



GARY MAGADZIRE SCHOOL OF AGRICULTURE AND NATURAL SCIENCES

ACADEMIC GUIDELINES FOR DEGREE AND DIPLOMA PROGRAMMES

KNOWLEDGE CULTURE DEVELOPMENT

2014-2018

**ACADEMIC GUIDELINES
FOR PROGRAMMES OFFERED IN THE GARY MAGADZIRE SCHOOL OF
AGRICULTURE AND NATURAL SCIENCES**

These Academic Guidelines are as far as possible accurate and up-to-date at the time of going to print. However, it should be noted that not all programmes or modules described herein will necessarily be on offer each year and that more programmes and modules will be added from time to time.

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UNIVERSITY MISSION STATEMENT

VISION

To be the centre of excellence in arts, culture and heritage studies as well as the advancement of other academic disciplines for the promotion of the development of society.

MISSION

In order to support the vision, we shall:

- a. Reclaim and preserve our African culture and heritage;
- b. Mainstream culture and heritage in our teaching and research;
- c. Lead in the development of entrepreneurs and professionals in the creative industry;
- d. Provide our stakeholders with an enabling environment for research and empower them with entrepreneurial skills;
- e. Produce versatile graduates equipped with skills and competencies relevant to the needs of society;
- f. Attract and retain highly competent staff,
- g. Use ICT -based solutions in teaching, learning, research, administration and innovation, and;
- h. Uplift communities we serve through our involvement in their development.

VALUES

GZU has adopted the following principles and standards of behaviour to define the University's culture and ensure a conducive work environment for the attainment of the Vision and Mission:

- Unhu/Ubuntu
- Excellence
- Integrity
- Results Focus
- Quality

ACADEMIC, SENIOR ADMINISTRATIVE AND TECHNICAL STAFF

Acting Dean

Dr.Chikodza E. DPhil (UZ), MSc. (Maths) [UZ], BSc. Hons (Maths) [UZ], Licentiate in Ed. (Maths) [Enrique Jose Varona, Cuba], PGD (Operations Research) [NUST]

Deputy Dean

Gwazani R. MSc. (Fisheries Mgt)[Frostburg State Uni], BSc. Agric Hons. (Crop Science) [UZ]

Administrative Assistant

Makotore Y. MSc (HRM), [MSU], BSc. (HRM) [GZU], ND (Secretarial Studies) [HEXCO], NC (Secretarial Studies) [HEXCO]

Senior Laboratory Technician

Chikomba A. BSc.Hons. (App. Phys.) [NUST]

Farm Managers

Muyanga I. HND (Ani. Prod.) (Chibero Agric College), ND (Ani. Hus.) (Gwebi Agric College)

Mukwende A. Bsc (Agric. Mgt) [ZOU], Dip. in Agric. (MSU), Cert. (Agric.) [Kushinga Phikelela]

Laboratory Technician

Shambira L. BTech. (Comp and Info Tech) [CUT], City and Guilds Cert (Telecomm Technicians Part 2 and 3)

Technical Assistant

Muza L. BSc. (Agric. Mgt.) [ZOU], ND (Agric) (Esigodini Agric. College)

Department of Agribusiness and Agrarian Development

Chairperson

Vacant

Lecturers

Nil

Department of Irrigation and Water Management

Chairperson

Nyoni K. MSc. (Int. Water Resources Mgt) [UZ], BSc. (Agric Eng) [UZ]

Department of Livestock, Wildlife and Fisheries

Chairperson

Hungwe T. MSc. (Ani. Sc.) [UZ], BSc. Hons. (Ani. Sc.) [UZ]

Lecturers

Nil

Department of Mathematics and Computer Science

Chairperson

Munthali A. MSc. (App. Phys.) [UZ], BSc.Hons. (App. Phys.) [NUST]

Lecturers

Chirima J. MSc. (Operations Research) [NUST] BSc. Hons. (Maths) [MSU]

Majeke F. MSc. (Operations Research) [NUST], BSc. Hons (Maths) [UZ], BSc. General (UZ)

Matete C. MSc. (Mathematical Modelling) [UZ], BSc. (Applied Maths) [NUST]

