

Degree and Study Plan

College: Agricultural & Marine Sciences
Department: Animal and Veterinary Sciences
Cohort: 2017
Degree: Bachelor of Science
Major: Animal Science

Summary of Credits:

| | |
|------------------------------------------------|------------|
| University Requirements (UR) | 6 |
| Arabic | 3 |
| Contemporary Omani Society | 1 |
| Oman & Islamic Civilization or Islamic Culture | 2 |
| University Electives (UE) | 6 |
| See List A | |
| College Requirements (CR) | 29 |
| See list B | |
| College Electives (CE) | 9 |
| See list C | |
| Departmental Requirements (DR) | |
| See list D | |
| Departmental Electives | |
| See list E | |
| Major Requirements (AR) | 54 |
| See list F | |
| Major Electives (AE) | 21 |
| See list G | |
| Specialization Requirements (SR) | |
| See list H | |
| Specialization Electives (SE) | |
| See list I | |
| Minor Requirements (IR) | 6 |
| See list J | |
| Minor Electives (IE) | 12 |
| See list K | |
| TOTAL | 125 |

For Reference contact: Dr. Waleed S. Al-Marzooqi

EXT: 3730

HOD: Dr. Waleed S. Al-Marzooqi

Date:

Dean's Office: Dr. Rashid Al-Yahyai

Date:

Admission & Registration:

Date:

DEPARTMENT OF ANIMAL AND VETERINARY SCIENCES

ANIMAL SCIENCE

Study Plan: for Cohort 2017

| Sem. | Course Code | Course Title | Cr. | Pre-req./Co-req.* | Cat. |
|-------------|--------------|--------------------|----------|-------------------|------|
| ONE FALL | | Foundation Program | 0 | | UR |
| | TOTAL | | 0 | | |

| | | | | | |
|---------------|----------|----------------------------------------|---|------------------------------------------------------------------------|----|
| TWO SPRING | ARAB1001 | Arabic | 3 | | UR |
| | CAMS2000 | Intro. CAMS | 0 | | CR |
| | CAMS2003 | Intro. to Food & Resource Economics | 3 | FPEL(0560 or 0600 or 0601 or 0602 or 0603 or 0604) | CR |
| | CHEM2101 | General Chemistry I | 4 | FPEL(0560 or 0600 or 0601 or 0602 or 0603 or 0604), FPMT(0105 or 0109) | CR |
| | LANC2145 | Communication in Agricultural Sciences | 3 | FPEL(0560 or 0600 or 0601 or 0602 or 0603 or 0604) | CR |
| | | University Elective | 2 | | UE |
| TOTAL | | 15 | | | |

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|---------------|----------|--------------------------------|---|----------------------------------------------------|----|
| THREE FALL | HIST1010 | Oman & Islamic Civilization | 2 | =ISLM1010 | UR |
| | BIOL2101 | General Biology I | 4 | FPEL(0560 or 0600 or 0601 or 0602 or 0603 or 0604) | CR |
| | LANC2146 | Academic Writing in Science | 3 | LANC2145 | CR |
| | | University Elective | 2 | | UE |
| | | University Elective | 2 | | UE |
| | ANVS2101 | Introduction to Animal Science | 3 | FPEL(0560 or 0600 or 0601 or 0602 or 0603 or 0604) | CE |
| TOTAL | | 16 | | | |

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|----------------|----------|---------------------------------------|---|------------------------------------------------------------------------|----|
| FOUR SPRING | SOCY1001 | Contemporary Omani Society | 1 | = SOCI3320 | UR |
| | CAMS3000 | Seminar & Presentation Skills | 2 | CAMS2000, FPCS(0101 or 0102), FPMT(0105 or 0109), LANC2146 | CR |
| | CAMS3001 | Biometry & Experimental Design in AMS | 3 | CAMS2000, FPCS(0101 or 0102), FPMT(0105 or 0109), LANC2146 | CR |
| | PHYS2101 | General Physics I | 4 | FPEL(0560 or 0600 or 0601 or 0602 or 0603 or 0604), FPMT(0105 or 0109) | CR |
| | ANVS2201 | Introduction to Veterinary Technology | 3 | FPEL(0560 or 0600 or 0601 or 0602 or 0603 or 0604) | CE |
| | | College Elective | 3 | FPEL(0560 or 0600 or 0601 or 0602 or 0603 or 0604) | CE |
| TOTAL | | 16 | | | |

| | | | | | |
|--------------|--------------|--------------------------------------------------------|-----------|------------------------------|----|
| FIVE FALL | ANVS3101 | Genetics and Animal Breeding | 3 | ANVS(2101 or 2201), BIOL2101 | AR |
| | ANVS3102 | Animal Health | 3 | ANVS(2101 or 2201), BIOL2101 | AR |
| | ANVS3104 | Anatomy and Histology | 3 | ANVS(2101 or 2201), BIOL2101 | AR |
| | ANVS3108 | Farm Sanitation, Disease Control & Preventive Medicine | 3 | ANVS(2101 or 2201), BIOL2101 | AR |
| | ANVSXXXX | Major Elective | 3 | Check pre-requisites | AE |
| | TOTAL | | 15 | | |

