Faculty of Agricultural and Food Sciences (FAFS)

Graduate

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Caroline Rajeh	Research Support Officer

Coordinator of Graduate Programs

Imad Toufeili	Coordinator of Graduate Studies Program

Historical Background

The MS graduate program at FAFS was initiated in 1956. The program aims to offer specialized training in a variety of fields in food and agriculture and to prepare students for further studies in Europe and North America. The first MS degree in horticulture was granted in 1958 and the first MS in food technology in 1959. Since then, FAFS has continued to adapt its graduate programs to meet the needs of an evolving regional demand. An MS in nutrition was introduced in 1963, and the first degree was granted in 1965. An MS in ecosystem management, a major of the interfaculty MS in environmental sciences, has been offered since 1997. FAFS currently offers MS specialization in animal science, poultry science, agricultural economics, irrigation, plant protection, plant science, nutrition, public health nutrition, food technology, food safety, ecosystem management, rural community development, and food security. FAFS also offers a non-degree food security graduate diploma - online.

Mission

The mission of FAFS is to foster the sustainable enhancement of the health and well-being of people and nature throughout Lebanon and the region. To achieve its goals, the faculty uses basic and applied research as well as student-centered learning to prepare leaders and agents of change to address issues of local and global relevance at the nexus of human nutrition, food security, and the sustainable use of resources.

Vision

FAFS is a reference academic center specialized in issues of agriculture, food, nutrition, and the environment for the enhancement of livelihoods, human health, and well-being, as related to the Middle East.

Graduate Study

The faculty offers the MS degree, with or without a thesis, in the following majors which include animal science, poultry science, agricultural economics, irrigation, plant protection, plant science, nutrition, food safety, and food technology. The faculty offers an MS in environmental sciences (MSES), major: ecosystem management (ECOM) as part of an Interfaculty Graduate Environmental Sciences Program (IGESP) and an Interfaculty Graduate Nutrition Program (GNP). The faculty also offers two interdepartmental graduate programs: an MS in rural community development (RCOD) and an MS in food security. MS in public health nutrition is a new graduate program offered jointly by the Faculty of Agricultural and Food Sciences (FAFS) and the Faculty of Health Sciences (FHS).

Students following a thesis program are required to take a minimum of 21 graduate-level course credits plus a thesis (equivalent to 9 credits). Exceptionally, students pursuing an MS in ecosystem management or food security are required to take a minimum of 24 graduate-level course credits plus a thesis (equivalent to 6 credits); students pursuing an MS in rural community development are required to take a minimum of 27 graduate-level course credits plus a thesis (equivalent to 6 credits); students pursuing the MS in public health nutrition are required to take a minimum of 34 graduate-level course credits plus a thesis.

The thesis program may include a maximum of three tutorial course credits. Core regular courses should constitute a minimum of 12 credits excluding seminars and tutorials and a minimum of 15 credits in the case of ecosystem management, with graduate elective courses to be determined under the supervision of an adviser. Students following a non-thesis program are required to take a minimum of 27 graduate-level course credits. The program should include a minimum of 3 credits and a maximum of 6 tutorial credits with at least 12 credits being from core courses in the major. In the case of ecosystem management, a minimum of 27 graduate-level course credits are required in addition to a 3-credit project.

By the end of the first year, students would have had ample time to know the various specialties within their program and to become familiar with the professors and their concentrations. In addition, students would have taken the needed foundational courses necessary to make an informed decision about their research focus. Rules and regulations for graduate programs are given in the General University Academic Information section of this catalogue, and the Office of Admissions section include details about the Environmental Sciences Program. Information is also available in the FAFS Graduate Study Manual. Changes made after the publication of this catalogue will be made available through academic advisers. FAFS also offers a non-degree food security graduate diploma - online. Details of this program are provided below.

Graduate Research Requirements

Research Plan

- Graduate students are expected to present their research plan and to have a thesis committee meeting by the end of the first year of joining FAFS.
- Thesis students will have to register for FAFS 300 (0 cr.) in the second term. This course will guide them in their research proposal write-up and plan.
- The proposal defense will allow students (by the start of the third term at the latest):
  - to have a clear plan for their research journey.
  - to vet the research objectives and methodology with their committee members.
  - to take the Proposal Review exam. The grade of a successful exam will be a Pass (P/F).

Thesis Committee Meeting (before the Thesis Defense)

A thesis committee meeting is to be held one term before graduation. This meeting will outline the up-to-date progress and challenges and the expected outcome of the thesis. This meeting can be combined with the comprehensive exam.

Thesis/Non-Thesis Data Handling

It is expected that the students deliver a data notebook, with an electronic version of the thesis data, to the major professor before graduation. A data notebook is to be examined by the major professor for proper research conduct. The above applies to the project/tutorial data of non-thesis students.

Thesis Format/Manuscript Submission

Each thesis-track graduate student is expected to prepare a manuscript/paper for submission to a peer-reviewed journal. Accordingly, students are expected to prepare their thesis in a manuscript format.

With regards to its length, the whole thesis, excluding references, appendices, and all other supportive material for the thesis will include:

- A shorter literature review compared to the regular, non-manuscript format, thesis.
- A typical manuscript length for the materials and methods, and results and discussion sections.
- A formatting change would be needed to make the thesis/manuscript compatible with the relevant journal formatting requirements.
- By the time of graduation, students need to ensure that the manuscript is at least submitted to a peer-reviewed journal of relevance to the research topic/field of studies.

PhD Program

A PhD program in biomedical sciences/nutrition is offered in collaboration with the Faculty of Medicine. For more information, see Faculty of Medicine and Medical Center (FM/AUBMC) sections.

Food Security Program

Director	Chalak, Ali
Food Security Program Executive Committee	Chalak, Ali (Chair); Habib, Rima; Hamadeh, Shady; Iskandar, Christelle; Jaafar, Hadi; Nasreddine, Lara; Tell, Tariq; Zurayk, Rami

Mission

The Food Security Program aims to promote food security through education, research, community action, and policy-oriented professional practice. The program pursues a holistic approach to the many aspects of food security, including nutritional health, agricultural production, economic development, environmental sustainability, and socio-cultural considerations. The program educates a new generation of leaders in the Middle East and North Africa and throughout the Arab world, preparing graduates to address the vital issue of food security in an interdisciplinary and hands-on fashion. Through its Food Security Program, the Faculty of Agricultural and Food Sciences offers a master of science in food security as well as a non-degree food security graduate diploma - online.

Graduate Programs

The Faculty of Agricultural and Food Sciences offers two graduate-level programs of study through the Food Security Program, leading to an MS in food security or the food security graduate diploma - online. Both programs address the multiple dimensions of food security by drawing on key disciplines including agriculture, nutrition, and development economics.

MS in Food Security

Requirements

The MS in food security requires the completion of a total of 30 credits, including six required courses. Candidates for the MS in food security have the option of selecting a thesis or non-thesis program of study. Thesis students must complete 15 credits of required core courses, 9 credits from approved elective courses (at least 6 credits within FAFS), and 6 credits of thesis. Non-thesis students must complete 15 credits of required core courses, 12 credits from approved elective courses (at least 6 credits within FAFS), and 3 credits of project. In addition, all students must pass a comprehensive examination.

Students may opt to earn further specialization in one of the following three areas: rural development; economics and policies; or food production and consumption. For thesis students, specialization is earned through the completion of two FAFS electives in the desired focus area of the thesis. For non-thesis students, specialization is earned through the completion of three FAFS electives in the desired focus area of the project.

Required Courses		Credits
FSEC 300	Food Security: Challenges and Contemporary Debate	3
FSEC 305	Agriculture: Technology, Supply Chains, Sustainability	3
FSEC 310	Nutrition Security: Assessment and Intervention Strategies	3
FSEC 315	Food Policies and their Planning Process	3
FSEC 320	Graduate Seminar in Food Security	0
AGSC 301/NFSC 301	Statistical Methods in Agriculture/Statistical Methods for Nutrition and Food Sciences	3
FSEC 396	Comprehensive Exam	0
FSEC 397 or 399	Project or MS Thesis	3 or 6

The following list reflects suggested elective courses that have been offered in recent terms and is illustrative only. An updated list of suggested electives is provided for enrolled students on a term-by-term basis. The listing and availability of elective courses is subject to change based on course offerings.

Approved Electives:		Credits
Rural Development Specialization		
AGSC 384	Political Economy of Middle East Development	3
NFSC 306	Community Nutrition: Research and Intervention	3
RCOD 341	Rural Community Development: Theories, Debates, and Challenges	3
RCOD 342	Qualitative Methods	4

Economics and Policies Specialization		
AGSC 376	Resource and Environmental Economics	3
AGSC 389	Research Methods in Applied Economics	3
ENSC 630 / LDEM 630	Natural Resource Management	3
FSEC 306	Indicators and Tools for Measuring Food Security	3
PPIA 301	Public Policy	3
PPIA 305	Economics for Public Policy	3
PPIA 309	Evidence, Policy, and Communication	3
PSPA 316	International Environmental Policy	3
PSPA 352	Foundations of Public Policy	3
PSPA 361	Public and Non-Profit Program Evaluation	3

Food Production and Consumption Specialization		
AGSC 389	Research Methods in Applied Economics	3
CIVE 648	Climate Change and Water Resources	3
LDEM 635 / ENSC 635 / PSPA 346A	Political Ecology of Water	3
NFSC 351	Food Safety: Contaminants and Toxins	3

Course Descriptions

AGSC 301/NFSC 301 Statistical Methods in Agriculture/Statistical Methods for Nutrition and Food Sciences 2.3; 3 cr.
An investigation of the statistical techniques needed to design experiments and analyze and interpret agricultural research data. Prerequisites: STAT 210 or EDUC 227, and CMPS 209. Fall.

FSEC 300 Food Security: Challenges and Contemporary Debate 3.0; 3 cr.
This course introduces concepts and principles of food security, namely availability, accessibility, utilization, and stability of food supply. Students are familiarized with the history of thought on food security, from Malthus to the Green Revolution to Sen and the inclusion of political and social factors in considering food security.

FSEC 305 Agriculture: Technology, Supply Chains, Sustainability 3.0; 3 cr.
This course provides an understanding of sustainable agricultural production through a value chain approach as it relates to production and productivity, water and soil management, technology and post-harvest practices; with special application to the dry lands of the Middle East North Africa region.

FSEC 306 Indicators and Tools for Measuring Food Security 3.0; 3 cr.
This course introduces tools and datasets that are of importance to analyze the different elements (availability, access, utilization and stability) of food and nutrition security. Students are familiarized on how to use and interpret internationally state-of-the-art datasets. Students gain a critical perspective on data availability and gaps that will equip them with applied knowledge for future work in the field. The datasets and tools introduced cover population, agricultural production, economic, environmental, health, and nutrition.

FSEC 310 Nutrition Security: Assessment and Intervention Strategies 3.0; 3 cr.
This course introduces students to basic principles of nutrition security, community nutrition and nutritional ecology; and highlights the role that nutrition plays in improving the health and wellbeing of communities. The course aims to equip students with the knowledge and skills required to conduct population-based nutrition research, assess the nutrition needs of a population, to plan, implement and evaluate community nutrition programs and policies based on evidence-based practice and taking into consideration cultural, social, and contextual dimensions.

FSEC 315 Food Policies and their Planning Process 3.0; 3 cr.
This course builds knowledge of the food system from local planning and policy and applied economic perspectives. The course familiarizes students with key players and issues related to the practice of food system planning (the process and practice of creating and implementing food policies), how this practice interfaces with the economy and how to place these issues in a global context.

FSEC 320 Graduate Seminar in Food Security 0 cr.
This course provides a forum for exchange of experiences and knowledge sharing. Students will participate in field trips, complete individual tasks and projects related to food security issues in the Middle East and North Africa and the broader developing country context, and present and discuss findings.