Chipumuro M. MSc. (Operations Research) [NUST], BSc. Hons (Maths) [MSU]

Manjeese C. MCom. (Info Sys.) [GZU], BSc. (GZU)

Mawonike R. MSc. (Operations Research) [NUST], BSc. Hons (Maths) [MSU]

Sai K. O. MSc. (Info Sys. Mgt.) [MSU], BSc. (Comp Science and Physics) [GZU]

Lecturers

Makoni T. MSc. (Operations Research and Stats.) [NUST], BSc. Hons. (Maths) [MSU]

Mandiudza M. MSc (App. Maths Modelling) [NUST], BSc. (Maths and Comp Science) [GZU], Dip. (Edu) [Hillside Tr's College]

Mawere T. MSc. (Info Sys. Mgt.) [MSU], BSc. Hons. (Info Sys.) [MSU]

Department of Physics, Geography and Environmental Science

Chairperson

Mapurisa B. MSc. (App. Phys.) [UZ], BSc. Hons. (Phys.) [UZ], BSc. Gen (Phys., Maths and Geo.)

Lecturers

Chapungu L. MSc (Env. Pol. & Planning) [UZ], BSc. Hons. (Geo) [UZ], BA. Gen. (UZ)

Chayangira J. MSc. (Agric. Meteorology) [NUST], BSc. Hons. (App. Phys.) [NUST]

Chazireni E. DPhil. (Geo) [UNISA], MA. (Geo) [UNISA], BA. Hons (Geo) [UNISA], BA. Genl [UNISA], PGD (Edu) [ZOU]

Chigonda T. MSc (Env. Pol. & Planning) [UZ], BSc. Hons. (Geo) [UZ], BA Gen [UZ]

Chikodzi D. MSc (Env. Pol. & Planning) [UZ], BA.Hons. (Geo) [UZ], BA. Gen [UZ]

Mapira J. DPhil (Curric. Studies) [Uni. of Stellenbosch], MSc. (Env. Sci.) [UB], BA. Gen. [UZ], GCE [UZ]

Murwendo T. Masters (Env Pol Studies) [UZ], BA. Hons. (Geo) [UZ]

Mudzengi B. MSc (Env. Pol. and Planning) [UZ], BA. Hons. (Geo) [UZ], BA Gen [UZ]

Mutowo G. MPhil. [UZ], BA Hons. (Geo) [UZ], BSc. Gen [UZ]

Seyitini L. MSc. (App. Phys.) [UZ], BSc. Hons. (Phys.) [UZ], BSc. Gen [UZ]

Simba F. MSc. (Agric. Meteorology) [UZ], BSc. Hons. (Phys.) [UZ], BSc. Gen [UZ]

Zinhiva H. MSc. (Env. Pol. and Planning) [UZ], BA. Hons. (Geo) [UZ], BEd. [UZ], Dip. (Edu) [UZ]

Mabhegedhe M. MSc. (Molecular and Cell Bio.) [Uni. of Wits], BSc. Hons. (App. Bio and Biochem) [NUST]

Ngaza N. MSc. (Polymer Sc.) [Stellenbosch], BSc (Chem) [Stellenbosch]

Department of Soil and Plant Sciences

Chairperson

Vacant

Associate Professor

Shoko M. D. DPhil. (Agronomy) [Uni. of Stellenbosch], MSc. (Crop Prod.) [AU], BSc. (Agric Mgt.) [UZ], Dip. Edu [Belvedere Tech. Tr's College], Dip. (Agric) [Esigodini Agric College]

Lecturers

Makaza K. MSc. (Agronomy) [Uni of Zambia], BSc. Agric Hons. (Crop Science) [UZ],
GCE. [UZ]

Mubvuma M. MSc. (Agric. Meteorology) [UZ], BSc. Hons. (Crop Prod. and Horticulture)
[MSU]

SCHOOL REGULATIONS FOR UNDERGRADUATE DEGREE PROGRAMMES

1. PREAMBLE

- 1.1 These regulations shall be read in conjunction with the Great Zimbabwe University's General Academic Regulations for Undergraduate Degrees and Diplomas, hereinafter referred to as General Regulations.
- 1.2 Senate has the prerogative to change, cancel or replace any of these regulations.
- 1.3 A student who has started a programme following one set of regulations shall not be affected by regulations adopted subsequently unless agreed to in writing by the student.
- 1.4 Senate has the authority to exempt a student from any of these regulations.
- 1.5 The General Regulations shall supersede School Regulations.