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|---------------|----------|---------------------------|-----------|--------------------------------|----|
| SIX SPRING | ANVS3105 | Fundamentals of Nutrition | 3 | (ANVS(2101 or 2201)), BIOL2101 | AR |
| | ANVS3106 | Systemic Physiology | 3 | ANVS(2101 or 2201), BIOL2101 | AR |
| | ANVS4102 | Poultry Production | 3 | ANVS(2101 or 2201) + CR* | AR |
| | ANVSXXXX | Major Elective | 3 | Check pre-requisites | AE |
| | ANVSXXXX | Major Elective | 3 | Check pre-requisites | AE |
| TOTAL | | | 15 | | |

| | | | | | |
|---------------|----------|--------------------------------|-----------|------------------------------|----|
| SEVEN FALL | ANVS3107 | Animal Reproductive Physiology | 3 | ANVS(2101 or 2201), BIOL2101 | AR |
| | ANVS3208 | Veterinary Immunology | 3 | ANVS(2101 or 2201), BIOL2101 | AR |
| | ANVS4113 | Animal Biotechnology | 3 | ANVS(2101 or 2201) + CR* | AR |
| | ANVSXXXX | Major Elective | 3 | Check pre-requisites | AE |
| | ANVSXXXX | Major Elective | 3 | Check pre-requisites | AE |
| TOTAL | | | 15 | | |

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|-----------------|----------|----------------------------|-----------|--------------------------|----|
| EIGHT SPRING | ANVS4124 | Dairy and Beef Production | 3 | ANVS(2101 or 2201) + CR* | AR |
| | ANVS4106 | Sheep and Goats Production | 3 | ANVS(2101 or 2201) + CR* | AR |
| | ANVS4108 | Meat Science | 3 | ANVS(2101 or 2201) + CR* | AR |
| | ANVS4111 | Horse Management and Care | 3 | ANVS(2101 or 2201) + CR* | AR |
| | ANVSXXXX | Major Elective | 3 | Check pre-requisites | AE |
| TOTAL | | | 15 | | |

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|--------|--------------|---------------------------|---|----------|----|
| SUMMER | ANVS 4800 | Animal Science Internship | 3 | CR* | AR |
| | TOTAL | | | 3 | |

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|--------------|----------|--------------------------------|-----------|--------------------------|----|
| NINE FALL | CAMS4101 | Management & Business Skills | 3 | CR* | CR |
| | ANVS3109 | Farm Practicum | 3 | ANVS(2101 or 2201) + CR* | AR |
| | ANVS4107 | Animal Nutrition | 3 | ANVS3105 + CR* | AR |
| | ANVS4104 | Camel Physiology and Husbandry | 3 | ANVS(2101 or 2201) + CR* | AR |
| | ANVSXXXX | Major Elective | 3 | Check pre-requisites | AE |
| TOTAL | | | 15 | | |

* CR - CAMS college requirement courses which are BIOL2101, CAMS2000, CAMS2003, CAMS3000, CAMS3001, CHEM2101, PHYS(2101 or 2107).

DEPARTMENT OF ANIMAL AND VETERINARY SCIENCES

ANIMAL SCIENCE

LIST B: College Requirements (29 Credits)

| Course Code | Course Title | Cr. | Pre-Requisite | Equivalents |
|-------------|--------------------------------------------------|-----|------------------------------------------------------------------------|-------------|
| BIOL2101 | General Biology I | 4 | FPEL(0560 or 0600 or 0601 or 0602 or 0603 or 0604) | |
| CAMS2000 | Introduction to Agricultural and Marine Sciences | 0 | | |
| CAMS2003 | Introduction to Food and Resource Economics | 3 | FPEL(0560 or 0600 or 0601 or 0602 or 0603 or 0604) | |
| CAMS3000 | Seminar and Presentation Skills | 2 | CAMS2000, FPCS(0101 or 0102), FPMT(0105 or 0109), LANC2146 | |
| CAMS3001 | Biometry and Experimental Design in AMS | 3 | CAMS2000, FPCS(0101 or 0102), FPMT(0105 or 0109), LANC2146 | |
| CAMS4001 | Management and Business Skills | 3 | CR* | |
| CHEM2101 | General Chemistry I | 4 | FPEL(0560 or 0600 or 0601 or 0602 or 0603 or 0604), FPMT(0105 or 0109) | |
| LANC2145 | Communication in Agricultural | 3 | FPEL(0560 or 0600 or 0601 or 0602 or 0603 or 0604) | |
| LANC2146 | Academic Writing in Science | 3 | LANC2145 | |
| PHYS2101 | General Physics I | 4 | FPEL(0560 or 0600 or 0601 or 0602 or 0603 or 0604), FPMT(0105 or 0109) | |

LIST C: College Electives (9 Credits)

| Course Code | Course Title | Cr. | Pre-Requisite | Equivalents |
|-------------|-----------------------------------------------|-----|----------------------------------------------------|-------------|
| ANVS2101 | Introduction to Animal Science | 3 | FPEL(0560 or 0600 or 0601 or 0602 or 0603 or 0604) | ANVS2001 |
| ANVS2201 | Introduction to Veterinary Technology | 3 | | ANVS2002 |
| CROP2510 | Introduction to Crop Production | 3 | | |
| FSHN2101 | Principles of Food Science | 3 | | FSHN2071 |
| FSHN2301 | Introduction to Human Nutrition and Dietetics | 3 | | |
| MASF2003 | Introduction to Marine Science and Fisheries | 3 | | |
| SWAE2001 | Introduction to Agricultural Engineering | 3 | | |
| SWAE2201 | Introduction to Soils and Water | 3 | | |

* CR - CAMS college requirement courses which are BIOL2101, CAMS2000, CAMS2003, CAMS3000, CAMS3001, CHEM2101, PHYS(2101 or 2107).

