approaches in biomedical sciences supported by three main pillars—bench, bedside, and community; resources, integration of expertise, and techniques within these pillars to promote enhancements in prevention, diagnosis, therapies, and healthcare.

CMB 622 Current Concepts in Molecular Translational Bioclinical Sciences and Innovation 2 (2-0-6)

Basic and current topics of cell and molecular biology; replication and transcription and dynamics of the genome; regulation of the gene, protein biosynthesis and targeting, cellular homeostasis and signal transduction pathway in health and diseases, cellular compartments and molecular machineries, cell motility and the cytoskeleton, regulation of the cell growth and development, organization of cell into tissue function.

CMB 623 Current Concept in Precision Medicine

1 (1-0-3)

Principles and approaches applied for effective treatment, prevention, diagnosis, and improvement of quality of life based on genetic, environmental, social, and lifestyle factors; main tools (big data, artificial intelligence, the various omics (genomics, epigenomics, proteomics, transcriptomics, metabolomics and microbiomics), pharmaco-omics, environmental and social factors) and the integration of these with preventive and population medicine; identification various biomarkers (clinical and omics based), laboratory and radiological investigations.

CMB 614 Basic Biomedical Innovation and Technology

2 (2-0-6)

Integrated innovations and future trends in biomedical technology and healthcare processes; regulatory and technical challenges throughout the design phases of biomedical technology products; insight into product design and development; persuasive health technology to support healthcare promotion; and the path to commercialization, including key considerations in building healthcare and life sciences ventures.

CMB 615 Technologies in Drug Research and Development

2 (2-0-6)

Current technologies applied to research in drug discovery and development: combinatorial chemistry; protein X-ray crystallography; recombinant and expression systems; strategies and methods in monitoring and targeting protein-protein interactions; high-throughput screening; coupled luminescent methods; and antisense and RNAi technologies.

CMB 624 Current Topics in Cancer and Cancer Research

2 (1-2-5)

Techniques for investigation of cancer development and progression; potential targets for anticancer drugs; medicinal plants and their constituents; cells and tissue culture, cytotoxicity test, mechanism of action (antioxidant, metastasis, angiogenesis, and apoptosis); animal models for investigation of cancer development, progression and anticancer activity (using conventional measurement and imaging system); molecular techniques for investigation of cancer development and progression (genomics, proteomics, and metabolomics).

CMB 625 Techniques in Molecular Translational Bioclinical Sciences and Innovation 2 (1-2-5)

Basic techniques in molecular biology and immunology: genetic material isolation, purification and diagnosis, genetic engineering and recombinant DNA technology in medical researches; protein isolation, identification and characterization; basic cell biology techniques and characterization using molecular techniques; and immunofluorescence technology in imaging, ELISA and diagnostic applications.

CMB 626 Current Concepts in Epidemiology

2 (2-0-6)

Definition and scope of epidemiology; the cause and risk factors of disease; nature of disease; investigation of the etiology of disease; measuring the frequency of disease; prevention and control of disease; descriptive epidemiology; analytical epidemiology; and application of statistics in epidemiology.

CMB 711 Special Topics in Product Development

2 (2-0-6)

Seminars, presentation and discussion, or self-study, or paper writing on current topics in various types of innovative products (medicines, vaccines, diagnostics, and healthcare products) health sciences.

CMB 712 Special Topics in Innovation in Health sciences

2 (2-0-6)

Seminars, presentation and discussion, or self-study, or paper writing on current topics in various types of innovations in health sciences.

CMB 713 Current Topics in Dermatological Drug Discovery and Development 2 (2-0-6)

Recent research advances in Dermatological Drug Discovery and Development; processes of dermatological drug discovery and development: drug target identification; pre-clinical studies; chemistry manufacturing and control (CMC); clinical drug development (phases I-IV); roles of pharmacokinetics, toxicokinetic and pharmacogenomics; and regulatory requirements.

