MASTER IN INDUSTRIAL TECHNOLOGY

Main Language of Instruction:
French ☑ English ☑ Arabic ○

Campus Where The Program Is Offered: CST

OBJECTIVES

- Create synergy between the local industry and the University.
- Directly address the needs and requirements of the local and regional industry in various fields: cosmetics, pharmaceuticals, paint, detergent, paper, food, chemical, fertilizers, ceramics, glass, water, polymers, textiles, waste valorization, etc.
- Develop the necessary skills to:
  - Improve and optimize production processes.
  - Quality management.
  - Production and supply chain management.
  - Research, development, and innovation.
- Prepare students to become future industrial entrepreneurs

PROGRAM LEARNING OUTCOMES (COMPETENCIES)

- Manage industrial companies
- Lead various units within the industrial function
- Develop industrial strategies
- Design innovative and industrialize products
- Establish or audit quality management systems
- Create one›s own business

ADMISSION REQUIREMENTS

Who can apply?
- Students holding a Bachelor in Life and Earth Sciences - Biochemistry, Chemistry, Nutrition, Physics, any engineering degree, Pharmacy, or any other relevant degree after a thorough review of the application.
- Students holding a first-year master›s degree in science from outside USJ and deemed equivalent by the USJ Equivalence Commission.
- Admission is subject to the review of the application and an interview with the candidate.

COURSES/CREDITS GRANTED BY EQUIVALENCE

Case by case

PROGRAM REQUIREMENTS

Required courses (120 credits):
- Fundamentals of Process Engineering - 2 credits
- Foundations for Quality Approach - 2 credits
- Communication - 4 credits
- Law and Legislation - 2 credits
- Packaging and Conditioning - 2 credits
- Entrepreneurship - 6 credits
- Industrial Process Engineering I - 4 credits

- Industrial Process Engineering II - 4 credits
- Industrial Computing - 2 credits
- Integrated Management System - 6 credits
- Fields of Industrial Chemistry I - 5 credits
- Fields of Industrial Chemistry II - 6 credits
- Manufacturing Operational Management - 8 credits
- Organizational and Strategic Management - 7 credits
- Experimental Design - 2 credits
- Professional Development: Bridging to Professional Life - 4 credits
- Fermentation Processes - 4 credits
- Project Management - 4 credits
- End-of-Study Project - 30 credits
- Resource Efficiency and Cleaner Production Industry - 2 credits
- Starting a Business: Strategy and Implementation - 5 credits
- Thermodynamics of Solutions - 3 credits
- Data Processing and Analysis - 6 credits

SUGGESTED STUDY PLAN

Semester 1

Code	Course Name	Credits
048BFCCM1	Fundamentals of Process Engineering	2
048BDQTM1	Foundations for Quality Approach	2
048COMTM1	Communication	4
048DRLTM1	Law and Legislation	2
048GP1CM1	Industrial Process Engineering I	4
048IICPM1	Industrial Computing	2
048DC1CM1	Fields of Industrial Chemistry I	5
048TSCCM1	Thermodynamics of Solutions	3
048TADTM1	Data Processing and Analysis	6
	Total	**30**
048CARCM*	Communication in Arabic	2

* a refresher course for students who join the master›s program midway through.

Semester 2

Code	Course Name	Credits
048EMCCM2	Packaging and Conditioning	2
048ETPTM2	Entrepreneurship	6
048DC2CM2	Fields of Industrial Chemistry II	6
048PEXCM2	Experimental Design	2
048PVPTM2	Professional Development: Bridging to Professional Life	4
048FERCM2	Fermentation Processes	4
048PRMTM2	Project Management	4
048REITM2	Resource Efficiency and Cleaner Production Industry	2
	Total	**30**

Semester 3

Code	Course Name	Credits
048GP2CM3	Industrial Process Engineering II	4
048IMSCM3	Integrated Management System	6
048MOMCM3	Manufacturing Operational Management	8
048OSMCM3	Organizational and Strategic Management	7
048SABCM3	Starting a Business: Strategy and Implementation	5
	Total	**30**

Semester 4

Code	Course Name	Credits
048PFETM4	End-of-Study Project	30
	Total	**30**

COURSE DESCRIPTION

048BFCCM1 Fundamentals of Process Engineering 2 Cr.