DEPARTMENT OF ANIMAL AND VETERINARY SCIENCES

ANIMAL SCIENCE

LIST F: Major Requirements (54 Credits)

| Course Code | Course Title | Cr. | Pre-Requisite | Equivalents |
|-------------|--------------------------------------------------------|-----|-------------------------------|-------------|
| ANVS3101 | Genetics and Animal Breeding | 3 | ANVS(2101 or 2201), BIOL2101 | |
| ANVS3102 | Animal Health | 3 | ANVS(2101 or 2201), BIOL2101 | |
| ANVS3104 | Anatomy and Histology | 3 | ANVS(2101 or 2201), BIOL2101 | |
| ANVS3105 | Fundamentals of Nutrition | 3 | (ANVS(2101 or 2201), BIOL2101 | |
| ANVS3106 | Systemic Physiology | 3 | ANVS(2101 or 2201), BIOL2101 | |
| ANVS3107 | Animal Reproductive Physiology | 3 | ANVS(2101 or 2201), BIOL2101 | |
| ANVS4113 | Animal Biotechnology | 3 | ANVS(2101 or 2201) + CR* | |
| ANVS3208 | Veterinary Immunology | 3 | ANVS(2101 or 2201), BIOL2101 | |
| ANVS4124 | Dairy and Beef Production | 3 | ANVS(2101 or 2201) + CR* | |
| ANVS4102 | Poultry Production | 3 | ANVS(2101 or 2201) + CR* | |
| ANVS4104 | Camel Physiology and Husbandry | 3 | ANVS(2101 or 2201) + CR* | |
| ANVS3109 | Farm Practicum | 3 | ANVS(2101 or 2201) + CR* | |
| ANVS4106 | Sheep and Goat Production | 3 | ANVS(2101 or 2201) + CR* | |
| ANVS4107 | Animal Nutrition | 3 | ANVS3105 + CR* | |
| ANVS4108 | Meat Science | 3 | ANVS(2101 or 2201) + CR* | |
| ANVS4111 | Horse Management and Care | 3 | ANVS(2101 or 2201) + CR* | |
| ANVS4800 | Animal Science Internship | 3 | After 87 credits + CR* | |
| ANVS3108 | Farm Sanitation, Disease Control & Preventive Medicine | 3 | ANVS(2101 or 2201), BIOL2101 | |

LIST G: Major Electives (21 Credits)**

| Course Code | Course Title | Cr. | Pre-Requisite | Equivalents |
|-------------|--------------------------------------------------|-----|------------------------------------|-------------|
| ANVS2204 | Veterinary Parasitology | 3 | ANVS(2101 or 2201), BIOL2101 | |
| ANVS2206 | Veterinary Microbiology | 3 | ANVS(2101 or 2201), BIOL2101 | |
| ANVS3211 | Veterinary Hematology | 3 | ANVS(2101 or 2201), BIOL2101 | |
| ANVS3212 | Clinical Chemistry, Cytology & Urology | 3 | ANVS3211, BIOL2101 | |
| ANVS4110 | Veterinary Pathology & Necropsy Techniques | 3 | ANVS3104 + CR* | |
| ANVS4112 | Diseases of Large Animals | 3 | ANVS3106 + CR* | |
| ANVS4213 | Diagnostic Microbiology | 3 | ANVS2206 + CR* | |
| ANVS4902 | Research Project in Animal & Veterinary Sciences | 3 | Manual Registration, GPA≥2.0 + CR* | |

* CR - CAMS college requirement courses which are BIOL2101, CAMS2000, CAMS2003, CAMS3000, CAMS3001, CHEM2101, PHYS(2101 or 2107).

** Courses from any Department (preferably related to a Minor) of the College of Agricultural and Marine Sciences or another College, may be selected with the approval of Academic Advisor, Head of Department and Assistant Dean of Undergraduate Studies. **No course will be approved without filling the substitution form and getting all necessary approvals prior registering any course not listed in the above degree plan.**

DEPARTMENT OF ANIMAL AND VETERINARY SCIENCES**ANIMAL SCIENCE****LIST J: Minor Requirements (3 Credits)**

| Course Code | Course Title | Cr. | Pre-Requisite |
|--------------------|--------------------------------|------------|----------------------------------------------------|
| ANVS2101 | Introduction to Animal Science | 3 | FPEL(0560 or 0600 or 0601 or 0602 or 0603 or 0604) |

LIST K: Minor Electives (15 Credits)

| Course Code | Course Title | Cr. | Pre-Requisite |
|--------------------|--------------------------------|------------|-------------------------------|
| ANVS3208 | Veterinary Immunology | 3 | ANVS(2101 or 2201), BIOL2101 |
| ANVS3101 | Genetics and Animal Breeding | 3 | ANVS(2101 or 2201), BIOL2101 |
| ANVS3102 | Animal Health | 3 | ANVS(2101 or 2201), BIOL2101 |
| ANVS3104 | Anatomy and Histology | 3 | ANVS(2101 or 2201), BIOL2101 |
| ANVS3105 | Fundamentals of Nutrition | 3 | (ANVS(2101 or 2201), BIOL2101 |
| ANVS3106 | Systemic Physiology | 3 | ANVS(2101 or 2201), BIOL2101 |
| ANVS3107 | Animal Reproductive Physiology | 3 | ANVS(2101 or 2201), BIOL2101 |
| ANVS4124 | Dairy and Beef Production | 3 | ANVS(2101 or 2201) + CR* |
| ANVS4102 | Poultry Production | 3 | ANVS(2101 or 2201) + CR* |
| ANVS4104 | Camel Physiology and Husbandry | 3 | ANVS(2101 or 2201) + CR* |
| ANVS4106 | Sheep and Goat Production | 3 | ANVS(2101 or 2201) + CR* |
| ANVS4107 | Animal Nutrition | 3 | ANVS3105 + CR* |
| ANVS4113 | Animal Biotechnology | 3 | ANVS(2101 or 2201) + CR* |
| ANVS4111 | Horse Management and Care | 3 | ANVS(2101 or 2201) + CR* |

LIST J: MINOR REQUIREMENTS

Within CAMS (18 credits):

