Department of Agriculture (AGRI)

Chairperson:	Bashour, Isam
Professor Interim Emeritus:	Kawar, Nasri
Professors:	Abou Jawdah, Yusuf; Bashour, Isam; Farran, Mohamad; Haidar, Mustapha; Hamadeh, Shady
Associate Professors:	Chaaban, Jad; Chalak, Ali; Jaafar, Hadi
Assistant Professors:	Abebe, Gumataw; Martiniello, Giuliano
Lecturer:	Jaber, Lina
Instructor:	Sobh, Hana
Associates to the Department:	Bahn, Rachel Anne; Aoun, Mirella

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 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 on page 668 of this catalogue.

MS in Agricultural Economics[1]

Core Courses

AGSC 301 Statistical Methods in Agriculture 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 and Spring.*

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 student 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.*

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

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

AGSC 396 Comprehensive Exam 0 cr.

AGSC 399 MS Thesis 9 cr.

1) Students have to take 6 cr. from the above list as core requirements (other than AGSC 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 free graduate elective with the advisor's approval.

MS in Animal Science[1]

Core Courses

AGSC 301 Statistical Methods in Agriculture 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 and Spring.*

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 non-infectious 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.

AVSC 396 Comprehensive Exam 0 cr.

AVSC 399 MS Thesis 9 cr.

1) All graduate students in the POSC and ANML programs should take at least 12 credits of AVSC core courses in addition to AGSC 301.

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 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[1]

Core Courses

AGSC 301 Statistical Methods in Agriculture 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 and Spring.*

1) Students have to take 6 credits from the above list as core requirements (other than AGSC 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 advisor.

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.

AGSC 396 Comprehensive Exam 0 cr.

AGSC 399 MS Thesis 9 cr.

MS in Plant Protection[1]

Core Courses

AGSC 301 Statistical Methods in Agriculture 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 and Spring.*

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 232 or consent of instructor.*

AGSC 322[2] Plant Parasitic Fungi and Bacteria 2.3; 3 cr.
Morphology, taxonomy, and identification of fungi and bacteria parasitic on plants. *Prerequisite: AGSC 232. 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 232. 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 221, AGSC 232 and AGSC 284.*

AGSC 388[3] 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 221, AGSC 232, and AGSC 284.*

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

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

AGSC 396 Comprehensive Exam 0 cr.

AGSC 399 MS Thesis 9 cr.

1) Students have to take 6 credits from the above list as core requirements (other than AGSC 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 advisor.
2) Emphasis Plant Pathology.
3) Emphasis Entomology and Weed Science.

MS in Plant Science[1]

Core Courses

AGSC 301 Statistical Methods in Agriculture 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 and Spring.*

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 231.*

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 3.0; 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.

AGSC 396 Comprehensive Exam 0 cr.

AGSC 399 MS Thesis 9 cr.

1) Students have to take 6 credits from the above list as core requirements (other than AGSC 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 advisor.

MS in Poultry Science[1]

Core Courses

AGSC 301 Statistical Methods in Agriculture 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 and Spring.*

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.

AVSC 396 Comprehensive Exam 0 cr.

AVSC 399 MS Thesis 9 cr.

1) Students in POSC and ANML programs should take at least 12 credits of AVSC core courses in addition to AGSC 301.

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 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.