FSEC 396 Comprehensive Exam 0 cr.
Comprehensive exam.

FSEC 397 Project 3 cr.
Project.

FSEC 399 MS Thesis 6 cr.
MS thesis.

Food Security Graduate Diploma – Online

The food security graduate diploma – online offers a multi-disciplinary perspective and area of study. This program is designed for working professionals and future leaders who are looking for a career-transforming opportunity that explores the areas of food security, agricultural production, nutrition security, and public policy and development programming. The food security graduate diploma – online is delivered in a flexible, fully online format.

Those students who wish to extend their course of study can transfer up to 12 credits (four courses) that have been successfully completed under the food security graduate diploma towards the MS in food security degree program.

Requirements

The food security graduate diploma – online requires completion of a total of 12 credits, divided across four required courses.

Required Courses		Credits
FSEC 300D	Food Security: Challenges and Contemporary Debate	3
FSEC 305D	Agriculture: Technology, Supply Chains, Sustainability	3
FSEC 310D	Nutrition Security: Assessment and Intervention Strategies	3
FSEC 315D	Food Policies and their Planning Process	3

Course Descriptions

FSEC 300D Food Security: Challenges and Contemporary Debate 3.0; 3 cr.
This course introduces concepts and principles of food security, namely availability, accessibility, utilization, and stability of food supply. Students are familiarized with the history of thought on food security, from Malthus to the Green Revolution to Sen and the inclusion of political and social factors in considering food security.

FSEC 305D Agriculture: Technology, Supply Chains, Sustainability 3.0; 3 cr.
This course provides an understanding of sustainable agricultural production through a value chain approach as it relates to production and productivity, water and soil management, technology and post-harvest practices; with special application to the dry lands of the Middle East North Africa region.

FSEC 310D Nutrition Security: Assessment and Intervention Strategies 3.0; 3 cr.
This course introduces students to basic principles of nutrition security, community nutrition and nutritional ecology; and highlights the role that nutrition plays in improving the health and wellbeing of communities. The course aims to equip students with the knowledge and skills required to conduct population-based nutrition research, assess the nutrition needs of a population, to plan, implement and evaluate community nutrition programs and policies based on evidence-based practice and taking into consideration cultural, social, and contextual dimensions.

FSEC 315D Food Policies and their Planning Process 3.0; 3 cr.
This course builds knowledge of the food system from local planning, and policy and applied economic perspectives. The course familiarizes students with key players and issues related to the practice of food system planning (the process and practice of creating and implementing food policies), how this practice interfaces with the economy and how to place these issues in a global context.

MS in Rural Community Development (RCODE)

RCODE Coordinator	Chalak, Ali
Professors	Hamadeh, Shady; Zurayk, Rami, Chalak, Ali

The Faculty of Agricultural and Food Sciences offers an interdepartmental graduate program hosted by the Environment and Sustainable Development Unit, that leads to the degree of master of science (MS) in rural community development (RCODE, thesis or non-thesis).

Graduates of the program will gain knowledge to improve prospects of rural development and build their capacities in community development to better design, manage, follow up, evaluate, and monitor projects either in the public or private sector, locally, regionally, and internationally.

The program combines theoretical and experiential courses from the university at large. The MS in rural community development focuses on the following:

- The major theoretical and conceptual approaches to rural development.
- The elaboration and implementation of sound rural development policies and projects.
- The capacity to conduct research in the social, economic, political, and environmental dimensions of rural development.
- The qualitative and quantitative instruments of social enquiry to effectively pursue studies in rural development.

The core program emphasizes community and participatory development, sustainable livelihoods, rural and agricultural policies, agrarian change, gender issues, social analysis of communities, environmental transformations, design and planning, program development and non-profit management, and community action research and skills for community change. Elective courses provide the desirable flexibility to enhance the breadth of the program and its multi-disciplined approach from registered programs at the FAFS and other faculties. Such courses allow specialization in environmental and natural resource management, community nutrition and food security, project planning, sustainable agriculture, communication and development, and community health.

Requirements

All relevant requirements and regulations of the university and the Faculty of Agricultural and Food Sciences for the master's degree apply to the MS in RCODE.

Applicants must hold a bachelor's degree from AUB or its equivalent from a recognized institution of higher learning.

Eligibility for admission is the same for both the thesis MS and non-thesis MS options. The students, for reasons commensurate with specific interests and required training, may change from the non-thesis to the thesis track and vice versa, subject to approval by the department supervising the chosen major.

Thesis and Non-Thesis Options

The degree offers both thesis and non-thesis options. The program has six core courses. These cover issues related to the theory, methods and practice of rural community development and offer the opportunity for practical experience as well as research in rural community development. Two or three specialization electives can be selected from a list of approved courses to provide further insight into specific issues in rural community development from registered programs at the FAFS and other AUB faculties.

The successful completion of the degree will require 33 credit hours. At least 27 of the total 33 credits must be earned within the Faculty of Agricultural and Food Sciences (FAFS); among these are 21 credits (for thesis students), and 18 credits (for non-thesis students). An additional 6 credits (for thesis students) and 9 credits (for non-thesis students) must be selected from the list of approved electives within FAFS. The remaining 6 credits are free electives which may be earned from courses in FAFS or AUB at large as per the table below:

	Core Courses	FAFS Electives	Free Electives	Project/Thesis	Total
Thesis (cr.)	15	6	6	6	33
Non-Thesis (cr.)	15	9	6	3	33

Core Courses

RCOD 341 Rural Development, Theories, Debates, and Challenges 3.0; 3 cr.
This course approaches rural development from a multi-disciplinary perspective blending political economy, political ecology, and political sociology. It explores the theories, debates and policies that emerged in the field of rural development. The course will provide tools to analyze key contemporary agricultural and rural development issues and challenges. It places the agricultural and rural development in the context of globally and nationally changing institutions, markets, actors, and political structures, focusing on rural and agrarian transformation with particular reference to the Middle East North Africa region.

RCOD 342 Qualitative Research Methods in Rural Development 3.3; 4 cr.
The course introduces students to a variety of qualitative and participatory methodological approaches to the study of rural development. It enables students to think critically about the relationship between theory, method, data, and analysis in order to select appropriate qualitative methods in students' own research. It helps students to develop a critical sense of the scope and limits of different research methodologies and consider problems encountered in doing qualitative research (including ethical and political concerns) in Lebanon and the region. If RCOD 342 is not offered, equivalent course is: URPL 630- Research Methods (3 cr.) from the Department of Architecture and Design/ Maroun Semaan Faculty of Engineering and Architecture and 1 cr. Tutorial (RCOD 304).

RCOD 343/AGSC 301/NFSC 301 Statistical Methods in Agriculture/Statistical Methods for Nutrition and Food Sciences 2.3; 3 cr.
The course provides an investigation of the statistical techniques needed to design experiments and analyze and interpret agricultural research data. Topics include linear regression, analysis of variance, and analysis of covariance with both continuous and categorically coded variables. Introduction to logistic regression and some nonlinear models. Surveys will be analyzed using programs like SAS and SPSS. Prerequisites: STAT 210 or EDUC 227, and CMPS 209 or consent of instructor. Fall. If RCOD 343 is not offered, equivalent courses are: AGSC 301 from the Department of Agriculture OR NFSC 301 from the Department of Nutrition and Food Sciences from the Faculty of Agricultural and Food Sciences.

RCOD 344 Practicum 3.3; 4 cr.
Practicum in rural community development settings, such as projects, development agencies, governmental or non-governmental organizations. Through hands- on experience, this practicum prepares students to assume increasing levels of responsibility with competence in these settings. Students will work with the RCOD program director to find a placement in a development agency or organization in Lebanon or abroad. They will work on mutually agreed-upon projects under the supervision of a professional practitioner. Internships will be flexible both in duration and expected hours per week.

RCOD 304 Project/Tutorial 3.0; 3 cr.
This course provides the framework within which RCOD students develop their degree projects. During weekly class sessions, students will share elements of their projects (the problem or issue addressed, the procedures employed, outlines, drafts, etc.) for critiques by students and the professor before final presentation. The final project will involve in depth investigation of an issue.

RCOD 305 Seminar 0.0; 1 cr.
The course provides a forum for experience exchange and knowledge sharing. Students will present and discuss relevant issues with active and prominent figures in the community development scene in the Middle East North Africa (MENA) region.

RCOD 395 Comprehensive Exam 0 cr.
Comprehensive exam.

RCOD 399 MS Thesis 6 cr.
MS thesis.

Specialization Electives: 9 credits for non-thesis option and 6 credits for thesis option

ENSC 630 / LDEM 630 Natural Resources Management 3.0; 3 cr.
This course introduces students to key concepts in ecosystem-based natural resources management (NRM) and to the management of specific terrestrial resources: soils, water, land, and biodiversity with examples drawn from drylands and developing nations. A landscape lens is adopted to examine territory-scale resource management options, such as farming, ecotourism, forestry, and rangelands. The course also addresses the physical, socio-economic, cultural, political, and geographic specificity of NRM by reviewing the status of Arab natural resources in a changing environment.

NFSC 306 Community Nutrition: Research and Intervention 3.0; 3 cr.
The role of nutrition in improving the health and well-being of communities. Population nutritional status and needs assessment, as well as planning, implementing, and evaluating community nutrition and emergency nutrition programs and policies. Identification and assessment of nutritional status in the community, nutritional surveys, program development, nutritional education planning policies, and nutritional ecology. Prerequisites: NFSC 221 and NFSC 222.

AGSC 376 Resource and Environmental Economics 3.0; 3 cr.
A course that addresses and analyzes resource and environmental problems facing today's society, with an emphasis on providing the students with an intensive introduction to the qualitative theory necessary for an effective analysis of resource problems.

AGSC 384 Political Economy of Middle East Development 3.0; 3 cr.
A course that provides an understanding of economic development and underdevelopment as it relates to environmental degradation and demographic, social and cultural change with special application to the economies of the Middle East.

ECON 332 Political Economy of Development 3.0; 3 cr.
Studies the role of factors such as geography, historical path dependence, institutions, and culture in determining economic growth; introduces the basic tools of political economics; studies models of governance and mis-governance and the role of institutional failure; examines empirical issues in validating the effect of institutions and culture on economic outcomes. Occasionally.

Free Electives: 6 credits

AGSC 389 Research Methods in Applied Economics 3.0; 3 cr.
A course that provides an overview of theoretical and applied research methods for the study of agricultural, resource, and development economics issues. Prerequisite: AGSC 301 or NFSC 301

NFSC 351 Food Safety: Contaminants and Toxins 3.0; 3 cr.
General principles of food toxicology with emphasis on toxic constituents in plant, animal, marine and fungal origin, contaminants, and food processing induced toxins. Risk characterization and laws and regulations of food safety.

PSPA 343 / ENSC 658 Environmental Conflict Resolution 3.0; 3 cr.
An introduction to contemporary approaches to global environmental negotiation and conflict resolution including the efforts of international organizations at risk communication, mediation, and facilitation. This course focuses on procedures to manage negotiations of environmental conflicts and disputes between governments, corporations, ecologists, the media, and the general population. Information is also provided on environmental dispute cases successfully resolved. Alternate years.

EPHD 331 Population Change and Health 3.0; 3 cr.
Population change is central to public health. This course provides a broad introduction to the field of population. It identifies core topics in population, discusses their relation to development and health and emphasizes measurement issues. Topics covered include population size and growth as they relate to resources and to population health; components of population change including fertility and mortality, their links to development and consequences for health; population composition by age and gender and by socioeconomic status, and related inequalities; and population movements including forced, internal and international migration as factors of population change and health. Special focus is given to the Arab world and the Middle East region.