J1. Minor in Animal Science (18 credits)

| Course Code | Course Title | Cr. | Pre-Requisite |
|----------------------------------------|--------------------------------|-----|----------------------------------------------------|
| ANVS2101 | Introduction to Animal Science | 3 | FPEL(0560 or 0600 or 0601 or 0602 or 0603 or 0604) |
| Five courses from the following | | | |
| ANVS3208 | Veterinary Immunology | 3 | ANVS(2101 or 2201), BIOL2101 |
| ANVS3101 | Genetics and Animal Breeding | 3 | ANVS(2101 or 2201), BIOL2101 |
| ANVS3102 | Animal Health | 3 | ANVS(2101 or 2201), BIOL2101 |
| ANVS3104 | Anatomy and Histology | 3 | ANVS(2101 or 2201), BIOL2101 |
| ANVS3105 | Fundamentals of Nutrition | 3 | (ANVS(2101 or 2201), BIOL2101 |
| ANVS3106 | Systemic Physiology | 3 | ANVS(2101 or 2201), BIOL2101 |
| ANVS3107 | Animal Reproductive Physiology | 3 | ANVS(2101 or 2201), BIOL2101 |
| ANVS4124 | Dairy and Beef Production | 3 | ANVS(2101 or 2201) + CR* |
| ANVS4102 | Poultry Production | 3 | ANVS(2101 or 2201) + CR* |
| ANVS4104 | Camel Physiology and Husbandry | 3 | ANVS(2101 or 2201) + CR* |
| ANVS4106 | Sheep and Goat Production | 3 | ANVS(2101 or 2201) + CR* |
| ANVS4107 | Animal Nutrition | 3 | ANVS3105 + CR* |
| ANVS4113 | Animal Biotechnology | 3 | ANVS(2101 or 2201) + CR* |
| ANVS4111 | Horse Management and Care | 3 | ANVS(2101 or 2201) + CR* |

J2. Minor in Crop Sciences (18 credits)

| Course Code | Course Title | Cr. | Pre-Requisite |
|----------------------------------------|-------------------------------|-----|----------------------------------------------------|
| CROP2510 | Introduction to Crop Sciences | 3 | FPEL(0560 or 0600 or 0601 or 0602 or 0603 or 0604) |
| Five courses from the following | | | |
| CROP2011 | Ornamental Horticulture | 3 | BIOL2101 |
| CROP3502 | Forages and Pastures | 3 | BIOL2101,CROP2510 |
| CROP3512 | Vegetable Production | 3 | CROP2510 |
| CROP3514 | Fruit Production | 3 | CROP2510 |
| CROP3522 | Plant Pathology | 3 | BIOL2101 |
| CROP3526 | General Entomology | 3 | BIOL2101 |
| CROP3005 | Field Crop Production | 3 | CROP2510 |
| CROP4514 | Landscape Plant Management | 3 | CROP2011 + CR* |

J3. Minor in Food Science (18 credits)

| Course Code | Course Title | Cr. | Pre-Requisite |
|----------------------------------------|---------------------------------------------|-----|----------------------------------------------------|
| FSHN2101 | Principles of Food Science | 3 | FPEL(0560 or 0600 or 0601 or 0602 or 0603 or 0604) |
| Five courses from the following | | | |
| FSHN3101 | Properties of Food & Agricultural Materials | 3 | (FSHN2101 or SWAE2001), PHYS(2101 or 2107) |
| FSHN3103 | Food Analysis | 3 | CHEM3324, FSHN2302 |
| FSHN3104 | Food Chemistry I | 3 | CHEM3324, FSHN2302 |
| FSHN3105 | Food Microbiology I | 3 | BIOL3441 |
| FSHN3106 | Food Processing I | 3 | FSHN2101 or SWAE2001 |
| FSHN3107 | Food Sanitation and Quality Control | 3 | BIOL3441, FSHN2101 |
| FSHN3108 | Food Packaging | 3 | FSHN3102 or PHYS2102 |
| FSHN3109 | Sensory Evaluation of Food | 3 | FSHN2101, CAMS3001 |
| FSHN4107 | Milk and Milk Products | 3 | FSHN(3104, 3105, 3106) + CR* |

J4. Minor in Human Nutrition (18 credits)

| Course Code | Course Title | Cr. | Pre-Requisite |
|----------------------------------------|-----------------------------------------------|-----|----------------------------------------------------|
| FSHN2301 | Introduction to Human Nutrition and Dietetics | 3 | FPEL(0560 or 0600 or 0601 or 0602 or 0603 or 0604) |
| FSHN2302 | Principles of Biochemistry | 3 | BIOL2101, CHEM2101 |
| Five courses from the following | | | |
| FSHN3305 | Macronutrients in Human Nutrition | 3 | FSHN2301, (BIOL2101 or CHEM2101) |
| FSHN3306 | Micronutrients in Human Nutrition | 3 | FSHN (2302, 3305) |
| FSHN3307 | Nutrition Assessment and Planning | 3 | FSHN (2301, 2302) |
| FSHN3111 | Public Sanitation**** | 3 | BIOL3441, FSHN2101 |
| FSHN3309 | Life Cycle Nutrition | 3 | FSHN (2301, 3307) |
| FSHN4306 | Community Nutrition | 3 | FSHN(2301, 3307) + CR* |

**** Students who pass FSHN3075 cannot take FSHN3111

J5. Minor in Marine Science and Fisheries (18 credits)

| Course Code | Course Title | Cr. | Pre-Requisite |
|-------------|--------------------------------------------------------------------------------|-----|----------------------------------------------------|
| MASF2003 | Introduction to Marine Science and Fisheries | 3 | FPEL(0560 or 0600 or 0601 or 0602 or 0603 or 0604) |
| MASFXXXX | Any MASF2000/3000/4000 level courses (excluding University Electives) | 15 | Check pre-requisites |