2. DEFINITION OF TERMS

In these Regulations the following terms shall be used as defined:

- 2.1 **Core module** – a compulsory module which a student must take in a programme.
- 2.2 **Optional module** – a module a student may take to fulfil the requirements of a programme.
- 2.3 **Equivalent module** – a module similar to another in terms of weighting and content.
- 2.4 **Area of specialisation** – a field from which the student draws modules or a module for detailed study.
- 2.5 **Practicum** – a practical component of a module done over a period of time to meet the requirements of a programme.

3. PROGRAMMES

- 3.1 For programmes offered under the School of Agriculture and Natural Sciences, refer to section **2.2.1.5** of the General Academic Regulations.
- 3.2 More degree programmes shall be added from time to time.

4. ENTRY REQUIREMENTS

4.1 Normal Entry Requirements

- 4.1.1 At least five (5) "O" level passes including English Language and Mathematics.
- 4.1.2 For Agriculture, an "O" Level pass in a Science subject is a requirement.
- 4.1.3 At least two (2) "A" level passes of which one of them should be in the discipline to be studied.
- 4.1.4 For Computer Science and Statistics and Operations Research, at least two (2) "A" level passes including Mathematics or its recognized equivalents.

4.1.5 For Agriculture, at least two (2) Advanced level passes in Agriculture, Chemistry, Physics, Biology, Geography or Mathematics.

4.2 **Special Entry**

Refer to Section 3.2 of the General Academic Regulations.

4.3 **Mature Entry**

Refer to Section 3.3 of the General Academic Regulations.

5. STRUCTURE OF DEGREE PROGRAMMES

5.1 A programme shall run for at least eight (8) semesters.

5.2 A Bachelor of Science Honours Degree shall consist of a minimum of forty-two (42) modules.

5.3 For Agriculture, Bachelor of Science Honours Degree shall consist of a minimum of forty four (44) modules.

5.3.1 At Level I, a candidate shall register for a minimum of fourteen (14) modules.

1.3.1.1 For Agriculture, a candidate shall register for a minimum of fifteen (15) modules.

5.3.2 At Level II, a candidate shall register for at least twelve (12) modules.

5.3.2.1 For Agriculture, a candidate shall register for at least (14) modules

5.3.3 At Level III, a candidate shall register for three (3) modules and is required to spend a minimum of ten (10) months on work related learning.

5.3.4 At Level IV, a student shall register for a minimum of twelve (12) modules.

5.4 A Bachelor of Agriculture and Natural Science Special Honours Degree shall consist of eight (8) modules.

5.5 A module in a programme shall be taught in thirty-six (36) to forty-eight (48) contact hours per semester.

5.6 A programme shall have compulsory and optional modules.

5.7 The following modules shall be compulsory for all degree programmes:

- Academic and Professional Communication
- Research Methods and Statistics
- Information and Communication Technology
- Introduction to Zimbabwean Cultures and Heritage
- African Philosophy and Thought
- Research project

6. ASSESSMENT

6.1 Normally, assessment of each module shall be based on continuous assessment as well as formal examinations. Continuous assessment shall contribute 30% and the end of semester examination shall contribute 70% of the final mark.

- 6.2 Each Department shall determine components of continuous assessment that will be considered for the final continuous assessment mark.

7. WORK RELATED LEARNING

- 7.1 At Level III, a candidate shall be on Work Related Learning at any private or public institution where theory is applied into practice which is equivalent to four modules.

- 7.2 The Work Related Learning Report shall be equivalent to two modules and Continuous

Work Related Learning Assessment shall be equivalent to two modules.

- 7.3 Block Release students who are employed in the relevant sector and with at least two (2) years, experience may apply to the School to have the Work Related Learning Level run concurrently with Level IV.