HPCH 332 Community Health Promotion, Mobilization, and Development Advocacy 2.0; 2 cr.
In this course, students learn about the notion of community health, and the principles of community organizing to identify needs, values and resources in a community setting in order to develop an advocacy plan that will address a priority community health issue topical areas cover community organizing, types of community assessments, prioritization, community based participatory approaches, advocacy strategies, and community organizing and advocacy ethics. Prerequisite: PBHL 312.

FSEC 300 Food Security: Challenges and Contemporary Debate 3.0; 3 cr.
This course introduces concepts and principles of food security, namely availability, accessibility, utilization, and stability of food supply. Students are familiarized with the history of thought on food security, from Malthus to the Green Revolution to Sen and the inclusion of political and social factors in considering food security.

FSEC 305 Agriculture: Technology, Supply Chains, Sustainability 3.0; 3 cr.
This course provides an understanding of sustainable agricultural production through a value chain approach as it relates to production and productivity, water and soil management, technology and post-harvest practices with special application to the dry lands of the Middle East North Africa region.

FSEC 310 Nutrition Security: Assessment and Intervention Strategies 3.0; 3 cr.
This course introduces students to basic principles of nutrition security, community nutrition and nutritional ecology; and highlights the role that nutrition plays in improving the health and wellbeing of communities. The course aims to equip students with the knowledge and skills required to conduct population-based nutrition research, assess the nutrition needs of a population, to plan, implement and evaluate community nutrition programs and policies based on evidence-based practice and taking into consideration cultural, social, and contextual dimensions.

FSEC 315 Food Policies and their Planning Process 3.0; 3 cr.
This course builds knowledge of the food system from local planning and policy and applied economic perspectives. The course familiarizes students with key players and issues related to the practice of food system planning (the process and practice of creating and implementing food policies), how this practice interfaces with the economy and how to place these issues in a global context.

Department of Agriculture (AGRI)

Chairperson	Jaafar, Hadi
Professor Emeritus	Kawar, Nasri
Professors	Abou Jawdah, Chalak, Ali; Yusuf; Farran, Mohamad; Haidar, Mustapha; Hamadeh, Shady; Jaafar, Hadi
Adjunct Professor	Mohtar, Rabi
Adjunct Associate Professor	Chaaban, Jad
Assistant Professors	El Kayal, Walid; Gedikoglu, Haluk
Lecturers	Jaber, Lina; Doughan, Youssef
Instructor	Sobh, Hana

Graduate Programs

The graduate study program leading to the MS degree with a thesis or non-thesis option is offered with a specialization in the following areas: agricultural economics, animal science, irrigation, plant science, plant protection, and poultry science; preparing students for a productive career in integrated agricultural technology, livestock and poultry, natural resources management and agribusiness. The graduate programs are designed to prepare students for a successful career in the field by providing them with advanced knowledge and skills in specialized areas. The programs aim to develop students' abilities in research through the completion of a thesis or non-thesis option and equip them with the tools to analyze and solve complex problems in agricultural production and management. The programs also focus on enhancing students' understanding of the economic, social, and environmental factors that impact the agricultural industry, fostering critical thinking and decision-making skills, as well as developing effective communication with professionals in the field.

The graduates will be capable of serving in Lebanon, the Middle East, and other regions around the world.

Graduate students in the department may become candidates for a degree in the interfaculty program in nutrition by meeting the requirements described in the Division of University Interdisciplinary section of the catalogue.

MS in Agricultural Economics

Core Courses

AGSC 301/NFSC 301 Statistical Methods in Agriculture/Statistical Methods for Nutrition and Food Sciences 2.3; 3 cr.
An investigation of the statistical techniques needed to design experiments and analyze and interpret agricultural research data. Prerequisites: STAT 210 or EDUC 227, and CMPS 209. Fall.

AGSC 303 An Introduction to the Lebanese Economy 3.0; 3 cr.
This course provides explanations and analysis of the problems confronting the Lebanese economy with regard to socio-economic development and under-development. Students will be familiarized with how to use, critically analyze, and interpret the various national socioeconomic indices, and gain an understanding of the political economy context and evolution.

AGSC 325 Production Economics 3.0; 3 cr.
A course that focuses on the organization of farmers for higher income through improved resource use and competitive position.

AGSC 376 Resource and Environmental Economics 3.0; 3 cr.
A course that addresses and analyzes resource and environmental problems facing today's society, with an emphasis on providing the students with an intensive introduction to the qualitative theory necessary for an effective analysis of resource problems.

AGSC 377 Economics of Water Resources 3.0; 3 cr.
This course applies the tools of neo-classical microeconomics to water resource planning and management. The primary focus of the course is on water problems within agriculture but also examines issues related to the water needs of municipal usage, industry, and recreation/ environmental purposes.

AGSC 384 Political Economy of Middle East Development 3.0; 3 cr.
A course that provides an understanding of economic development and underdevelopment as it relates to environmental degradation and demographic, social, and cultural change, with special application to the economies of the Middle East.

AGSC 389 Research Methods in Applied Economics 3.0; 3 cr.
A course that provides an overview of theoretical and applied research methods for the study of agricultural, resource, and development economics issues. Prerequisite: AGSC 301 or NFSC 301.

AGSC 395 Graduate Seminar in Agricultural Science 1.0; 1 cr.
Graduate seminar in agricultural science.

AGSC 300 Graduate Tutorial 1-3 cr.
Directed study.

AGSC 396 Comprehensive Exam 0 cr.
Comprehensive exam.

AGSC 399 MS Thesis 9 cr.
MS thesis.

Students should take 6 cr. from the above list as core requirements (other than AGSC 301/NFSC 301, AGSC 395, and AGSC 399 for thesis and AGSC 300C for non-thesis), 9 cr. as electives from any of the courses listed for the other AGSC majors, plus 3 cr. as a free graduate elective with the adviser's approval.

MS in Animal Science

Core Courses

AGSC 301/NFSC 301 Statistical Methods in Agriculture/Statistical Methods for Nutrition and Food Sciences 2.3; 3 cr.
An investigation of the statistical techniques needed to design experiments and analyze and interpret agricultural research data. Prerequisites: STAT 210 or EDUC 227, and CMPS 209. Fall.

AVSC 304 Preventive Immunology and Patterns of Animal Diseases 3.0; 3 cr.
Basic aspects of specific and non-specific body defense mechanisms. Introduction to population medicine with emphasis on spatial and temporal pattern of disease occurrence; survey, surveillance and monitoring. Mechanisms of infectious disease transmission, routes of infection and pathogen exit. Methods of disease prevention; increasing animal resistance (genetic, nutritional, immunologic methods). Vaccine and vaccination in herd/flock health management; Prevention of disease entry into a farm (biosecurity); prevention of disease spread within farm and between farms (isolation of sick animals, quarantine, movement restriction, etc.). Prerequisite: AVSC 224.

AVSC 306 Diseases of Livestock 3.0; 3 cr.
The course deals with selected livestock diseases of economic and public health importance. Etiology, clinical characteristics, diagnosis, epidemiology, and control of infectious and noninfectious diseases of animals. Concepts of one health approach for Zoonotic diseases and environmental protection. Principle of herd health management for livestock diseases of economic importance.

AVSC 330 Advanced Livestock Production 3.0; 3 cr.
Recent advances in livestock production practices as related to interactions between animal and milieu with reference to the specific nutritional and climatic conditions of the Middle East.

AVSC 336 Ruminant Nutrition 3.0; 3 cr.
Recent advances in the nutrition of cattle, sheep, and goats with reference to microbiological aspects of digestion and its relation to practical feeding.

AVSC 388 Animal Production and Environmental Management 3.0; 3 cr.
A course that characterizes the impact of extensive and intensive livestock systems on the environmental sustainability of the two systems in terms of technical constraints and feasible corrective environmental management strategies.

AVSC 395 Graduate Seminar in Animal Science 1.0; 1 cr.
Graduate seminar in animal science.

AVSC 396 Comprehensive Exam 0 cr.
Comprehensive exam.

AVSC 399 MS thesis 9 cr.
MS Thesis.

All graduate students in the POSC and ANML programs should take at least 12 credits of AVSC core courses in addition to AGSC 301/NFSC 301, AVSC 395, and AVSC 399 for thesis and AVSC 300C for non-thesis), 9 cr. as electives from any of the courses listed below, plus 3 cr. as a free graduate elective with the adviser's approval.

Elective Courses

AVSC 300 Graduate Tutorial 1-3 cr.
Directed study.

AVSC 305 Poultry Diseases 3.0; 3 cr.
Etiology, clinical characteristics, identification, prevention, and control of the major infectious and metabolic diseases of poultry.

AVSC 307 Poultry Production in Warm Regions 3.0; 3 cr.
Recent advances in poultry production practices under high temperature conditions with special emphasis on physiology of heat stress in birds as related to housing, management and feeding. Prerequisite: AVSC 226.

AVSC 325 Core Pathology Mechanisms of Disease 3.0; 3 cr.
This course will entail the study of graduate medical pathological mechanisms of disease found in humans and animals. We will initially review the conceptual building blocks of spontaneous disease pathology, followed by a defined literature reading – each week we will read, review, and present a research article describing a classical or newly emerging disease in humans or animals, and relate it to underlying pathology disease mechanisms. The course will take the structure of a weekly journal club. This is an advanced course that will be most helpful for students who are interested in the natural, animal, and medical sciences at both the basic and clinical levels of expression. Students taking the course should be matriculated into graduate or postdoctoral study. Under special circumstances, very advanced undergraduates in the natural, or agricultural, health or clinical sciences can matriculate with the permission of the instructor.

AVSC 329 Advanced Animal Physiology 2.3; 3 cr.
Comparative physiology of domestic animals with special emphasis on digestion, reproduction, lactation, and thermo-regulation. Prerequisite: AVSC 275 or equivalent.

AVSC 334 Advanced Poultry Nutrition 2.3; 3 cr.
Recent developments in poultry nutrition; design and implementation of poultry nutrition experiments. Prerequisite: AVSC 271.

MS in Irrigation

Core Courses

AGSC 301/NFSC 301 Statistical Methods in Agriculture/Statistical Methods for Nutrition and Food Sciences 2.3; 3 cr.
An investigation of the statistical techniques needed to design experiments and analyze and interpret agricultural research data. Prerequisites: STAT 210 or EDUC 227, and CMPS 209. Fall.

AGSC 310 Advanced Soil Physics 3.0; 3 cr.
Physical properties of soils in arid, semi-arid, and sub-humid regions; soil-water-plant atmosphere relationships, plant water extraction, and evapotranspiration; salt and water flow in soils, soil heat flow, and modeling soil water extraction and evaporation.

AGSC 326 Surface Irrigation Engineering 3.0; 3 cr.
Principles of design, operation, and evaluation of surface irrigation systems; irrigation field design and field measurement techniques. Prerequisite: consent of instructor.

AGSC 328 Sprinkler and Micro-Irrigation Engineering 3.0; 3 cr.
Fundamentals of design, operation, evaluation, and selection of pressurized irrigation systems; pipeline economics, pump hydraulics, and pumping plant design considerations.

AGSC 330 Integrated Water Resources Management 3.0; 3 cr.
Quantitative methods for analyzing water resource problems. Topics covered include the design and management of facilities for river basin development, flood control, water supply, hydropower, and other activities related to water resources. Stochastic and deterministic methods for approaching and analyzing water resource problems, reservoir sizing, simulation, hydrologic time series analysis, and optimization methods.

AGSC 317 Surface and Groundwater Hydrology 3.0; 3 cr.
Relevant statistical concepts and extreme event distributions, rainfall frequency analysis, rainfall-runoff relationships, unit hydrograph theory, overland flow routing, and stochastic processes in hydrology. Occurrence, storage, distribution, and movement of ground water; confined and unconfined aquifer properties, well-aquifer hydraulics and relationships and ground water basin management.