J6. Minor in Natural Resource Economics (18 credits)

| Course Code | Course Title | Cr. | Pre-Requisite |
|----------------------------------------|--------------------------------------------------|-----|----------------------------------------------------|
| CAMS2003 | Introduction to Food and Resource Economics | 3 | FPEL(0560 or 0600 or 0601 or 0602 or 0603 or 0604) |
| Five courses from the following | | | |
| NREC3011 | Economics of Fisheries Management | 3 | CAMS2003 |
| NREC3101 | Marketing of Agricultural and Fisheries Products | 3 | CAMS2003 |
| NREC3106 | Social Survey Design and Analysis | 3 | CAMS(2003, 3001) |
| NREC3107 | Food Service Systems- Operations Management | 3 | FSHN2072 or NREC3101 |
| NREC3300 | Natural Resource and Environmental Economics | 3 | CAMS2003 |
| NREC4103 | Agribusiness Entrepreneurships | 3 | CR* |
| NREC4230 | Agricultural Finance | 3 | CR* |
| NREC4430 | Benefit Cost Analysis | 3 | CR* |
| NREC4500 | Extension Methods and Techniques | 3 | CR* |

J7. Minor in Soil Sciences (18 credits)

| Course Code | Course Title | Cr. | Pre-Requisite |
|----------------------------------------|-------------------------------------------------------------------------------------|-----|----------------------------------------------------|
| SWAE2201 | Introduction to Soil and Water | 3 | FPEL(0560 or 0600 or 0601 or 0602 or 0603 or 0604) |
| Five courses from the following | | | |
| SWAE3002 | Desertification & Land Restoration | 3 | SWAE2201 |
| SWAE3302 | Environmental Soil Chemistry | 3 | CHEM2101, SWAE2201 |
| SWAE3304 | Soil and Water Conservation | 3 | PHYS2101, (SWAE2001or SWAE2201) |
| SWAE3311 | Environmental Soil Physics | 3 | PHYS2101, (SWAE2001or SWAE2201) |
| SWAE3411 | Environmental Soil Microbiology | 3 | BIOL2101 |
| SWAE4111 | Hydropedology for Soil-Water-Landscape Interactions Water-Landscape Interactions | 3 | SWAE(2201, 3303, 3311) + CR* |
| SWAE4401 | Water and Nutrients in Soil-Plant Environments | 3 | SWAE2201 + CR* |
| SWAE4404 | Soil Genesis and Classification | 3 | ERSC2101 or SWAE2201 + CR* |
| SWAE4412 | Management of Salt-Affected Soils | 3 | SWAE2201 + CR* |

J8. Minor in Water Technology (18 credits)

| Code | Title | Cr. | Pre-Requisite |
|----------------------------------------|-------------------------------------------|-----|----------------------------------------------------|
| SWAE2201 | Introduction to Soil and Water | 3 | FPEL(0560 or 0600 or 0601 or 0602 or 0603 or 0604) |
| Five courses from the following | | | |
| SWAE3303 | Elements of Hydrology | 3 | PHYS(2101 or 2107), SWAE(2201 or 2001) |
| SWAE3310 | Fundamentals of Fluid Mechanics | 3 | MATH2107, PHYS(2101 or 2107) |
| SWAE3315 | Water Quality | 3 | CHEM2101, SWAE2201 |
| SWAE3402 | Irrigation Principles | 3 | SWAE2201 |
| SWAE4217 | Transport of Chemicals in Porous Media | 3 | SWAE(3303, 3311) + CR |
| SWAE4305 | Water Control and Supply | 3 | SWAE(2201, 3310)+ CR* |
| SWAE4325 | Water Treatment | 3 | CHEM2101, MATH2107, SWAE3315 + CR* |
| SWAE4400 | Ground Water Hydrology | 3 | SWAE3303 + CR* |
| SWAE4402 | Design & Management of Irrigation Systems | 3 | SWAE(3310, 3402) + CR* |

Minors outside CAMS (18 credits):**Minors from the College of Science****J9. Minor in Biotechnology (18 credits)**

| Required Courses (7 Credits) | | | |
|---------------------------------------------|--------------------------------------------|-----|-----------------------------------------------|
| Code | Course Title | Cr. | Prerequisite |
| BIOL2101 | General Biology-I | 4 | FPEL 0560 or FPEL0600 or FPEL0603 or FPEL0604 |
| BIOL3202 | Molecular Biology | 3 | BIOL2101 + LANC2058 |
| Remaining credits from the following | | | |
| BIOL3441 | Introductory Microbiology | 3 | BIOL2101 + LANC2058 |
| BIOL4034 | Biochemistry | 3 | BIOL2101 & CHEM3322 |
| BIOL4046 | Fundamentals of Biotechnology | 3 | BIOL3202 |
| BIOL4500 | Cell Biology | 3 | BIOL2101 |
| BIOL5120 | Microbial Biotechnology | 3 | BIOL 4046 & BIOL3441 |
| BIOL5132 | Tissue Culture | 3 | BIOL 4046 & BIOL4500 |
| BIOL5402 | Immunology | 3 | BIOL4500 |
| BIOL5040 | Microbial Genetics and Genetic Engineering | 3 | BIOL3441 |