8. PROVISIONS FOR PROGRESSION

Refer to **Section 8** of the General Academic Regulations.

9. FAILURE TO SATISFY EXAMINERS

Refer to **Section 9** of the General Academic Regulations.

10. AWARD OF A DEGREE

To be awarded a degree, a candidate must have attained a minimum of forty-two (42) modules.

11. DEGREE CLASSIFICATION AND WEIGHTING

- 11.1 The degree shall be classified using the average marks from modules at Level II, III and IV only, the overall mark being the weighted average.
- 11.2 For degree classification, refer to **Section 5** of the General Academic Regulations.

DEPARTMENT OF LIVESTOCK, WILDLIFE AND FISHERIES

REGULATIONS FOR THE BACHELOR OF SCIENCE HONOURS DEGREE IN AGRICULTURE (LIVESTOCK, WILDLIFE AND FISHERIES)

1 PREAMBLE

- 1.1 These regulations should be read in conjunction with the General Academic Regulations for the Undergraduate Degrees and Diplomas, hereinafter referred to as the General Regulations which has precedence over School Regulations.
- 1.2 Senate has the prerogative to change, cancel or replace any of these regulations.
- 1.3 A student who has started a programme following one set of regulations shall not be affected by regulations adopted subsequently unless agreed to in writing by the student.
- 1.4 The programme is designed for the study of Bachelor of Science Honours degree in Agriculture (Livestock, Wildlife and Fisheries).
- 1.5 Candidates will graduate with B.Sc. Honours degree in Agriculture specialising in Livestock or Wildlife or Fisheries.

2. GENERAL DESCRIPTION OF THE PROGRAMME

Livestock and Wildlife have a legitimate, viable and competitive land use now well established in Africa. Zimbabwe played a leading and pioneering role in developing livestock, wildlife and fisheries as land use options in both commercial and communal area farming sectors. On marginal lands, the sector generates foreign exchange earnings and provides incentives to conserve the country's wildlife and biodiversity. Masvingo province is home to a number of wildlife protected areas and fisheries which are interfacing with livestock production systems. Most people seek to make an impact at the national level and local level. The major challenge is therefore to develop sustainable Livestock, Wildlife and Fisheries institutions that serve both to protect the resources and provide incentives for sustainable harvesting and conservation. These issues are the focus of this programme.

3. OBJECTIVES

The programme attempts to achieve the following objectives:

- 3.1 To enhance efficiency and effectiveness of the utilisation and conservation of livestock, wildlife and fisheries.
- 3.2 To demonstrate knowledge on sustainable use of natural resources.
- 3.3 To capacitate institutions in value chain addition to contribute to rural development.
- 3.4 To design appropriate production systems for different stakeholders

4. CAREER PROSPECTS

Extension Officers, Research Officers, Animal Nutritionists, Animal Breeders, Geneticists, Ecologists, Wildlife Conservationists, Game and Safari Managers, Ichthyologists, Limnologists, Fish Breeders, Tourism Experts

5. ENTRY REQUIREMENTS

5.1 Normal Entry

5.1.1 Refer to **Section 4.1** of the School Regulations.

5.2 Special Entry

5.2.1 Refer to **Section 4.2** of the School Regulations.

6. STRUCTURE OF THE PROGRAMME

6.1 Duration

The normal duration of Bachelor of Science Honours degree in Livestock, Wildlife and Fisheries shall be four (4) years of full time study.

6.2 Degree Structure

6.2.1 Refer to **Section 5** of the School Regulations.

6.3 Work Related Learning

6.3.1 Refer to **Section 7** of the School Regulations

6.4 MODULES

LEVEL I SEMESTER I

Students are required to take eleven (11) modules plus two compulsory modules from the School of Culture and Heritage Studies and two other university-wide modules.