CMB 714 Current Topics in Diagnostic Test and Vaccine Development 2 (2-0-6)

Recent research advances in diagnostic test development: development of key components, such as antigens and antibodies; development and optimization of a prototype assay; laboratory validation and clinical validation; field studies for full-scale, prospective validation; standard operating procedures for manufacturing and quality assurance; and processes of vaccine development: exploratory stage; pre-clinical stage; clinical development; regulatory review and approval; manufacturing; and quality control for development of new vaccines.

CMB 715 Current Topics in Functional Food and Nutraceuticals 2 (2-0-6)

Classes of functional foods and nutraceuticals, identification of specific compounds that have health promoting properties, structure-function/dynamic-mechanisms relationship with body systems leading to the observed benefits, food bioactives intended to be consumed as supplements in the form of pharmaceutical formulation, relationship between diet and health, issues and challenges in the development, evidence testing, marketing and changing regulations controlling functional foods and nutraceuticals.

CMB 721 Special Topics in Translational Medicines 2 (2-0-6)

Seminars, presentation and discussion, or self-study, or paper writing on current topics in translational sciences for medicine, vaccines, diagnostics, and healthcare products.

CMB 722 Special Topics in Molecular Translational Bioclinical Sciences and Innovation 2 (2-0-6)

Recent research advances in Translational Bioclinical Sciences and Innovation: whole genome DNA sequencing; genomics; transcriptomics; proteomics, computational molecular biology; functional genomics; molecular biology in infectious and non-infectious diseases; genes and diseases; gene therapy; and DNA vaccine.

CMB 723 Clinical Pharmacokinetics 2 (2-0-6)

Clinical applications of pharmacokinetics for dose optimization in patients following a single or multiple dose administration (oral and intravenous injection/infusion); therapeutic drug monitoring (TDM); linear and non-linear pharmacokinetics; pharmacokinetic models; pharmacokinetics in renal failure and dose adjustment; and pharmacokinetic-pharmacodynamic models.

CMB 724 Special Topics in Microbiology and Immunology 2 (2-0-6)

Seminars, presentations and discussion, or self-study, or paper writing on current topics in microbiology and immunology as assigned by the course committee.

CMB 731 Computer Application in Pharmacokinetics 2 (1-2-5)

Lectures and practical sessions on pharmacokinetic data analysis using computer software: pharmacokinetic models and concepts; analysis steps; pharmacokinetic modeling (plasma and/or urine concentration data) ; pharmacokinetic- pharmacodynamic modeling; and non- linear pharmacokinetics.

CMB 732 Advanced Statistics in Translational Bioclinical Sciences and Innovation 2 (2-0-6)

Analysis of contingency tables; logistic regression analysis; survival analysis; Cox regression analysis; parametric model: Exponential, Gamma, and Weibull distributions; meta- analysis for dichotomous or continuous data; and heterogeneity and publication bias in meta-analysis.

CMB 733 Translational Bioclinical Sciences and Innovation Data Management 2 (2-0-6)

Central role of data management in Translational Bioclinical Sciences and Innovation research; composition of data management; data management processes; data coding; standard operating procedure (SOP); and quality standards.

CMB 734 Research Protocol Design 2 (2-0-6)

The components of research protocol development and the issues that need to be addressed: background and introduction; review of literature; research questions; hypotheses; and study methodology (description of study design, study site, study sample, sample size, sampling techniques, instruments proposed to be used, procedure to be followed, proposed analyses, ethical issues, project timeline, budget and logistics, and dissemination/ publications).

CMB 803 Thesis 36 credits

Development of bioclinical sciences research proposal related to student's thesis; conduct of research to generate new knowledge; writing up the thesis; preparation of manuscripts and publication; research ethics; and publishing ethics.

CMB 807 Thesis

27 credits

Development of bioclinical sciences research proposal related to student's thesis; conduct of research to generate new knowledge; writing up the thesis; preparation of manuscripts and publication; research ethics; and publishing ethics.