J10. Minor in Environmental Biology (18 credits)

| Required Courses (8 Credits) | | | |
|---------------------------------------------|---------------------------------------|-----|-----------------------------------------------|
| Course Code | Course Title | Cr. | Prerequisite |
| BIOL2101 | General Biology-I | 4 | FPEL 0560 or FPEL0600 or FPEL0603 or FPEL0604 |
| BIOL2102 | General Biology-II | 4 | BIOL2101+ LANC2058 |
| Remaining credits from the following | | | |
| BIOL2600 | Biodiversity | 3 | BIOL2101 + LANC2058 |
| BIOL3005 | Ecology | 3 | BIOL2102+ LANC2058 |
| BIOL3205 | Invertebrates | 3 | BIOL2102+ LANC2058 |
| BIOL3009 | Introduction to Environmental Science | 3 | BIOL2102+ LANC2058 |
| BIOL3410 | Angiosperm Biology | 3 | BIOL2102+ LANC2058 |
| BIOL4009 | Waste management | 3 | BIOL2102 |
| BIOL4021 | Vertebrate Zoology | 3 | BIOL2102 |
| BIOL4023 | Entomology | 3 | BIOL2102 |
| BIOL5010 | Ecotoxicology | 3 | BIOL3009 |
| BIOL4054 | Marine Biology | 3 | BIOL3005 |

| | | | |
|----------|---------------------------------|---|----------|
| BIOL5052 | Fresh Water Biology | 3 | BIOL3005 |
| BIOL5021 | Desert Biology | 3 | BIOL3005 |
| BIOL5610 | Environmental impact assessment | 3 | BIOL3005 |

J11. Chemistry (18 credits)

| Required Courses (12 Credits) | | | |
|--------------------------------------|------------------------------------------------------------------|--------|----------------------------------------------------------------------------------------------|
| Code | Title | Cr. | Pre-req./Co-req.* |
| CHEM2101 | General Chemistry I | 4 | FPEL0560 or FPEL0600 or FPEL0601 or FPEL0602 FPEL0603 or FPEL0604 and (FPMT0105 or FPMT0109) |
| CHEM2102 | General Chemistry II | 4 | CHEM2101 or CHEM1071 |
| CHEM3322 or CHEM3324 | Organic Chemistry I or Organic Chemistry | 4 4 | LANC2058 and CHEM2101 (LANC2058 or LANC2161) and (CHEM1071 or CHEM2101) |
| Remaining credits from the following | | | |
| Code | Title | Cr. | Pre-req./Co-req.* |
| CHEM2350 | Chemical Safety: Protecting ourselves and the environment | 3 | CHEM2101 or CHEM1071 or CHEM2110 |
| CHEM3311 | Inorganic Chemistry I | 3 | LANC2058 and CHEM2102 and MATH2107 |
| CHEM3328 | Green Chemistry | 3 | LANC2058 and (CHEM3322 or CHEM3324) |
| CHEM3333 | Physical Chemistry I | 3 | LANC2058 and CHEM2101 and PHYS2101 and MATH2107 |
| CHEM3337 | Fundamentals of the Corrosion of Metals | 3 | LANC2058 and (CHEM2101 or CHEM1071) |
| CHEM3348 | Introduction to Chemical and Instrumental Analysis | 3 | CHEM2102 |
| CHEM3350 | Environmental Chemistry | 3 | LANC2058 and CHEM2102 |
| CHEM3400 | Introduction to Chemical Process Industries | 3 | LANC2058 and CHEM2101 and CHEM3333* |
| CHEM3420 | Petroleum Chemistry | 3 | LANC2058 and (CHEM3322 or CHEM3324) |
| CHEM4412 | Inorganic Materials | 3 | CHEM3311 |
| CHEM4414 | Fundamentals of X-ray Crystallography | 3 | CHEM3311 |
| CHEM4424 | Introduction to Natural Products | 3 | CHEM3324 or CHEM4422 |
| CHEM4429 | Fundamentals of Medicinal Chemistry and Drug Design | 3 | CHEM3324 or CHEM4422 |
| CHEM4433 | Physical Chemistry II | 3 | CHEM3333 and MATH2108 |
| CHEM4437 | Electrochemistry: Fundamentals and Applications | 3 | CHEM3333 |
| CHEM4445 | Forensic Chemistry | 3 | CHEM3341 or CHEM3348 |
| CHEM4472 | Fine Chemicals | 3 | CHEM3324 or CHEM4422 |
| CHEM4477 | Essentials of Biological Chemistry | 3 | CHEM3324 or CHEM4422 |
| CHEM5537 | Surfactants: Principles & Applications in the Petroleum Industry | 3 | CHEM3333 or CHPE3102 |
| CHEM5539 | Chemical Sensors | 3 | CHEM3333 and (CHEM3348 or CHEM4441) |

J12. Computer Science (18 credits)