AGSC 334 Remote Sensing of the Environment 2.3; 3 cr.
Quantitative methods for analyzing remote sensing datasets from the agricultural and natural resources perspective. The principles of electromagnetic radiation, as well as the interactions of solar radiation with the earth's atmosphere will be explored. The spectral reflectance, transmittance, and absorption characteristics of the three main Earth cover types– vegetation, soil, and water– will be stressed. Spatial, spectral, and temporal characteristics of the major low-, medium- and high-resolution multispectral sensor systems and their data products will be studied and compared.

AGSC 300 Graduate Tutorial 1-3 cr.
Directed study.

AGSC 395 Graduate Seminar in Agricultural Science 1.0; 1 cr.
Graduate seminar in agricultural science.

AGSC 396 Comprehensive Exam 0 cr.
Comprehensive exam.

AGSC 399 MS Thesis 9 cr.
MS thesis.

Students should take 6 credits from the above list as core requirements (other than AGSC 301/NFSC 301, AGSC 395, and AGSC 399 for thesis and AGSC 300C for non-thesis), 9 credits as electives from any of the courses listed for other AGSC majors, plus 3 credits in free graduate electives to be approved by the adviser.

MS in Plant Protection

Core Courses

AGSC 301/NFSC 301 Statistical Methods in Agriculture/Statistical Methods for Nutrition and Food Sciences 2.3; 3 cr.
An investigation of the statistical techniques needed to design experiments and analyze and interpret agricultural research data. Prerequisites: STAT 210 or EDUC 227, and CMPS 209. Fall.

AGSC 311 Advanced Principles and Methods in Plant Pathology 2.3; 3 cr.
Serological and molecular diagnostic techniques, nucleic acids hybridization, PCR, marker assisted selection, brief review of physiology of host-pathogen relationships and current methods of research including cloning and transgenic plants. Prerequisite: AGSC 233 or consent of instructor.

AGSC 322 Plant Parasitic Fungi and Bacteria 2.3; 3 cr.
Morphology, taxonomy, and identification of fungi and bacteria parasitic on plants Prerequisite: AGSC 233. Alternate years.

AGSC 323 Plant Virology 2.3; 3 cr.
Fundamental and practical aspects of plant virology including isolation, characterization, identification replication and management of plant pathogenic viruses, including gene silencing and transgenic plants. Prerequisite: AGSC 233. Alternate years.

AGSC 332 Plant-Pest Interactions 3.0; 3 cr.
Principles and factors involved in interactions between pests and their host plants; application of perspectives in chemical ecology to agricultural systems; effect of biotic and abiotic factors on the physiology, adaptation, and survival of pest populations in agroecosystems. Prerequisites: AGSC 233 and AGSC 245.

AGSC 388 Integrated Pest Management 3.0; 3 cr.
Principles and concepts of integrated pest management; monitoring and forecasting of pest population, tactics, strategies, and implementations of IPM in the agricultural ecosystems; and environmental, economic, and social implications of IPM. Prerequisites: AGSC 233 and AGSC 245.

AGSC 300 Graduate Tutorial 1-3 cr.
Directed study.

AGSC 395 Special Topics in Agricultural Science 1.0; 1 cr.
Special topics in agricultural science.

AGSC 396 Comprehensive Exam 0 cr.
Comprehensive exam.

AGSC 399 MS Thesis 9 cr.
MS thesis.

Students should take 6 credits from the above list as core requirements (other than AGSC 301/NFSC 301, AGSC 395, and AGSC 399 for thesis and AGSC 300C for non-thesis), and 9 credits as electives from any of the courses listed for other AGSC majors, plus 3 credits in free graduate electives to be approved by the adviser.

MS in Plant Science

Core Courses

AGSC 301/NFSC 301 Statistical Methods in Agriculture/Statistical Methods for Nutrition and Food Sciences 2.3; 3 cr.
An investigation of the statistical techniques needed to design experiments and analyze and interpret agricultural research data. Prerequisites: STAT 210 or EDUC 227, and CMPS 209. Fall.

AGSC 307 Advanced Crop Production 3.0; 3 cr.
Theories and principles of plant growth, development, and responses to the environment, with an integrated approach to understanding crop productivity. Prerequisites: AGSC 220 and AGSC/AVSC 246.

AGSC 308 Plant Tissue Culture and Crop Improvement 2.3; 3 cr.
This course introduces students in the agriculture program a sound understanding of the applied and scientific basis of micro propagation and in-vitro plant breeding.

AGSC 312 Fertilizer Technology and Use 2.3; 3 cr.
Fertilizers in agricultural development, current developments in fertilizer technology, fertigation, and special problems associated with fertilizer use and research methodology in soil fertility. Prerequisite: AGSC 265.

AGSC 319 Advanced Vegetable Production 3.0; 3 cr.
Physiological and genetic control of growth and management of vegetable plants and their products; effects of nutrition, irrigation and other variables on crop performance and quality of produce; presentation and interpretation of recent research progress in vegetable production.

AGSC 324 Methods of Soil and Plant Tissue Analysis 2.3; 3 cr.
Analytical techniques, operation of instruments in plant analysis and in physical, chemical, and mineralogical analysis of soils.

AGSC 300 Graduate Tutorial 1–3 cr.
Directed study.

AGSC 395 Special Topics in Agricultural Science 1.0; 1 cr.
Special topics in agricultural science.

AGSC 396 Comprehensive Exam 0 cr.
Comprehensive exam.

AGSC 399 MS Thesis 9 cr.
MS thesis.

Students should take 6 credits from the above list as core requirements (other than AGSC 301/NFSC 301, AGSC 395, and AGSC 399 for thesis and AGSC 300C for non-thesis), and 9 credits as electives from any of the courses listed for other AGSC majors, plus 3 credits in free graduate electives to be approved by the adviser.

MS in Poultry Science

Core Courses

AGSC 301/NFSC 301 Statistical Methods in Agriculture/Statistical Methods for Nutrition and Food Sciences 2.3; 3 cr.
An investigation of the statistical techniques needed to design experiments and analyze and interpret agricultural research data. Prerequisites: STAT 210 or EDUC 227, and CMPS 209. Fall.

AVSC 304 Preventive Immunology and Patterns of Animal Diseases 3.0; 3 cr.
Basic aspects of specific and non-specific body defense mechanisms and the role of vaccination in population protection; study of the patterns of diseases. Prerequisite: BIOL 224 or AVSC 224.

AVSC 305 Poultry Diseases 3.0; 3 cr.
Etiology, clinical characteristics, identification, prevention, and control of the major infectious and metabolic diseases of poultry.

AVSC 307 Poultry Production in Warm Regions 3.0; 3 cr.
Recent advances in poultry production practices under high temperature conditions with special emphasis on physiology of heat stress in birds as related to housing, management and feeding. Prerequisite: AVSC 226.

AVSC 334 Advanced Poultry Nutrition 2.3; 3 cr.
Recent developments in poultry nutrition; design and implementation of poultry nutrition experiments. Prerequisite: AVSC 271.

AVSC 388 Animal Production and Environmental Management 3.0; 3 cr.
A course that characterizes the impact of extensive and intensive livestock systems on the environmental sustainability of the two systems in terms of technical constraints and feasible corrective environmental management strategies.

AVSC 395 Graduate Seminar in Animal Science 1.0; 1 cr.
Graduate seminar in animal science.

AVSC 396 Comprehensive Exam 0 cr.
Comprehensive exam.

AVSC 399 MS Thesis 9 cr.
MS thesis.

All graduate students in the POSC and ANML programs should take at least 12 credits of AVSC core courses in addition to AGSC 301/NFSC 301, AVSC 395, and AVSC 399 for thesis and AVSC 300C for non-thesis), 9 cr. as electives from any of the courses listed below, plus 3 cr. as a free graduate elective with the adviser's approval.

Elective Courses

AVSC 300 Graduate Tutorial 1-3 cr.
Directed study.

AVSC 306 Diseases of Livestock 3.0; 3 cr.
Etiology, clinical characteristics, identification, and control of some selected infectious and metabolic diseases of economic impact on animal production.

AVSC 325 Core Pathology Mechanisms of Disease 3.0; 3 cr.
This course will entail study of graduate medical pathological mechanisms of disease found in humans and animals. We will initially review the conceptual building blocks spontaneous disease pathology, followed by defined literature reading – each week we will read, review, and present a research article describing a classical or newly emerging disease in humans or animals, and relate it to underlying pathology disease mechanisms. The course will take the structure of a weekly journal club. This is an advanced course that will be most helpful for students who are interested in the natural and biomedical sciences at both the basic and clinical levels of expression. Students taking the course should be matriculated into graduate or postdoctoral study. Under special circumstances, very advanced undergraduates in the natural or clinical sciences can matriculate with the permission of the instructor.

AVSC 329 Advanced Animal Physiology 2.3; 3 cr.
Comparative physiology of domestic animals with special emphasis on digestion, reproduction, lactation, and thermo-regulation. Prerequisite: AVSC 275 or equivalent.

AVSC 330 Advanced Livestock Production 3.0; 3 cr.
Recent advances in livestock production practices as related to interactions between animals and milieu with reference to the specific nutritional and climatic conditions of the Middle East.

AVSC 336 Ruminant Nutrition 3.0; 3 cr.
Recent advances in the nutrition of cattle, sheep, and goats with reference to microbiological aspects of digestion and its relation to practical feeding.

Department of Landscape Design and Ecosystem Management (LDEM)

Chairperson	Abunnasr, Yaser
Professors	Talhouk, Salma; Zurayk, Rami (ECOM Program Coordinator)
Associate Professor	Abunnasr, Yaser
Assistant Professors	Al-Akl, Nayla (Dean of Student Affairs); Dreksler, Beata
Lecturer	Bacha, Karim
Instructor	Fabian, Monika
Adjunct Associate Professor	Trovato, Maria Gabriella

Graduate Program

The graduate study program leading to the MSES (master of science in environmental sciences) degree with a specialization in ecosystem management (ECOM) is offered with a thesis or non-thesis option.

The program educates students in ecosystem science and management by integrating instruction in biophysical and human systems. It provides students with sufficient research experience and equips them with the necessary tools for professional practice and/or the pursuit of higher education. Students are prepared to be leaders and agents of change to address issues of local and global relevance at the nexus of human development, ecological integrity, and the sustainable use of resources.

Core and elective courses are structured to provide students with a diversified and multidisciplinary background in environmental sciences including environmental restoration and nature conservation, ecosystem sciences and management, urban greening and natural resources planning and management. The program crosses traditional boundaries by applying an interdisciplinary approach and multiple resource knowledge to ecosystem studies while also emphasizing human-nature interactions.

Effective fall 2020-21, new ECOM students will need to take a total of 5 core courses equivalent to 15 credits (three core courses from LDEM in addition to two core courses from ENVT, ENVH or ENVP). The three core graduate courses offered at LDEM include LDEM 301 (Urban Greening), LDEM 302 (Green Infrastructure for Resilient Landscapes and Cities), and LDEM 630 (Natural Resources Management). ECOM students will also need to take three elective courses equivalent to 9 credits (to be determined after consultation with their adviser). ECOM students will also register for a Comprehensive Exam (ENSC 695; 0 cr.) and an MS Thesis (ENSC 699; 6 cr.) In addition to the above, effective fall 2023-24, ECOM students will have to register for LDEM 320 (Graduate Seminar in Ecosystem Management; 0cr.) as a mandatory seminar every term until graduation.

Natural resources management involves not only understanding of ecosystem structure and function when used for a variety of purposes, but also the incorporation of social, economic, and political considerations into decision-making. Consequently, the discipline involves the collection, analysis, interpretation and integration of information not only from the more traditional areas of science but also from the areas of management.

For full details on the admission requirements for this interfaculty program, see the Office of Admissions section of this catalogue and the Admission Policies for the Interfaculty Graduate Environmental Sciences Program.