Core Modules

Code	Module description
ASP 107	Introduction to Chemistry
ASP 108	Introduction to Biology
ASP 101	Introduction to Soil Science
HCSC 101	Communication Skills
HCSC 111	Introduction to Computers and Computer Applications
APRAC 101	Practical Agriculture I
BAC 101	African Philosophy and Thought

SEMESTER II

Core Modules

Code	Module description
ALWF 102	Animal Anatomy and Physiology
AAA 102	Introduction to Agricultural Economics
ALWF 101	Agricultural Biochemistry
ASP 104	Basic Microbiology and Introductory Entomology

APRAC 102	Practical Agriculture II
ASP 103	Principles of Genetics
AF 101	Fisheries Management and Population Dynamics
BHS 110	Introduction to Zimbabwean Cultures and Heritage

Optional modules

AIW 101	Engineering Materials
ASP 106	Plant Botany and Physiology
ASP 102	Agriculture History of Zimbabwe

NB: Not all optional modules will be on offer at any one given time.

LIVESTOCK OPTION

LEVEL II Semester I

Core Modules

Code	Module description
RMS 201	Introduction to Research Methods and Statistics
AL 201	Dairy Production
ALW 203	Introduction to Animal Production
APROP 201	Scientific and Proposal Writing Skills in Agriculture
AIW 208	Drought Preparedness Management
ALW 201	Animal Nutrition
AW 201	Wildlife Management

LEVEL II SEMESTER II

Core Modules

Code	Module description
AL 208	Beef Production
AL 207	Pig and Poultry Production Systems
ALW 202	Pasture and Range Management
AW 204	Wildlife Ecology
AAA 201	Professional Ethics in Agriculture
AL 209	Livestock Improvement
ASTA 201	Agricultural Statistics

LEVEL III

Core Modules

Code	Module description
APRAC 301	Employer's Assessment
APRAC 302	Academic Supervisor's Assessment
APRAC 303	Student's Report

LEVEL IV SEMESTER I

Core Modules

Code	Module description
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AL 404	Animal Breeding
AL 406	Sheep and goat Production Systems
AL 401	Livestock Disease Management
AGIS 401	Geographic Information Systems and Remote Sensing
AIW 408	Meteorology and Climate Change
ASP 404	Agro-forestry

LEVEL IV SEMESTER II

Core Modules

Code	Module description
AL 407	Animal Products and Processing
APRO 401	Research Project
AAA 401	Agricultural Extension
AAA 403	Project Planning, Appraisal and Evaluation
AAA 404	Farm Management
ASP 408	Environmental Science and Pollution

WILDLIFE OPTION

LEVEL II Semester I

Core Modules

Code	Module description
RMS201	Introduction to Research Methods and Statistics
ALW 203	Introduction to Animal Production
APROP 201	Scientific and Proposal Writing Skills in Agriculture
AIW 208	Drought Preparedness Management
ALW 201	Animal Nutrition
AW 201	Wildlife Management
AW 206	Wildlife Population Dynamics

LEVEL II SEMESTER II

Core Modules

Code	Module description
AW 207	Wildlife Study Techniques and Technologies
AW 204	Wildlife Ecology
AF 204	Fish Nutrition
AW 205	Intensive Wildlife Production Systems
ALW 202	Pasture and Range Management
AAA 201	Professional Ethics in Agriculture
ASTA 201	Agricultural Statistics

LEVEL III

Core Modules

Code	Module description
APRAC 301	Employer's Assessment

APRAC 302 Academic Supervisor's Assessment

APRAC 303 Student's Report

LEVEL IV SEMESTER I

Core Modules

Code	Module description
AW 401	Wildlife Disease Management
AGIS 401	Geographic Information Systems and Remote Sensing
AW 404	Safari and Parks Management
AIW 408	Meteorology and Climate Change
AW 402	Zoology and Captive Breeding
AW 406	Game Capture and Translocation

LEVEL IV SEMESTER II

Core Modules

Code	Module description
AW 407	Wildlife Law
APRO 401	Research Project
AAA 401	Agricultural Extension
AAA 403	Project Planning, Appraisal and Evaluation
AAA 404	Farm Management
ASP 408	Environmental Science and Pollution

FISHERIES OPTION

LEVEL II SEMESTER I

Core Modules

Code	Module description
RMS 201	Introduction to Research Methods and Statistics
AF 202	Aquaculture
AF 205	Ichthyology
AW 206	Wildlife Population Dynamics
APROP 201	Scientific and Proposal Writing Skills in Agriculture
AIW 208	Drought Preparedness Management
AW 201	Wildlife Management