| Required Courses (7 Credits) | | | |
|--------------------------------------|-------------------------------------------------------------------|---------|-------------------------------------------------------------------------|
| Code | Title | Credits | Pre-Requisite / Co-Requisite* |
| COMP2101 | Introduction to Computer Science | 4 | FPELO560 or FPELO600 or FPELO603 or FPELO604) and (FPCS0101 or PCS0102) |
| COMP2201 | Fundamentals of Object Oriented Programming | 3 | COMP2101 |
| Remaining credits from the following | | | |
| Code | Title | Credits | Pre-Requisite / Co-Requisite* |
| COMP2102 | Problem Solving and Programming | 3 | COMP2101 |
| COMP2105 | Introduction to Problem Solving with Visual Basic | 3 | COMP2101 |
| COMP3203 | Introduction to Data Structures and Algorithms | 3 | COMP2201 and MATH3340 and LANC2058 |
| COMP3204 | Advanced Java Programming | 3 | COMP2201 and LANC2058 |
| COMP3205 | Database Systems | 3 | COMP3203 and LANC2058 |
| COMP3302 | Introduction to Multimedia | 3 | COMP2201 and LANC2058 |
| COMP3401 | Introduction to Software Engineering | 4 | COMP2201 and LANC2058 |
| COMP3501 | Computer Organization & Assembly Language | 3 | COMP2201 and ECCE3206 and LANC2058 |
| COMP3502 | Computer Networks | 3 | COMP3501 and LANC2058 |
| COMP3600 | Intelligent Systems | 3 | COMP3203 and LANC2058 |
| COMP3601 | Bioinformatics Algorithms | 3 | BIOL2101 and COMP2101 |
| COMP3700 | Introduction to Web Computing | 3 | COMP3203 and LANC2058 / COMP3205* |
| COMP4100 | Ethics and Skills for Computing Professionals | 2 | COMP3401 |
| COMP4202 | Database Development | 3 | COMP3205 |
| COMP4204 | Advanced Data Structures and Algorithms | 3 | COMP3203 and MATH3340 |
| COMP4205 | Competitive Programming | 3 | COMP3203 |
| COMP4212 | Introduction to Information Retrieval | 3 | COMP3203 |
| COMP4300 | Computer Graphics I | 3 | COMP3203 and MATH2202 |
| COMP4402 | Software Testing | 3 | COMP3401 |
| COMP4404 | Software Project Management | 3 | COMP3401 |
| COMP4471 | Computational Methods | 3 | COMP2101 and MATH2108 and MATH2202 |
| COMP4501 | Fundamentals of Operating Systems | 3 | COMP3203 and COMP3501 |
| COMP4504 | Wireless Networks | 3 | COMP3502 |
| COMP4506 | Systems and Networks Programming | 3 | COMP4501 and COMP3502 |
| COMP4603 | Machine Learning | 3 | COMP3600 and STAT2103 |
| COMP4604 | Digital Image Processing | 3 | COMP3600 |
| COMP4701 | Web Application Development | 3 | COMP3700 and COMP3205 |
| COMP4704 | Mobile Application Development | 3 | COMP3700 and COMP3205 |
| COMP5101 | Comparative Programming Languages | 3 | COMP3203 and COMP3501 |
| COMP5400 | Software Architecture and Design | 3 | COMP3401 |
| COMP5401 | Requirement Engineering | 3 | COMP3401 |
| COMP5504 | Distributed Systems | 3 | COMP4506 |
| COMP5507 | Cryptography and Network Security | 3 | COMP3203 and COMP3502 |
| COMP5508 | Interconnection Networks for Multiprocessor and Multicore Systems | 3 | COMP3502 |
| COMP5509 | Penetration Testing and Ethical Hacking | 3 | COMP4507 |
| COMP5511 | Computer Forensics | 3 | COMP4507 |
| COMP5521 | Finite Automata & Formal Languages | 3 | MATH3340 |
| COMP5522 | Compiler Construction | 3 | COMP3501 and COMP5521 |
| COMP5603 | Computer Vision | 3 | COMP4603 |
| COMP5605 | Mobile Robotics | 3 | COMP3600 and MATH2108 |

| Remaining credits from the following | | | |
|---------------------------------------------|-----------------------------------------|----------------|--------------------------------------|
| Code | Title | Credits | Pre-Requisite / Co-Requisite* |
| COMP5701 | Web Services | 3 | COMP3700 |
| COMP5702 | Semantic Web | 3 | COMP4701 |
| COMP5704 | Web Data Mining and Knowledge Discovery | 3 | COMP3700 and STAT2103 |

J13. Earth Science (18 credits)

| Required Courses (8 Credits) | | | |
|---------------------------------------------|-----------------------------------------------|------------|-------------------------------------------------|
| Course Code | Course Title | Cr. | Prerequisite (Co-requisite*) |
| ERSC2101 | Introduction to Geology I | 4 | FPEL0560 or FPEL0600 or FPEL0603 or FPEL0604 |
| ERSC2102 | Introduction to Geology II | 4 | ERSC2101 |
| Remaining credits from the following | | | |
| ERSC2211 | Palaeontology I | 3 | ERSC2101 and LANC2058 |
| ERSC3000 | Environmental Geology | 3 | ERSC2101 and LANC2058 |
| ERSC3002 | Environmental Site Assessment and Remediation | 3 | ERSC2102 and ERSC3000 and LANC2058 |
| ERSC3010 | Mineralogy | 3 | ERSC2102* and LANC2058 |
| ERSC3021 | Structural Geology | 3 | ERSC2102 and LANC2058 |
| ERSC3041 | Stratigraphy | 3 | ERSC2102 and LANC2058 |
| ERSC3051 | Igneous Petrology | 3 | ERSC3010 and LANC2058 |
| ERSC3061 | Introduction to Remote Sensing | 3 | ERSC2102 and LANC2058 |
| ERSC3901 | Sedimentary Petrology | 3 | ERSC2211 and ERSC3010 |
| ERSC4012 | Metamorphic Petrology | 3 | ERSC3051 |
| ERSC4031 | Geochemistry | 3 | ERSC2102 and CHEM2101 |
| ERSC4032 | Environmental Geochemistry | 3 | ERSC2101 and CHEM2101 |
| ERSC4040 | Geological Interpretation of Well-logs | 3 | ERSC3041 |
| ERSC4051 | Hydrogeology | 3 | ERSC3000 |
| ERSC4071 | Economic Geology | 3 | ERSC3051 |
| ERSC4311 | Sedimentary Environments and Facies | 3 | ERSC3901 |
| ERSC4321 | Structural Geology II | 3 | ERSC3021 |
| ERSC5011 | Basin Analysis | 3 | ERSC3021 and ERSC4311 |
| ERSC5012 | Techniques in Sequence Stratigraphy | 3 | ERSC4311 |
| ERSC5031 | Tectonics | 3 | ERSC3021 |
| ERSC5051 | Petroleum Geology | 3 | ERSC3041 |
| ERSC5061 | Exploration Geophysics | 3 | GEOP3041 |
| GEOP3041 | General Geophysics | 3 | ERSC2101 and PHYS2101 and MATH2107 and LANC2058 |