For information regarding graduation requirements, refer to the General University Requirements in this catalogue.

Credit requirements are tabulated below:

Course Type	Credits
Core	15 (out of which 9 are from LDEM)
Electives	9
Project/Thesis	3/6
Graduate Seminar	0
Total number of credits required for graduation	**30**

MSES (Major: Ecosystem Management)

Core Courses

LDEM 301 / URDS 674 / ARCH 074 Urban Greening 3 cr.
This course allows students to develop an understanding of nature in cities, present the latest research and concepts on urban nature, describe, and conceptually apply urban greening approaches, explore urban residents' relation with nature, and discuss opportunities and limitations of urban greening in restrictive environments. Graduate standing (senior undergraduate standing upon consent of instructor).

LDEM 302 / URDS 675 / ARCH 075 Green Infrastructure for Resilient Landscapes and Cities 3 cr.
Green infrastructure is an ecologically based system, naturally occurring or engineered, across urban and rural contexts, that is multi-functional and delivers essential cultural, social, environmental, ecological and economic benefits. It requires a holistic and systems approach to improving ecological function while providing vital ecosystem services for human populations. The course introduces students to the concepts, theories, and applications of design, planning, and policy of green infrastructure in conjunction with open space planning and design. A particular focus is the relationship and synergy between green infrastructure and climate change adaptation of landscapes and cities. A case study approach is utilized to study green infrastructure across multiple scales, disciplines and applications in the Middle East and North Africa (MENA) region. Green infrastructure is inherently multi-disciplinary and intersects with landscape architecture; urban design and planning; architecture; environmental engineering; public health; urban policy; and environmental policy. Graduate standing (senior undergraduate standing upon consent of instructor).

LDEM 630 / ENSC 630 Natural Resources Management 3 cr.
This course introduces students to key concepts in ecosystem-based natural resources management (NRM) and to the management of specific terrestrial resources: soils, water, land, and biodiversity with examples drawn from drylands and developing nations. A landscape lens is adopted to examine territory-scale resource management options, such as farming, ecotourism, forestry, and rangelands. The course also addresses the physical, socio-economic, cultural, political, and geographic specificity of NRM by reviewing the status of Arab natural resources in a changing environment (Core course).

LDEM 320 Graduate Seminar in Ecosystem Management 0 cr.
This graduate seminar is meant to provide students with a road map towards the completion of their thesis/projects. Students develop an understanding of the graduate program they are engaged in and are guided to identify their research interests, select a faculty adviser and a thesis/project committee, develop the project concept and the methodology, prepare their proposal, practice their comprehensive exam, and present their research findings (mandatory seminar for ECOM students is offered every term; equivalent to FSEC 320).

ENSC 695 Comprehensive Exam 0 cr.
Comprehensive exam.

ENSC 697 Project 3 cr.
Students who opt for the project option instead of the thesis need to take one additional elective course.

ENSC 699 MS thesis 6 cr.
MS thesis.

Elective Courses

LDEM 632/ URPL 641 Geographic Information System (GIS) 2:3; 3 cr.
This course acquaints students with classical and modern methods of landscape analyses as well as assessment and changes in landscape structure using ArcGIS and its extensions. Students will be gradually introduced to the subject both to acquire and integrate geographic data, and to learn how to analyze and interpret the results. All topics are demonstrated on selected tasks. The goal of this course is to explore various approaches to modeling landscape pattern and change. The focus is on the design and use of computerized geographic information systems for land planning and design decisions and on understanding, describing, and predicting land-use and land-cover. The course will move between social and ecological processes and applications of the models. Students will learn to evaluate the trade-offs associated with use of a particular modeling approach within a given situation, and to implement (at least minimally) several of the approaches discussed (cross-listed with LDEM 251).

ENSC 633 / LDEM 633 / URDS 664 Ecological Landscape Design and Planning 3 cr.
An introduction to the theory and methodology of ecological landscape design and planning, which aims to introduce the holistic approach of landscape ecology and its application in the sustainable management of natural and cultural landscapes and ecosystems. The course syllabus is planned to prioritize Mediterranean ecosystems and landscapes and equally to promote interdisciplinary collaboration in research and project management.

LDEM 300 Graduate Tutorial 1-3 cr.
Directed study in ecosystem management.

Department of Nutrition and Food Sciences (NFSC)

Chairperson	Obeid, Omar
Professors	Abiad, Mohammad; Hwalla, Nahla; Kharroubi, Samer (Associate Dean of Student Affairs); Nasreddine, Lara; Obeid, Omar; Olabi, Ammar; Toufeili, Imad
Adjunct Professor	Naja, Farah
Adjunct Associate Professor	Jomaa, Lamis
Assistant Professors	Fares, Elie Jacques; Iskandar, Christelle
Assistant Professor of Practice	Chamieh, Marie Claire
Visiting Assistant Professor	Ouaijan, Krystel
Assistant Research Professor	Habib Mourad, Carla

Graduate Programs

The Department of Nutrition and Food Sciences offers four graduate programs of study leading to the MS degree in food safety, food technology, nutrition, nutrition and dietetics coordinated program, and a joint MS degree in public health nutrition with the Faculty of Health Sciences (FHS) For more detailed information see the interdisciplinary section of the graduate catalogue. Students can follow either a thesis or a non-thesis program of study. The department also offers a Ph.D. in biomedical sciences-nutrition track in collaboration with the Faculty of Medicine (FM). The department conducts quality research in the following areas: community nutrition, public health nutrition, clinical nutrition, nutritional biochemistry, nutrition epidemiology, food chemistry, food microbiology, food safety, food packaging, and sensory evaluation of food.

For more information about the graduate programs, please refer to the NFSC website: https://www.aub.edu.lb/fafs/nfsc/Pages/Default.aspx.

MS in Nutrition

The MS in nutrition program offers both thesis (31 cr.) and non-thesis (31 cr.) options and is normally completed over two years on a full-time basis. The program provides students with an advanced understanding of human nutrition at the individual and community levels and applies current research information and methods to nutrition practice.

Master of Science in Nutrition (Thesis Track)

Students in the thesis track are expected to complete a 9-credit thesis under the supervision of a thesis adviser and to defend their thesis as per AUB policies concerning graduate programs. Students should complete a comprehensive exam prior to the thesis defense. After the satisfactory defense of the research work, the thesis should be approved by the supervisory committee members and deposited at the AUB Library.

Master of Science in Nutrition (Non-Thesis Track)

Students in the non-thesis track are expected to complete a 3-6 credit project (tutorial). Students can choose elective courses from within or outside FAFS upon the approval of their supervisor.

Credit Requirements for Both the Thesis and Non-Thesis Options:

MS Degree Requirements

		Non-Thesis Track Credits	Thesis Track Credits
NFSC 301	Statistical Methods for Nutrition and Food Sciences	3	3
NFSC 311	Advanced Nutrition: Macronutrients	3	3
NFSC 314	Advanced Nutrition: Minerals	3	3
NFSC 315	Advanced Nutrition: Vitamins	3	3
NFSC 395	Graduate Seminar in Nutrition and Food Science	1	1
Electives (Students can substitute Elective courses by taking additional Graduate Tutorial credits.)		**12-15**	**6-9**
NFSC 396	Comprehensive Exam	0	0
NFSC 300	Graduate Tutorial	3-6	0-3
NFSC 399	MS Thesis	-	9
Total year credits		**31**	**31**

Core Courses (Thesis)

NFSC 301 Statistical Methods for Nutrition and Food Science 2.3; 3 cr.
This is an intermediate-level course in statistics. Topics include an introduction to designs in Nutrition and Food Science research; methods of describing data; statistical inference for means and proportions; linear and logistic regression, and an introduction to multiple regression. Prerequisites: NFSC 210, STAT 210 or EDUC 227 and CMPS 209. Fall.

NFSC 311 Advanced Nutrition: Macronutrients 3.0; 3 cr.
Advances in carbohydrates, protein, lipid, fiber, and energy metabolism. Prerequisite: NFSC 274.

NFSC 314 Advanced Nutrition: Minerals 3.0; 3 cr.
Advanced nutritional, biochemical, and physiological aspects of macro- and micro-mineral elements, and toxic elements in humans. Prerequisite: NFSC 274.

NFSC 315 Advanced Nutrition: Vitamins 3.0; 3 cr.
Advanced nutritional, biochemical, and physiological aspects of vitamins and vitaminlike substances in humans. Prerequisite: NFSC 274.

NFSC 395 Graduate Seminar in Nutrition and Food Science 1.0; 1 cr.
Graduate seminar in nutrition and food science.

NFSC 396 Comprehensive Exam 0 cr.
Comprehensive exam.

NFSC 399 MS Thesis 9 cr.
MS thesis.

Core Courses (Non-Thesis)

NFSC 301 Statistical Methods for Nutrition and Food Science 2.3; 3 cr.
This is an intermediate-level course in statistics. Topics include an introduction to designs in Nutrition and Food Science research; methods of describing data; statistical inference for means and proportions; linear and logistic regression, and an introduction to multiple regression. Prerequisites: NFSC 210, STAT 210 or EDUC 227 and CMPS 209. Fall.

NFSC 300 Graduate Tutorial 1-3 cr.
Directed study.

NFSC 311 Advanced Nutrition: Macronutrients 3.0; 3 cr.
Advances in carbohydrates, protein, lipid, fiber, and energy metabolism. Prerequisite: NFSC 274.

NFSC 314 Advanced Nutrition: Minerals 3.0; 3 cr.
Advanced nutritional, biochemical, and physiological aspects of macro- and micro-mineral elements, and toxic elements in humans. Prerequisite: NFSC 274.

NFSC 315 Advanced Nutrition: Vitamins 3.0; 3 cr.
Advanced nutritional, biochemical, and physiological aspects of vitamins and vitaminlike substances in humans. Prerequisite: NFSC 274.

NFSC 395 Graduate Seminar in Nutrition and Food Science 1.0; 1 cr.
Graduate seminar in nutrition and food science.

NFSC 396 Comprehensive Exam 0 cr.
Comprehensive exam.

Elective Courses for MS in Nutrition

NFSC 300 Graduate Tutorial 1-3 cr.
Directed study.

NFSC 305 Sensory Evaluation of Food 3.0; 3 cr.
Designed to help the food scientist solve typical sensory problems, select appropriate panelists for specific sensory tests, and conduct such tests, analyze, interpret the results, and write a report. Prerequisite: STAT 210 or EDUC 227.

NFSC 306 Community Nutrition: Research and Intervention 3.0; 3 cr.
The role of nutrition in improving the health and well-being of communities. Population nutritional status and needs assessment, as well as planning, implementing, and evaluating community nutrition and emergency nutrition programs and policies. Identification and assessment of nutritional status in the community, nutritional surveys, program development, nutritional education planning policies, and nutritional ecology. Prerequisites: NFSC 221 and NFSC 222.

NFSC 307 Nutritional Epidemiology 3.0; 3 cr.
This course deals with the design, conduct, analysis, and interpretation of epidemiologic studies related to nutrition, particularly the relationship between nutritional status, diet, and disease. Prerequisites: STAT 210 or EDUC 227 and CMPS 209. Fall and spring.

NFSC 308 Nutrition and Non-Communicable Diseases 3.0; 3 cr.
Advances in nutritional care, metabolic changes, and dietary management of nutrition related diseases. Prerequisites: NFSC 292 and NFSC 293.

NFSC 310 Advanced Food Biochemistry 3.0; 3 cr.
Study of food enzymes, lipid oxidation in foods and biological systems, and genetically modified food. Prerequisite: NFSC 261.

NFSC 312 Sports Nutrition 3.0; 3 cr.
Nutritional needs for the various types of athletic performance, and selected ergogenic and ergolytic supplements as related to physical performance. Prerequisite: NFSC 274.