This course aims to introduce students to the fundamentals of process engineering, enable them to understand and apply the concepts of material and energy balances, and explore the principles of heat transfer and thermodynamics applied to heat exchangers in industrial processes.

048BDQTM1 Foundations for Quality Approach 2 Cr.

The primary objective of this course is to introduce the new requirements of ISO 9001:2015 - Quality Management System (QMS). To apply these requirements through the process approach and the use of performance measurement tools and continuous improvement as a basis for effective business management.

048COMTM1 Communication 4 Cr.

Oral Communication

Among all modes of interpersonal exchange, communication stands out as the most frequent activity. It thus forms the foundation for effective teamwork, group collaboration, or within a company.

Knowing how to communicate means:

a) Expressing one›s ideas
b) Listening and asking questions
c) Maintaining relational exchange
d) Providing feedback

Written Communication

The primary objective of this section is to understand the importance of effective written communication in enhancing the organization›s image. This includes an introduction to various situations of written communication within the organization, such as key internal communication messages (memos, reports, summaries, letters, etc.).

The second objective of this course is to equip students with all the necessary techniques for drafting documents essential in the professional world. From resumes to cover letters, including job application emails and unsolicited applications, students will gain a clear idea of the appropriate vocabulary to use depending on the situation they encounter.

Negotiation

The final part of this course allows students to acquire essential negotiation skills, exploring effective communication strategies, conflict resolution, and agreement conclusion in various professional contexts. Students learn the art and science of negotiation, mastering techniques to navigate complex situations, build relationships, and achieve mutually beneficial outcomes in a dynamic global market.

048DRLTM1 Law and Legislation 2 Cr.

The first part of this course aims to define intellectual property (IP), which encompasses all exclusive rights granted for intellectual creations. It is a legal right to an idea, invention, or creation in industrial, scientific, literary, and artistic domains. The objective is to present the interests and advantages of such a concept before introducing the procedures for registering inventions or products.
The second part of this law course aims to provide students with a set of rules governing interactions with citizens. It covers consumer law, business law, social law, labor law, and environmental law. These rules are codified, and students must be able to identify the texts related to each domain to navigate them. It includes:

- International environmental law and environmental law in Lebanon
- Labor law
- Social security law
- Commercial law
- Company law, industrial law

048GP1CM1 Industrial Process Engineering I 4 Cr.

This course focuses on conservation processes that reduce water activity through its elimination. It begins with an introduction to the water-material relationship, determination of water activity and degree of freedom, and then moves on to water elimination methods: boiling, vacuum evaporation, heat exchangers and evaporators with single, double, and triple effects, entrainment, atomization, multi-stage drying, and freeze-drying. The course covers theoretical aspects, limiting factors, establishment of material and energy balances, control of input and output parameters, evaporation capacity, equipment, energy costs, and optimizations.

048IICPM1 Industrial Computing 2 Cr.

The objective of this course on LabVIEW (Laboratory Virtual Instrument Engineering Workbench) is to provide students with the necessary skills and knowledge to effectively utilize LabVIEW as a platform for designing measurement and control systems. This includes understanding the graphical development environment provided by National Instruments, learning how to acquire data through measurement, control instruments, and implement industrial automation using LabVIEW. The course would cover topics such as programming with LabVIEW, data acquisition techniques, instrument control, industrial automation concepts, and practical applications of LabVIEW in various fields.

048DC1CM1 Fields of Industrial Chemistry I 5 Cr.

This course aims to introduce the fields of basic industrial, organic, and inorganic chemistry. It also covers certain para-chemical industries. The instruction continues with methods for treating industrial pollution, including solid waste, liquid effluents, and gaseous emissions. Additionally, this course enables students to gather all relevant information about the pharmaceutical industry into a practical and targeted vision, thereby allowing them to integrate into various departments within this type of industry.

048TSCCM1 Thermodynamics of Solutions 3 Cr.