J14. Mathematics (18 credits)

| Required Courses (14 Credits) | | | |
|-------------------------------|-------------------------------|----|--------------------------------------------------------------------------------------------------|
| Code | Title | Cr | Pre-req./Co-req.* |
| MATH2107 | Calculus I | 4 | FPEL0560 or FPEL0600 or FPEL 0601 or FPEL0602 or FPEL0603 or FPEL0604 and (FPMT0105 or FPMT0109) |
| MATH2108 | Calculus II | 3 | MATH2107 |
| MATH2202 [†] | Linear Algebra I [†] | 3 | FPEL0560 or FPEL0600 or FPEL 0601 or FPEL0602 or FPEL0603 or FPEL0604 and (FPMT0105 or FPMT0109) |
| MATH3110 [†] | Calculus III [†] | 4 | LANC2058 and MATH2108 |

[†] MATH 3171 Linear Algebra & Multivariate Calculus (3 credits; Pre-req.: MATH2108) can substitute both MATH2202 and MATH3110 above. However, students who have passed MATH 3171 cannot take MATH 2202 or MATH 3110, and vice versa.

| Remaining credits from the following | | | |
|--------------------------------------|---------------------------------------------------------------------------------------------|--------|-------------------------------------|
| Code | Title | Cr | Pre-req./Co-req.* |
| MATH2350 or MATH3340 | Foundations of Mathematic or Discrete Mathematics for Computer Sciences | 3 3 | MATH2107 MATH2107 and COMP2101 |
| MATH3302 or MATH4174 | Ordinary Differential Equations or Differential Equations and Applications for Engineers | 3 3 | LANC2058 and MATH2108 MATH2108 |
| MATH3303 | Linear Algebra II | 3 | LANC2058 and MATH2202 |
| MATH3573 | Graph theory | 3 | MATH2350 or MATH3360 |
| MATH3744 | Introduction to Mathematical Modelling | 3 | LANC2058 and MATH3110 and MATH3302 |
| MATH4141 | Numerical Analysis | 3 | MATH2202 and MATH3302 |
| MATH4450 | Real Analysis I | 3 | MATH2108 and (MATH2350 or MATH3340) |
| MATH4452 | Introduction to Complex Variables | 3 | MATH3110 or MATH3171 |
| MATH4453 | Abstract Algebra I | 3 | MATH2202 and (MATH2350 or MATH3340) |
| MATH4473 | Linear Programming | 3 | MATH2202 or MATH3171 |
| MATH4474 | Introduction to Partial Differential Equations | 3 | MATH3302 |
| MATH4481 | Introduction to Optimisation | 3 | MATH2108 and (MATH2202 or MATH3171) |
| MATH4599 | Introduction to Topology | 3 | MATH2350 |
| MATH5551 | Fluid Dynamics | 3 | MATH4474 |
| MATH5558 | Introduction to Number Theory | 3 | MATH3340 and MATH3350 and MATH3357 |

J15. Physics (18 credits)

| Required Courses (14 Credits) | | | |
|------------------------------------------------------------|--------------------|------------|-------------------------------------------------|
| Course Code | Course Title | Cr. | Pre-Requisite/Co-Requisite* |
| PHYS2101 | General Physics I | 4 | FPEL0560 or FPEL0600 or FPEL0601 or FPEL0602 or |
| PHYS2102 | General Physics II | 4 | PHYS2101 /MATH2017* |
| PHYS3103 | Physics III | 3 | LANC2058 and PHYS2102 and MATH2107 |
| PHYS3104 | Modern Physics | 3 | LANC2058 and PHYS3103 |
| Electives (min 4 Credits) | | | |
| Any other courses in Physics * | | 4 (min) | |
| *Excluding Physics courses offered as University Electives | | | |

J16. Statistics (18 credits)

| Required Courses (10 Credits) | | | |
|-------------------------------|-----------------------------|---------|-------------------------------------------------------------------------------------------------|
| Code | Title | Credits | Pre-Requisite / Co-Requisite* |
| STAT2101 | Introduction to Statistics | 4 | (FPE0560 or FPEL0600 or FPEL0601 or FPEL0602 or FPEL0603 or FPEL0604) and (FPMT0105 or PMT0109) |
| STAT2102 | Introduction to Probability | 3 | STAT2101 and MATH2108* |
| STAT3334 | Introduction to Inference | 3 | STAT2102 and LANC2058 |

| Remaining credits from the following | | | |
|--------------------------------------|----------------------------------------|---------|------------------------------------|
| Code | Title | Credits | Pre-Requisite / Co-Requisite* |
| STAT3331 | Operations Research 1 | 3 | STAT2101 and MATH2108 and LANC2058 |
| STAT3335 | Introduction to Sampling | 3 | STAT2102 and LANC2058 |
| STAT3336 | Computational Techniques in Statistics | 3 | STAT2102 and COMP2200 and LANC2058 |
| STAT3338 | Statistical Methods | 3 | STAT3334 and LANC2058 |
| STAT4432 | Regression Analysis | 3 | STAT3334 |
| STAT4433 | Design and Analysis of Experiments | 3 | STAT3338 |
| STAT4434 | Nonparametric Statistics | 3 | STAT3334 |
| STAT4436 | Survey Design | 3 | STAT3335 |
| STAT4533 | Quality Assurance and Reliability | 3 | STAT2102 |
| STAT5521 | Categorical Data Analysis | 3 | STAT3338 |
| STAT5536 | Time Series Analysis | 3 | STAT4432 |
| STAT5537 | Multivariate Techniques | 3 | STAT3334 and MATH2202 and MATH3110 |