NFSC 351 Food Safety: Contaminants and Toxins 3.0; 3 cr.
General principles of food toxicology with emphasis on toxic constituents in plant, animal, marine, and fungal origin, contaminants, and food processing induced toxins. Risk characterization and laws and regulations of food safety. Prerequisite: NFSC 277.

NFSC 370 Food Product Development 3.0; 3 cr.
Study of the chemical and physical properties of food ingredients. Designed to apply the product development process from idea generation to marketing. Prerequisite: NFSC 287 or NFSC 288.

NFSC 391 Research Techniques 1.6; 3 cr.
Principles of animal experiments, analytical techniques, and instrumentation used in nutrition and food science research studies. Prerequisite: NFSC 267.

MS in Nutrition and Dietetics Coordinated Program

The master of science in nutrition and dietetics coordinated program (MS-NDCP) is mainly designed for students who wish to obtain the Registered Dietitian Nutritionist (RDN) credential and work as professionals in the various fields of nutrition and dietetics. The MS-NDCP is a two-year program that integrates the practicum and didactic courses during each term. It consists of 40 Credits: 29 credits of didactic coursework; and 11 credits of integrated supervised practice (1035 hours of supervised practice) at affiliated hospital sites, community centers, and NGOs.

Mission

The mission of the master of science in nutrition and dietetics coordinated program (MS-NDCP) is to prepare graduates with the knowledge, expanded skills, and intellectual maturity to become progressive, innovative, and inter-professional dietetic practitioners. Graduates will be capable of applying ethical research practices when reviewing, evaluating, and conducting research. They will utilize evidence-based practice effectively to manage diet-related diseases and promote optimal nutritional status and well-being of culturally diverse individuals and groups. Graduates of the program are expected to serve the profession and larger community through public service, and leadership.

The MS-NDCP graduate program is US accredited, under the International Coordinated Program (ICP) 2022 standards, by the Accreditation Council for Education in Nutrition and Dietetics (ACEND) of the Academy of Nutrition and Dietetics (AND), 120 South Riverside Plaza, Suite 2190, Chicago, IL 60606-6995, (312) 899-0040 ext. 5400.

To be eligible for graduation with the degree of MS-NDCP, students must:

- successfully complete a minimum of 40 credits hours.
- complete 1035 hours of supervised practice at an affiliated site and fulfill all rotation requirements including assignments, activities, and relevant forms (student rotation log, clinical experience form, rotations checklists, etc.) within the specified time frames.
- achieve a minimum grade of 80 percent (3.3) in each of the MS-NDCP core courses.
- achieve an overall GPA of 3.3 in each of the two AY years of MS-NDCP.
- achieve an overall GPA of 3.3 in the supervised practicum.
- successfully complete the program within three and a half years (150 percent) of enrollment.

Failure to meet the above MS-NDCP graduation requirements will result in dismissal from the program.

Lebanese citizens are eligible to become licensed dietitians upon completing the Lebanese colloquium exam for dietitians.

Credit requirements for the MS-NDCP are tabulated below:

Term	Course	Credits
Year 1 Fall 1	NFSC 392 Medical Nutrition Therapy I	3
	NFSC 375 Quantity Food Production	2
	NFSC 308 Nutrition and Non-Communicable Diseases	3
	NFSC 397 FA - Dietetic Practicum	2
	Total credits per term	10 credits
Year 1 Spring 1	NFSC 393 Medical Nutrition Therapy II	3
	NFSC 324 Advanced Nutrition Principles and Practices	1
	NFSC 383 Nutrition Communication and Education	3
	NFSC 328 Applied Clinical Dietetics	3
	NFSC 397 SA - Dietetic Practicum	2
	Total credits per term	12 credits
Year 1 Summer 1	NFSC 397 R - Dietetic Practicum	3
	Total credits per term	3 credits
Year 2 Fall 2	NFSC 301 Statistical Methods for Nutrition and Food Sciences	3
	NFSC 306B Community and Public Health Nutrition	2
	NFSC 384 Seminar in Clinical Dietetics	1
	NFSC 397 FB - Dietetic Practicum	2
	Total credits per term	8 credits

Year 2 Spring 2	NFSC 390 Capstone project	3
	NFSC 319 Ethics, Leadership, and Entrepreneurship in Dietetics	2
	NFSC 326 Inter-professional Seminar	0
	NFSC 397 SB - Dietetic Practicum	2
	Total credits per term	7 credits
	Total Credits	40

Core Courses

NFSC 301 Statistical Methods for Nutrition and Food Sciences 2.3, 3 cr.
This is an intermediate-level course in statistics. Topics include an introduction to designs in nutrition and food science research; methods of describing data; statistical inference for means and proportions; linear and logistic regression, and an introduction to multiple regression. Prerequisites: NFSC 210, STAT 210 or EDUC 227 and CMPS 209. Fall.

NFSC 306B Community and Public Health Nutrition 2.0, 2 cr.
The course describes the role of nutrition in improving the health and well-being of communities. The course aims to equip students with the skills required to conduct population-based nutrition research; assess the nutrition needs of a population; plan, implement, and evaluate community nutrition programs and policies.

NFSC 308 Nutrition and Non-Communicable Diseases 3.0, 3 cr.
There is increasing evidence about the role of nutrition in modulating the risk of non-communicable diseases, which are highly prevalent in developed countries and are following an escalating secular trend in countries undergoing the nutrition transition. Nutrition and non-Communicable diseases course discusses the epidemiology and etiology of the major diet-related diseases including obesity, cardiovascular diseases, type 2 diabetes, and cancer, while focusing on the role of dietary factors in modulating the risk of these diseases. The course will also focus on the intersection between diet, physical activity, obesity and chronic disease from a life-course and global perspective and the potential for policy-level and individual-level approaches to address the key diet-related diseases and the main nutrition interventions and recommendations for their prevention and management. Fall.

NFSC 319 Ethics, Leadership, and Entrepreneurship in Dietetics 2.0, 2 cr.
Including nutrition laws; the nature and scope of nutrition practice, drug usage, the role of various government agencies; potential bases for discipline or other liability; and licensure requirements. Students will learn the governmental framework within which nutrition is practiced, as well as acquire an understanding of the laws, regulations, and ethical responsibilities applicable to nutritionists so that they will be able to protect the public and ensure patients' wellbeing. This course provides a broad overview of leadership theory and skills that students can use in their personal, academic, and professional worlds. Students will develop advanced competencies relevant to the innovative and entrepreneurial practice of nutrition and dietetics. Students will be able to demonstrate ethical dilemmas as they relate to nutrition and dietetics practice, standards of professional performance, and the principles and standards of the 2018 code of ethics. Spring.

NFSC 324 Advanced Nutrition Principles and Practices 1.0, 1 cr.
The course is designed to provide the principles essential for being a successful Registered Dietitian (RD) including code of ethics, scope of dietetics practice, standards of dietetics practice, and medical coding. Additionally, the nutrition practices discussed will allow students to implement the Nutrition Care Process (NCP) in advanced MNT topics, which will be beneficial during their CP practicum experience and future career. Topics to be discussed will include, but are not limited to, nutrition-focused physical examination, heart failure, solid organ transplantation, advanced ICU principles such as vasopressors and EN use, end of life nutrition, and advanced nutrition support practices. Through the use of real-life clinical case study scenarios and role-playing, students will use the NCP in developing their nutrition care plans and practice counseling techniques to improve their effectiveness in providing nutrition education and working with an interdisciplinary team. Spring.

NFSC 326 Inter-professional Seminar 0 cr.
The course introduces students to the principles of Interprofessional Education (IPE) and Interprofessional Collaborative Practice (IPCP) in which multiple health workers from different backgrounds provide comprehensive health services to patients and communities. The course features guest speakers, discussions, and applied assignments to enhance the student's knowledge and skills related to professional practice, communications, and healthcare collaboration. It includes instructor-led sessions (often involving guests from the dietetics/paramedical profession), campus-based inter-professional education, and student-led sessions designed to promote reflection and engagement on professional practice topics. Spring.

NFSC 328 Applied Clinical Dietetics 2.2.5, 3 cr.
The course includes discussions of advanced nutrition principles and practices and the provision of nutrition care using the NCP clinical workflow elements at various settings. scope of practice, Standards of Professional Performance for the Registered Dietitians Nutritionist (RDN), and the code of ethics are further discussed. Students will self-assess their knowledge and training needs for advancement to a higher level of practice, as well as their autonomy, responsibility, and accountability in the management of several nutrition-related diseases. Spring.

NFSC 375 Quantity Food Production 1.3, 2 cr.
The course will allow students to apply the theoretical principles learned in NFSC 290-Food Service Management. This course is designed to introduce students to the basic principles of food preparation including understanding of food and kitchen safety and sanitation practices, basics of nutrition and healthy menus, cooking processes, recipe costing and budgeting, basic culinary techniques, proper use of kitchen tools and equipment, elements of food preservation, and food quality. Students will apply these principles to quantity food production. Fall.

NFSC 383 Nutrition Communication and Education 3.0, 3 cr.
The course addresses nutrition communication and education theories applied to individuals and groups. It deals with fostering students' counseling techniques and educational program development as they relate to increasing positive nutritional behaviors. The course aims at developing students' knowledge and understanding of health behavior and learning theories and practices to plan and produce nutrition education programs or communication messages, tools, and techniques that will contribute to preventing diet-related diseases and promoting health. Spring.

NFSC 384 Seminar in Clinical Dietetics 1.0, 1 cr.
The course focuses on developing communication and research skills as well as strengthening the critical thinking capacities of CP students undergoing an intensive internship program, by providing them the opportunity to present and discuss all interesting nutritional issues arising during their CP practicum. Students will be asked to present topics covering the medical nutrition therapy and the food service sections. The course provides the students with the chance to share with their colleagues their experiences in any controversial nutritional issue faced during their internship rotations. Emphasis will be put on the displayed thorough scientific background about the topic in question, the originality and interest of the case/topic being presented as well as on the analysis and interpretation skills used to deliver recommendations for future consideration. The students should work closely with the CP coordinator and director throughout the preparation for the seminar. Fall.

NFSC 392 Medical Nutrition Therapy I 3.0, 3 cr.
A 3-credit lecture-based course that involves lectures and discussion. The course will cover the most commonly encountered inborn errors of metabolism as well as other clinical conditions like cancer, HIV, cystic fibrosis, and celiac disease. The course will give insight about nutrition in critical care. Lectures will highlight clinical presentation, diagnosis, and treatment -mainly, medical nutrition therapy based on evidence previous and current research. Fall.

NFSC 393 Medical Nutrition Therapy II 3.0, 3 cr.
The course covers the nutritional care process in the treatment of diet-related diseases, and how dietary intervention can control or prevent diseases. It will help students: 1) understand the pathophysiology of selected diseases in which nutritional intervention plays a major role; 2) identify the nutritional needs of patients with disease; and 3) develop an appropriate patient nutrition care plan. The course prepares students to implement the nutrition care process for various conditions, including but not limited to overweight and obesity, diabetes, cardiovascular, gastrointestinal, and renal diseases as adapted to various population groups, including infants, children, adolescents, adults, pregnant/lactating females and the elderly. Spring.

NFSC 397(FA, SA, R, FB, SB) Dietetic Practicum 11cr.
This is an integrated dietetic practicum where students spend a total of 1035 hours in medical and community facilities to carry out their supervised practice in clinical, food service, and community settings. These practicum experiences are designed to provide a balanced opportunity to become competent in all areas of dietetics with a concentration in medical nutrition therapy (MNT). In the clinical setting, supervised practice experiences emphasize nutrition management of patients in specialty nutrition practice areas. Students will develop skills in the assessment, planning, implementation of nutrition care plans for patients with varying disease states and monitor and evaluate patients' progress. In the food service rotations, supervised practice experiences emphasize increasing independence in planning, delivering, and managing all food service activities. The community rotations are designed to give the student exposure to the role of the community dietitian in a variety of community programs.