This course is offered to students enrolled in the Master in Industrial Technology. It is taught in the first semester of the Master›s program. Prerequisites for this course include the courses Chemistry of Solutions and Thermodynamics. It assumes a solid understanding of equilibrium, evolution, and phase changes.
The course provides students with the tools needed to recognize and establish the laws governing the behavior of mixtures at a given temperature and pressure, as well as during phase changes. They also analyze the behavior of real mixtures and understand how deviations from ideality can be interpreted using the parameter of interaction between molecules.
For the first time, students will explore the cases of stable homogeneous mixtures and non-homogeneous mixtures governed by metastability or instability, allowing the observation of demixing regions. They will be able to establish, plot, and interpret the behavior of all these mixtures.
The learning outcomes of this course will serve as a basis for understanding the behavior of mixtures in reactors for other courses of the curriculum.

048TADTM1 Data Processing and Analysis 6 Cr.

The course Data Processing and Analysis is structured around three main axes.
The first axis, «Metrology,» aims to raise students› awareness of metrology, the science that focuses on measurements, by providing them with the necessary information for the management and control of measurement processes and equipment.
The second axis, «Statistics,» aims to sensitize students to the importance of statistics in data analysis, study planning, and understanding scientific literature.
The third axis, «Multivariate Analysis,» aims to equip students with the skills needed to use statistical tools to extract information and generate new knowledge from complex databases obtained through analytical methods or other means. This involves simultaneously analyzing a set of explanatory variables and constructing multivariate models that describe, compare, classify, and predict the characteristics of individual samples. Multivariate analysis is widely used in various fields such as science, engineering, pharmacology, medicine, economics, and sociology.

048CARCM1 Communication in Arabic 2 Cr.

Oral Communication
Among all modes of interpersonal exchange, communication stands out as the most frequent activity. It thus forms the foundation for effective teamwork, group collaboration, or within a company.
Knowing how to communicate means:

a) Expressing one's ideas
b) Listening and asking questions
c) Maintaining relational exchange
d) Providing feedback

048EMCCM2 Packaging and Conditioning 2 Cr.

This course aims to equip students with the essential knowledge and skills to address industrial challenges related to packaging and conditioning. It offers an in-depth exploration of materials, technologies, and manufacturing processes such as injection molding, extrusion, etc. The course also covers primary, secondary, and tertiary packaging processes, including filling, sealing, and labeling technologies. The latest innovations in the packaging world will also be presented. Students will have the opportunity to deepen their theoretical and practical skills through case studies and projects.

048ETPTM2 Entrepreneurship 4 Cr.

This course introduces students to entrepreneurship and provides them with key tools necessary for any entrepreneur to succeed, including concepts in accounting and finance. The first part of the course describes the role of entrepreneurs, analyzes wealth and/or job creation through the establishment or acquisition of a business; explains the various forms of entrepreneurship; discusses the concepts of creativity, innovation, and market benefit, and advocates for the idea of taking risks for the entrepreneur.
The second part provides an overview of the conceptual and regulatory framework underlying financial accounting, as well as an understanding of the content and structure of financial statements in order to be able to read and understand what financial statements can and cannot reveal about a commercial or industrial institution. It also addresses the different types of financial accounting information encountered in managerial life, providing a basic guide to transitioning from accounting to covering all accounting concepts and important managerial reporting tools that support appropriate managerial decision-making.
The final part aims to familiarize students with finance concepts and explain the basic elements of financial markets. Examples will help apply in practice the theories discussed.

048DC2CM2 Fields of Industrial Chemistry II 6 Cr.

Continuation of the course «Fields of Industrial Chemistry I.»
By the end of this course, students will be able to define a cosmetic/detergent product and select the various ingredients for a cosmetic/detergent product, interpret a cosmetic/detergent product label, study and compare different types of formulations. This course enables students to identify the appropriate raw materials for a product according to customer requirements or the specification sheet. The course also covers the dye and paint industry,

including their processes and production units. Students will also be able to define, create, and describe formulas for detergents, cosmetics, and paints. Analyses and formulations are presented in the form of practical work.
Furthermore, it provides students with advanced knowledge about the physicochemical behavior of polymer materials, correlating this with their spatial representation, assembly, and morphology to better relate these to their industrial applications. The glass transition, a key concept in the rheological behavior of amorphous or semi-crystalline polymers, will be explained and illustrated in polymers. The elastic, plastic, and viscoelastic rheological behavior of polymers will also be addressed to differentiate the behavior of polymer material classes. The notion of flow and softening, supported by examples, will help students better understand the world of plastics with the wide range of additives added to formulations. Additionally, students will be able to describe certain food industries and define and circumvent cross-cutting occupational risks.

