Department of  Agriculture (AGRI)

Chairperson: Hamadeh, Shady
Professor Emeritus: Kawar, Nasri
Professors: Abou Jawdah, Yusuf; Barbour, Elie; Bashour, Isam; Farran, Mohamad; Haidar, Mustapha; Hamadeh, Shady; Saad, Adib
Associate Professor: Chaaban, Jad
Assistant Professors: Chalak, Ali; Jaafar, Hadi; Prattis, Susan
Visiting Professor of Practice: Sawwan, Jamal
Visiting Assistant Professor: Abebe, Gumataw

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: Animal Science, Poultry Science, Plant Science, Plant Protection, Irrigation, and Agricultural Economics, preparing them for a productive career in Agricultural Technology, Natural Resources Management, and Agribusiness. In addition, the department is especially qualified and equipped for graduate study and research in the following areas in the following areas:

- nutrition of livestock and poultry
- diseases of livestock and poultry, including preventive immunology and the epizootiology of diseases
- production of milk, meat, and eggs as related to breeding and feeding

The graduates will then be capable of serving mainly in Lebanon, the Middle East, and/or other regions in 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 552 of this catalogue.
MS Degree in Agricultural Economics

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.
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.
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  Rural Social Change, Development and the Environment  3.0; 3cr.
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; 3cr.
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 396  Comprehensive Exam  0 cr.

AGSC 399  MS Thesis  9 cr.
MS in Animal Science

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 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 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.
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.

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.

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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.
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 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 Degree in Irrigation

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 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 395  Graduate Seminar in Agricultural Science  1.0; 1 cr.
AGSC 396  Comprehensive Exam  0 cr.
AGSC 399  MS Thesis  9 cr.
MS Degree in Plant Protection

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  Plant Parasitic Fungi and Bacteria  2.3; 3cr.
Morphology, taxonomy, and identification of fungi and bacteria parasitic on 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  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 395  Special Topics in Agricultural Science  1.0; 1 cr.
AGSC 396  Comprehensive Exam  0 cr.
AGSC 399  MS Thesis  9 cr.

Elective Courses

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

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.

1 Emphasis Plant Pathology
2 Emphasis Entomology and Weed Science
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 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.

MS Degree in Plant Science

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 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 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.

1 9 credits are required from the marked courses: AGSC 307, AGSC 308, AGSC 310, AGSC 312, AGSC 319, and AGSC 324.
AGSC 395  Special Topics in Agricultural Science  1.0; 1 cr.
AGSC 396  Comprehensive Exam  0 cr.
AGSC 399  MS Thesis  9 cr.

Elective Courses

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

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  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.

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Principles and concepts of integrated pest management (IPM); 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.**

All AGSC graduate courses are electives to all majors upon the approval of the adviser.

AGSC 300  Graduate Tutorial  1-3 cr.
Directed Study

AGSC 302  Scientific Communication  1.2; 2 crs.
The course covers the techniques of developing manuscripts, posters, and oral presentations.

AGSC 309  Drainage of Agricultural Lands  3.0; 3 cr.
Soil properties, porous media flow, hydraulic conductivity measurement, soil leaching
requirements, drainage investigations, and surface and subsurface drainage system design.
AGSC 316  Ground Water Hydrology 3.0; 3 cr.
Occurrence, storage, distribution, and movement of ground water; confined and unconfined
aquifer properties, well-aquifer hydraulics and relationships, and ground water basin
management.

AGSC 317  Surface Water 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.

AGSC 320  Project Planning and Management 3.0; 3 cr.
Project preparation, evaluation, and management. Alternate years.

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 376  Resource and Environmental Economics 3.0; 3 cr.
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.

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.
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and metabolic diseases of poultry.

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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.
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.

**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 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.