NFSC 390 Capstone Project 3 cr.

MS in Food Safety

Students may pursue a master of science in food safety with either a thesis track or a non-thesis track. Completion of the M.Sc. degree - thesis track requires a total of 31 credit hours. The non-thesis tracks requires a total of 33 credit hours.

Master of Science in Food Safety (Thesis track)

Students in the thesis track are expected to complete a 9-credit thesis under the supervision of a thesis adviser and to defend their thesis as per AUB policies concerning graduate programs. Students should complete a comprehensive exam prior to the thesis defense. After satisfactory defense of the research work, the thesis should be approved by the supervisory committee members and deposited at the AUB library.

Master of Science in Food Safety (Non-Thesis track)

Students in the non-thesis track are expected to complete a 3-credit project. Students can choose elective courses from within or outside FAFS. Non-thesis students must take at least two elective courses (8-credits) from different departments to expand their knowledge or from FAFS to pursue a specific topic in depth.

Credit Requirements for the Thesis and Non-Thesis Options for the Master of Food Safety:

Master of Science in Food Safety courses		Non-Thesis Track Credits	Thesis Track Credits
NFSC 301	Statistical Methods in Nutrition and Food Science	3	3
NFSC 310	Advanced Food Biochemistry	3	3
NFSC 350	Advanced Food Microbiology	3	3
NFSC 351	Food Safety: Contaminants and toxins	3	3
NFSC 352	Food Safety Systems	3	3
ENHL 311	Human Health Risk Assessment	3	3
NFSC 353	Advanced Applied Food Microbiology	3	3
NFSC 394	Internship	0	0
NFSC 395	Graduate Seminar	1	1

NFSC 396	Comprehensive Exam	0	0
NFSC 399	MS Thesis	-	9
NFSC 398/ NFSC 300C	Project/Tutorial	3	-
Total Core Credits		**25**	**31**
Electives		**8**	**0**
Total Credits		**33**	**31**

Core Courses (Thesis)

NFSC 301 Statistical Methods for Nutrition and Food Sciences 2.3; 3 cr.
This is an intermediate-level course in statistics. Topics include an introduction to designs in Nutrition and Food Science research; methods of describing data; statistical inference for means and proportions; linear and logistic regression, and an introduction to multiple regression. Prerequisites: STAT 210 or EDUC 227 and CMPS 209. Fall.

NFSC 310 Advanced Food Biochemistry 3.0; 3 cr.
Study of food enzymes, lipid oxidation in foods and biological systems, and genetically modified foods. Prerequisite: NFSC 261.

NFSC 350 Advanced Food Microbiology 3.0; 3 cr.
Advanced level food microbiology course examining microbes involved in food spoilage and preservation, foodborne illness (incidences, sources, mechanism of pathogenesis, biology, and ecology of major pathogens, etc...). This course will provide a perspective in advanced topics in food microbiology and describe the essential principles of advanced techniques in food microbiology and safety.

NFSC 351 Food Safety: Contaminants and Toxins 3.0; 3 cr.
The course will provide in-depth knowledge of toxins and allergens in food. It will cover the basic aspects of food and nutritional toxicology with primary emphasis on food components and food toxins. The natural toxins in food plants and animals, cancer modulating substances, mycotoxins, and all groups of contaminants such as pesticides, persistent organic pollutants (POP's), metals, packaging materials, hormones and animal drug residues will be topics stressed in the course. The purpose is to develop an understanding of the nature and properties of toxic substances and the magnitude of the hazards they present along with the biological response of the human body to such hazards.

NFSC 352 Food Safety Systems 3.0; 3 cr.
Students will examine current and emerging food safety concerns and management systems as preventative tools. Various food safety management systems are covered; HACCP, food traceability, GMPs, and recall systems. This course provides the knowledge needed in order to assist industries in meeting standards and applying different food safety systems requirements. In the course, students will be prepared to be certified for HACCP and ISO 22000.

NFSC 353 Advanced Applied Food Microbiology 1.6; 3 cr.
This course introduces food safety students to detection techniques for identifying pathogenic microorganisms in food. Through laboratory-based practical exercises, students will learn the principles underlying various analytical tools used in food analysis. The course consists of one-hour lecture sessions weekly, complemented by three-hour laboratory sessions twice a week. Prerequisite: NFSC 350.

NFSC 394 Internship 0 cr.
A one to two month's internship in the food industry that allows students to broaden their experience in the field. Weekly reports and work progress assessments should be presented to the adviser in order to follow up with the students and ensure diversity in their work.

NFSC 395 Graduate Seminar in Nutrition and Food Science 1.0; 1 cr.
graduate seminar in nutrition and food science.

NFSC 396 Comprehensive Exam 0 cr.
Comprehensive exam.

NFSC 399 MS Thesis 9 cr.
MS thesis.

ENHL 311 Human Health Risk Assessment 3 cr.
Human health risk assessment.

Core Courses (Non-Thesis)

NFSC 301 Statistical Methods for Nutrition and Food Sciences 2.3; 3 cr.
This is an intermediate-level course of statistics. Topics include an introduction to designs in nutrition and food science research; methods of describing data; statistical inference for means and proportions; linear and logistic regression, and an introduction to multiple regression. Prerequisites: STAT 210 or EDUC 227 and CMPS 209. Fall.

NFSC 310 Advanced Food Biochemistry 3.0; 3 cr.
Study of food enzymes, lipid oxidation in foods and biological systems, and genetically modified foods. Prerequisite: NFSC 261.

NFSC 350 Advanced Food Microbiology 3.0; 3 cr.
Advanced level food microbiology course examining microbes involved in food spoilage and preservation, foodborne illness (incidences, sources, mechanism of pathogenesis, biology, and ecology of major pathogens, etc...). This course will provide a perspective in advanced topics in food microbiology and describe the essential principles of advanced techniques in food microbiology and safety.

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NFSC 394 Internship 0 cr.
A one to two month's internship in the food industry that allows students to broaden their experience in the field. Weekly reports and work progress assessments should be presented to the adviser in order to follow up with the students and ensure diversity in their work.

NFSC 300 Graduate Tutorial 1-3 cr.
Directed study.

NFSC 396 Comprehensive Exam 0 cr.
Comprehensive exam.

NFSC 398 Project 3 cr.
Project.

ENHL 311 Human Health Risk Assessment 3 cr.
Human health risk assessment.

Elective Courses for the MS Degree in Food Safety

FSEC 300 Food Security: Challenges and Contemporary Debate 3 cr.
This course introduces concepts and principles of food security, namely availability, accessibility, utilization, and stability of food supply. Students are familiarized with the history of thought on food security, from Malthus to the Green Revolution to Sen and the inclusion of political and social factors in considering food security.

FSEC 310 Nutrition Security: Assessment and Intervention Strategies 3.0; 3 cr.
This course introduces students to basic principles of nutrition security, community nutrition, and nutritional ecology; and highlights the role that nutrition plays in improving the health and wellbeing of communities. The course aims to equip students with the knowledge and skills required to conduct population-based nutrition research, assess the nutrition needs of a population, to plan, implement and evaluate community nutrition programs and policies based on evidence-based practice and taking into consideration cultural, social, and contextual dimensions.

AGSC 376 Resource and Environmental Economics 3.0; 3 cr.
A course that addresses and analyzes resource and environmental problems facing today's society, with an emphasis on providing the students with an intensive introduction to the qualitative theory necessary for an effective analysis of resource problems.

AGSC 384 Rural Social Change, Development, and the Environment 3.0; 3 cr.
This course provides an understanding of economic development and underdevelopment as it relates to environmental degradation and demographic, social and cultural change with special application to the economies of the Middle East.

AVSC 304 Preventive Immunology and Patterns of Animal Diseases 3.0; 3 cr.
Basic aspects of specific and non-specific body defense mechanisms and the role of vaccination in population protection; study of the patterns of diseases. Prerequisite: BIOL 224 or AVSC 224.

AVSC 305 Poultry Diseases 3.0; 3 cr.
Etiology, clinical characteristics, identification, prevention, and control of the major infectious and metabolic diseases of poultry.

EHCL 317 Ethics and Law 1.5 cr.
This course examines the ethical and legal principles which health leaders in Lebanon and the region need to take into consideration when making systems decisions. The course draws a distinction between public health ethics and medical ethics, and it provides tools for ethical decision-making in healthcare.

ENSC 640 Toxicology and Environmental Health Hazards 3 cr.
The course presents toxicology in three sections. In the first section, the fundamental principles and essentials of toxicology are introduced, particularly dose-response, toxicokinetic, and cellular mechanisms of action. In the second section, the course discusses toxicity of main organ systems. Classic toxicants that adversely affect health, emerging hazardous human exposures, and special topics are discussed in the last section of the course. The course includes lecture style presentations, collective case studies activities and student-led discussions. Topics of local and regional relevance are also introduced through hosting guest speakers.

HMPD 314 Project Management 2 cr.
A course that exposes students to current project management trends, best practices, and strategies that can aid in better management of projects and programs in healthcare settings.

ENHL 312 Occupational Health 3 cr.
This course overviews the general principles of occupational health, relating work, the work environment, and workers' health and wellbeing to general principles of social equity and justice. The course surveys research on the social, economic, political, environmental, and health elements of a workplace using multidisciplinary approaches. Students who join the course are able to identify occupational hazards and work-related injuries and illnesses in workplaces and propose monitoring, management, and prevention strategies to lessen their impact on workers. With its emphasis on social justice, the course discusses the factors that make some workers' groups more vulnerable than others. Its unique approach emphasizes global perspectives and popular imaginations of workers through academic publications, newspaper journalism, cinema, lectures, and class discussions. This course is designed for students of multiple educational and training backgrounds and does not require prerequisite knowledge.

BIOC 317 Special Topics in Biochemistry and Genetics a-J; 1 cr.
A series of special elective courses (a-j), 1 credit each, which will emphasize the basic concepts and introduce recent developments in the fields of (a) Proteomics; (b) Metabolomics; (c) Genomics; (d) Lipidomics; (e) Enzymology; (f) Apoptosis; (g) Biochemistry of Inflammation; (h) Biochemical Toxicology; (i) Congenital Heart Problems; (j) Grant and Proposal Writing. Courses are open to medical doctors who would like to update their knowledge and to MSc/PhD graduates in biomedical and / or related fields. Elective. Prerequisite: consent of coordinator. First/second/summer term.

PHRM 315 Principles of Pharmacology 2 cr.
A course that covers the basic principles of drug action including pharmacokinetics, pharmacodynamics, pharmacogenetics, drug resistance, tolerance and toxicity, and pharmacovigilance.

MNGT 306 Leadership and Behavior in Organizations 3 cr.
This course sets the base for proper understanding and micro-level analysis of the role of individual and group behavior in organizations. It is designed as two independent modules; Module One Concerns Organizational Behavior while Module Two Concerns Leadership. The course will help students assimilate the different roles people play in an organization irrespective of their departmental positions or functional affiliations, and recognize the interactions inherent between people, structure, and environment. Particular attention is accorded to leadership as a focal point of group processes and a critical ingredient in successful organizational endeavors and transformations.

MNGT 319 Change Management 3 cr.
Examines in depth the change management process as a central paradigm in modern management theory and practice. The course spans a broad spectrum, including different change models and the various organizational forces that enable and resist change; and change processes at the individual, group, and organizational levels. The course also introduces theories, tools, approaches, and key competencies for managing change as well as practical case studies in the management of change.