048PECCM2 Experimental Design 2 Cr.

This course covers the study of the methodology of experimental design, which are robust and validated measurement methods through multiple linear regressions, analysis of variance (ANOVA), etc. Several designs are studied: full factorial designs at two levels, designs for second-degree models such as full factorial designs at three levels, central composite designs with stars, and face-centered composite designs, etc. The study strategy allows for organizing experiments to minimize study costs. The treatment of results enables the detection of significant effects and interactions between operational parameters. It also facilitates empirical modeling, obtaining response surfaces, and searching for an optimum. This methodology is very useful in the food, biological, and chemical industries. Experimental designs for formulation are also covered: unconstrained mixture designs (Type I), mixture designs with constraints on the lower limits (Type II), and mixture designs with constraints on both lower and upper limits with deformation of the parameter variation domain (Type III). The software StatGraphics is used for conducting experimental designs.

048PVPTM2 Professional Development: Bridging to Professional Life 4 Cr.

This course is divided into two parts:
Industrial visits aim to demonstrate the various stages of a specific industrial production. They provide insight into the operation of the production unit, production management, controls conducted during different stages, and the tests necessary for the conformity of the final product.
This course also covers the principles of developing analytical methods at lab level.

048FERCM2 Fermentation Processes 4 Cr.

This course explains the fundamentals of fermentation sciences, as well as the processes of their implementation. Numerous industrial applications are explored, including biological control, agri-food, pharmaceutical sciences, and waste treatment. Practical work accompanies the students› assimilation of the material.

048PRMTM2 Project Management 4 Cr.

This course is designed to equip students with the skills and knowledge necessary to effectively plan, execute, and manage projects across various disciplines. Through a combination of theoretical concepts and practical applications, students will learn how to navigate the complexities of project management, from start to finish.

048REITM2 Research Efficiency and Cleaner Production Industry 2 Cr.

The course aims to emphasize the importance of Resource Efficiency and Cleaner Production (RECP) in the industry, both environmentally and economically. It also provides students with key tools for sustainable production, enabling industrial businesses to use resources more efficiently, reduce their environmental footprint, and enhance their competitiveness.

048GP2CM3 Industrial Process Engineering II 4 Cr.

This course aims to study the flow around a particle during settling (or centrifugation) and to determine the flow regime to maximize the production rate. It also aims to determine pressure losses through membranes, establish material balances, and maximize the productivity of membrane processes such as filtration, ultrafiltration, and reverse osmosis, particularly in the food and chemical industries.

048IMSCM3 Integrated Management System 6 Cr.

The primary objective of this course is to introduce the requirements of the ISO 22000:2018 standard related to food safety, ISO 14001:2015 related to environmental management, and ISO 45001:2018 related to health and safety of personnel. This course also aims to clarify the integration of these systems within the same organization.

048MOMCM3 Manufacturing Operational Management 8 Cr.

This professional course, which includes 3 complementary courses, prepares students for the concepts of:

- Production management
- Supply chain management
- Accounting and finance for industries
- Industrial microbiology

The objective of the first part (production management) is to familiarize students with the design of a modern production unit through the organization of flows and production layouts, while following production performance indicators such as Overall Equipment Effectiveness (OEE) with the ultimate goal of increasing production chain efficiency. The course also covers the «Lean Manufacturing» production technique, stock management concepts, and various replenishment methods.

The second part (supply chain) aims to define the supply chain present in all types of industries (production or service), prioritize when forming the chain, and understand the different performance parameters that facilitate supply chain management to improve outcomes. It helps understand the various factors affecting consumer demand and their effects on the chain. It describes Sales and Operations Planning (S&OP) meetings and their impact on sales and operations.