MKTG 306 Marketing Management 3 cr.
This course deals with the fundamental aspects of managing and delivering marketing programs within a corporate context. Topics covered include analyzing marketing opportunities and channels; developing marketing strategies; marketing decision making, customer analysis and insight; product, pricing, communication, and promotion; and branding. The major elements of the marketing process and their relationship with each other will be thoroughly examined in local, regional, and international contexts through case examples. Additionally, students will delve into the analytical and research techniques used to make marketing decisions. The application of these techniques to marketing situations in both profit and non-profit organizations will be practiced through the use of case studies and individual assignments.

MKTG 312 Consumer Behavior 3 cr.
Uses a behavioral science perspective to describe, understand and predict the behavior of consumers in the marketplace. This course also magnifies the basic decision-making processes followed by consumers when faced with a choice situation. Prerequisite: MKTG 306.

MS in Food Technology

The M.Sc. in food technology program offers both thesis (31 cr.) and non-thesis (33 cr.) options and is normally completed over two years on a full-time basis. The program provides training in food biochemistry, food safety, food engineering and rheology, sensory evolution, and food product development.

Master of Science in Food Technology (Thesis Track)

Students in the thesis track are expected to complete a 9-credit thesis under the supervision of a thesis adviser and to defend their thesis as per AUB policies concerning graduate programs. Students should complete a comprehensive exam prior to the thesis defense. After satisfactory defense of the research work, the thesis should be approved by the supervisory committee members and deposited at the AUB library.

Master of Science in Food Technology (Non-Thesis Track)

Students in the non-thesis track are expected to complete a 3-6 credit project (tutorial). Students can choose elective courses from within or outside FAFS upon the approval of their supervisor.

Credit Requirements for Both the Thesis and Non-Thesis Options:

Master of Science in Food Technology		Non-Thesis Track Credits	Thesis Track Credits
NFSC 301	Statistical Methods in Nutrition and Food Science	3	3
NFSC 305	Sensory Evaluation of Food	3	3
NFSC 310	Advanced Food Biochemistry	3	3
NFSC 350	Advanced Food Microbiology	3	3
NFSC 370 or NFSC 377	Food Product Development or Food Packaging	3	3
NFSC 371	Food Engineering	3	3
NFSC 351	Food Safety: Contaminants and toxins	3	3
NFSC 395	Graduate Seminar	1	1
NFSC 396	Comprehensive Exam	0	0
NFSC 399	MS Thesis	-	9
NFSC 398/ NFSC 300C	Project/Tutorial	3	-
Total Core Credits		**25**	**31**
Electives		**8**	**0**
Total Credits		**33**	**31**

Core Courses (Thesis)

NFSC 301 Statistical Methods for Nutrition and Food Sciences 2.3; 3 cr.
This is an intermediate-level course in statistics. Topics include an introduction to designs in Nutrition and Food Science research; methods of describing data; statistical inference for means and proportions; linear and logistic regression, and an introduction to multiple regression. Prerequisites: STAT 210 or EDUC 227 and CMPS 209. Fall.

NFSC 305 Sensory Evaluation of Food 3.0; 3 cr.
Designed to help the food scientist solve typical sensory problems; select appropriate panelists for specific sensory tests and conduct such tests, analyze, and interpret the results, and write a report. Prerequisite: STAT 210 or EDUC 227.

NFSC 310 Advanced Food Biochemistry 3.0; 3 cr.
Study of food enzymes, lipid oxidation in foods and biological systems, and genetically modified foods. Prerequisite: NFSC 261.

NFSC 350 Advanced Food Microbiology 3.0; 3 cr.
Advanced level food microbiology course examining microbes involved in food spoilage and preservation, foodborne illness (incidences, sources, mechanism of pathogenesis, biology, and ecology of major pathogens, etc...). This course will provide a perspective in advanced topics in food microbiology and describe the essential principles of advanced techniques in food microbiology and safety.

NFSC 351 Food Safety: Contaminants and Toxins 3.0; 3 cr.
The course will provide in-depth knowledge of toxins and allergens in food. It will cover the basic aspects of food and nutritional toxicology with primary emphasis on food components and food toxins. The natural toxins in food plants and animals, mycotoxins, and all groups of contaminants such as pesticides, persistent organic pollutants (POP's), metals, packaging materials, hormones and animal drug residues will be topics stressed in the course. The purpose is to develop an understanding of the nature and properties of toxic substances and the magnitude of the hazards they present.

NFSC 370 Food Product Development 3.0; 3 cr.
Study of the chemical and physical properties of food ingredients. Designed to apply the product development process from idea generation to marketing. Prerequisite: NFSC 287 or NFSC 288.

NFSC 371 Food Engineering 3.0; 3 cr.
Basic concepts and principles of food engineering and their applications; focus on engineering design and analysis of unit operations common to food processing. Prerequisite: NFSC 291.

NFSC 377 Food Packaging 3.0; 3 cr.
This course provides the students with basic knowledge regarding food packaging materials, machinery, and technology. It provides an overview of the elements of packaging science and engineering applied to the presentation, distribution, and marketing of various food products. Prerequisite: NFSC 291.

NFSC 395 Graduate Seminar in Nutrition and Food Science 1.0; 1 cr.
Graduate seminar in nutrition and food science.

NFSC 396 Comprehensive Exam 0 cr.
Comprehensive exam.

NFSC 399 MS Thesis 9 cr.
MS thesis.

Core Courses (Non-Thesis)

NFSC 301 Statistical Methods for Nutrition and Food Sciences 2.3; 3 cr.
This is an intermediate-level course in statistics. Topics include an introduction to designs in Nutrition and Food Science research; methods of describing data; statistical inference for means and proportions; linear and logistic regression, and an introduction to multiple regression. NFSC 210 and CMPS 209. Fall.

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NFSC 395 Graduate Seminar in Nutrition and Food Science 1.0; 1 cr.
graduate seminar in nutrition and food science.

NFSC 396 Comprehensive Exam 0 cr.
Comprehensive exam.

NFSC 398 Project 3 cr.
Project.

NFSC 300C Graduate Tutorial 3 cr.
Directed study.

Elective Courses for the MS Degree in Food Technology

FSEC 300 Food Security: Challenges and Contemporary Debate 3.0; 3 cr.
This course introduces concepts and principles of food security, namely availability, accessibility, utilization, and stability of food supply. Students are familiarized with the history of thought on food security, from Malthus to the Green Revolution to Sen and the inclusion of political and social factors in considering food security.

FSEC 310 Nutrition Security: Assessment and Intervention Strategies 3.0; 3 cr.
This course introduces students to basic principles of nutrition security, community nutrition, and nutritional ecology; and highlights the role that nutrition plays in improving the health and wellbeing of communities. The course aims to equip students with the knowledge and skills required to conduct population-based nutrition research, assess the nutrition needs of a population, to plan, implement and evaluate community nutrition programs and policies based on evidence-based practice and taking into consideration cultural, social, and contextual dimensions.

AGSC 376 Resource and Environmental Economics 3.0; 3 cr.
A course that addresses and analyzes resource and environmental problems facing today's society, with an emphasis on providing the students with an intensive introduction to the qualitative theory necessary for an effective analysis of resource problems.

AGSC 384 Rural Social Change, Development, and the Environment 3.0; 3 cr.
This course provides an understanding of economic development and underdevelopment as it relates to environmental degradation and demographic, social and cultural change with special application to the economies of the Middle East.

AVSC 304 Preventive Immunology and Patterns of Animal Diseases 3.0; 3 cr.
Basic aspects of specific and non-specific body defense mechanisms and the role of vaccination in population protection; study of the patterns of diseases. Prerequisite: BIOL 224 or AVSC 224.

AVSC 305 Poultry Diseases 3.0; 3 cr.
Etiology, clinical characteristics, identification, prevention, and control of the major infectious and metabolic diseases of poultry.

EHCL 317 Ethics and Law 1.5 cr.
This course examines the ethical and legal principles which health leaders in Lebanon and the region need to take into consideration when making systems decisions. The course draws a distinction between public health ethics and medical ethics, and it provides tools for ethical decision-making in healthcare.

ENSC 640 Toxicology and Environmental Health Hazards 3.0; 3 cr.
The course presents toxicology in three sections. In the first section, the fundamental principles and essentials of toxicology are introduced, particularly dose-response, toxicokinetic, and cellular mechanisms of action. In the second section, the course discusses toxicity of main organ systems. Classic toxicants that adversely affect health, emerging hazardous human exposures, and special topics are discussed in the last section of the course. The course includes lecture style presentations, collective case studies activities and student-led discussions. Topics of local and regional relevance are also introduced through hosting guest speakers.

HMPD 314 Project Management 2 cr.
A course that exposes students to current project management trends, best practices, and strategies that can aid in better management of projects and programs in healthcare settings.

ENHL 312 Occupational Health 3.0; 3 cr.
This course overviews the general principles of occupational health, relating work, the work environment, and workers' health and wellbeing to general principles of social equity and justice. The course surveys research on the social, economic, political, environmental, and health elements of a workplace using multidisciplinary approaches. Students who join the course are able to identify occupational hazards and work-related injuries and illnesses in workplaces and propose monitoring, management, and prevention strategies to lessen their impact on workers. With its emphasis on social justice, the course discusses the factors that make some workers' groups more vulnerable than others. Its unique approach emphasizes global perspectives and popular imaginations of workers through academic publications, newspaper journalism, cinema, lectures, and class discussions. This course is designed for students of multiple educational and training backgrounds and does not require prerequisite knowledge.

BIOC 317 Special Topics in Biochemistry and Genetics a-J; 1 cr.
A series of special elective courses (a-j), 1 credit each, which will emphasize the basic concepts and introduce recent developments in the fields of (a) Proteomics; (b) Metabolomics; (c) Genomics; (d) Lipidomics; (e) Enzymology; (f) Apoptosis; (g) Biochemistry of Inflammation; (h) Biochemical Toxicology; (i) Congenital Heart Problems; (j) Grant and Proposal Writing. Courses are open to medical doctors who would like to update their knowledge and to MSc/PhD graduates in biomedical and/or related fields. Elective. Prerequisite: consent of coordinator. First/second /summer term.

PHRM 315 Principles of Pharmacology 2 cr.
A course that covers the basic principles of drug action including pharmacokinetics, pharmacodynamics, pharmacogenetics, drug resistance, tolerance and toxicity, and pharmacovigilance.

MNGT 306 Leadership and Behavior in Organizations 3.0; 3 cr.
This course sets the base for proper understanding and micro-level analysis of the role of individual and group behavior in organizations. It is designed as two independent modules; Module One Concerns Organizational Behavior while Module Two Concerns Leadership. The course will help students assimilate the different roles people play in an organization irrespective of their departmental positions or functional affiliations, and recognize the interactions inherent between people, structure, and environment. Particular attention is accorded to leadership as a focal point of group processes and a critical ingredient in successful organizational endeavors and transformations.

MKTG 312 Consumer Behavior 3.0; 3 cr.
Uses a behavioral science perspective to describe, understand and predict the behavior of consumers in the marketplace. This course also magnifies the basic decision-making processes followed by consumers when faced with a choice situation. Prerequisite: MKTG 306.

The Environment and Sustainable Development Unit (ESDU)

Director	Hamadeh, Shady

ESDU is an interdisciplinary research and development unit specializing in sustainable rural livelihoods. It was established at the Faculty of Agricultural and Food Sciences to promote collaboration on sustainable development initiatives among departments at AUB and with a variety of other institutions and organizations undertaking related activities.

ESDU activities, including research, capacity building, and outreach, aim at the following:

- Providing opportunities for faculty and students to work on real-life rural development projects.
- Fostering partnerships between research, private and public sectors, and local communities in order to develop community-based solutions.
- Networking with national, regional, and international centers and institutes in the areas of integrated natural resource management and sustainable development.

For more information, refer to: www.aub.edu.lb/fafs/esdu.

Faculty of Agricultural and Food Sciences (FAFS)

Graduate