The third part (accounting and finance for industries) aims to introduce students to preparing a projected income statement based on a business plan for a new business venture. This part of the course begins with a review of the balance sheet and income statement accounts. It is then divided into four distinct sections:

1. First Section: Students must be able to prepare the investment plan, including all the fixed assets necessary for the operation of the business activity.
2. Second Section: To calculate the project›s profitability, students must define the different types of company expenses (direct and indirect, variable or fixed) and budget an amount for each of these expenses.
3. Third Section: Students must prepare a projected income statement for three years based on the strategy developed in the business plan and the projected expenses. These forecasts will then be used to generate the monthly and annual cash flow statements.
4. Fourth Section: Students must calculate the break-even point to determine the minimum activity level that allows the company to cover all its expenses. Finally, students must analyze and assess profitability by calculating financial ratios and discussing the results with potential investors.

Additionally, a fourth part is added, which pertains to industrial microbiology. Its objective is to provide students with an in-depth understanding of the principles of microbiology as applied to the food industry. By the end of the course, students will be able to:

1. Understand the fundamental concepts of bacteriology, including morphology, nutrition, and bacterial growth.
2. Classify the main bacterial groups and identify foodborne infections.
3. Recognize bacteria contaminating food products and implement effective preventive measures.
4. Analyze the physicochemical and industrial factors influencing bacterial development.
5. Use indicator microorganisms to assess food safety and apply appropriate microbiological criteria and sampling plans.
6. Identify spoilage bacteria and evaluate their impact on the quality of different food matrices.
7. Apply their knowledge in practice.

048OSMCM3 Organizational and Strategic Management 7 Cr.

This course enables students to develop their abilities to conduct a comprehensive analysis of the strategic environment and build a relevant assessment of a company›s competitive situation. This, in turn, will empower them to make informed and qualified decisions by proposing a clear, simple, and adapted strategy, while outlining the operational and financial implications of that strategy.

Case studies on business strategies will help students develop the capacity to seek appropriate information and use conceptual tools appropriately.

- The primary goal of the Organizational Management part is to introduce students to management in general, the functioning of organizations, and businesses. This begins with an understanding of the managers› operating environment and the foundations of organizational governance.
- The goal of the Quality Management part is to understand how to achieve widespread involvement throughout the entire company to achieve perfect quality while minimizing waste and dysfunction, and continuously improving output elements or performance.
- Following the company›s positioning in the market, the implementation of a marketing strategy takes place. The main purpose of Marketing is to achieve customer satisfaction, requiring the identification of needs and determining profitable targets. The objective of the marketing section is to introduce students to marketing concepts and approaches. It allows students to analyze a market, develop a marketing strategy, and gain a theoretical and practical understanding of various components of the marketing mix. It also helps them understand consumer behavior and purchasing processes in both B2B and B2C contexts.

048SABCM3 Starting a Business: Strategy and Implementation 5 Cr.

This course is designed to familiarize students with the entrepreneurial landscape by guiding them through the process of transforming an idea into a viable company:

- Exploring the Value Chain and navigating the initial stages of business setup, with a focus on complying with Lebanese laws
- Conducting strategic analyses, obtaining necessary permissions, establishing production platforms including design, distribution, and machinery, and addressing packaging and labeling considerations
- Performing internal and external diagnostics, exploring strategic options, and organizing group work for task delegation
- Understanding the registration process for products and companies, creating flowcharts, and employing tools like SWOT and SMART analysis to develop strategic options and implementation plans
- Conducting comprehensive business analytics and financial evaluations to assess feasibility
- Examining all facets of launching an innovative business and leveraging knowledge acquired throughout the Master's program to drive project success

048PFETM4 End-of-Study Project 30 Cr.

The objective of the end-of-study project is to consolidate and validate the skills acquired during the training and requires adequate preparation. This internship can take place in an industry-type company, a consultancy firm, or a research laboratory. It typically lasts for 5 months. As part of their end-of-study project, students must bring significant added value to the host company. This can be achieved by solving a specific industrial problem, effectively implementing a quality management system, contributing to research and development, or any other action demonstrating a concrete and tangible contribution to the improvement or progress of the company.
This project culminates in the writing of a report and an oral defense in French or English. The defense is conducted before a mixed jury composed of members of the teaching team and external members, including the company supervisor in the case of an internship.