LEVEL II SEMESTER II

Core Modules

Code	Module description
AF 203	Limnology
AF 204	Fish Nutrition
AW 204	Wildlife Ecology
ASTA 201	Agricultural Statistics
AW 205	Intensive Wildlife Production Systems
ALW 202	Pasture and Range Management
AAA 201	Professional Ethics in Agriculture

LEVEL III

Core Modules

Code	Module description
APRAC 301	Employer's Assessment
APRAC 302	Academic Supervisor's Assessment
APRAC 303	Student's Report

LEVEL IV SEMESTER I

Core Modules

Code	Module description
AF 402	Catchment Management and Sampling Methods in Fisheries
AF 403	Fish Disease Management
AF 404	Integrated Fisheries Management
AGIS 401	Geographic Information Systems and Remote Sensing
AW 404	Safari and Parks Management
AIW 408	Meteorology and Climate Change

LEVEL IV SEMESTER II

Core Modules

Code	Module description
AF 401	Trout and Bream Fish Culturing
AW 407	Wildlife Law
APRO 401	Research Project
AAA 401	Agricultural Extension
AAA 403	Project Planning, Appraisal and Evaluation
AAA 404	Farm Management

7. ASSESSMENT

Refer to Section 6 of the School Regulations.

8. PROVISIONS FOR PROGRESSION

Refer to Section 8 of the School Regulations.

9. DEGREE CLASSIFICATION AND WEIGHTING

Refer to Section 11 of the School Regulations.

DEPARTMENT OF SOIL AND PLANT SCIENCES

REGULATIONS FOR THE BACHELOR OF SCIENCE HONOURS IN AGRICULTURE DEGREE (SOIL AND PLANT SCIENCES)

1. PREAMBLE

1.1 These regulations should be read in conjunction with the General Academic

Regulations for the Undergraduate Degrees and Diplomas, hereinafter referred to as the General Regulations which has precedence over School Regulations.

- 1.2 Senate has the prerogative to change, cancel or replace any of these regulations.
- 1.3 A student who has started a programme following one set of regulations shall not be affected by regulations adopted subsequently unless agreed to in writing by the student.
- 1.4 The programme is designed for the study of Bachelor of Science Honours degree in Agriculture (Soil and Plant Sciences).
- 1.5 Candidates will graduate with BSc Honours degrees in Agriculture, specialising in either Soil Science or Horticulture or Crop Production.

2. GENERAL DESCRIPTION OF THE PROGRAMME

This programme aims to provide students with the knowledge and skills in the application of concepts and principles of cropping systems analysis and design, and natural crop production as they affect both field and horticultural crops, bridging the current gaps between indigenous knowledge systems and modern conventional scientific knowledge. This is considered necessary for development of new value chains to address challenges associated with food and nutrition security in a changing climatic and economic environment. The importance of indigenous and exotic field and horticultural crops, and their contribution to agriculture and rural development will be emphasised.

3. OBJECTIVES

This programme attempts to achieve the following objectives:

- 3.1 To address knowledge and technical gaps by building capacity for development of resilient and sustainable crop production systems across the country's diverse agro-ecologies
- 3.2 To enhance efficiency and effectiveness of crop production
- 3.3 To contribute towards national food and nutritional security
- 3.4 To capacitate agricultural institutions with the theoretical and practical understanding of sound agronomic practices

4 CAREER PROSPECTS

Agronomist, Plant breeder, Plant entomologist, Agricultural Development Consultant, Geneticist, Pomologist, Olericulturist, Floriculturist, Agriculture Extension Officer, Landscape Designer and Plant Pathologist.

5 ENTRY REQUIREMENTS

To be admitted in the Bachelor of Science Honours degree in Agriculture (Soil and Plant Sciences), candidates must possess:

5.1 Normal Entry

5.1.1 Refer to Section 4.1 of the School Regulations.

5.2 Special Entry

5.2.1 Refer to Section 4.2 of the School Regulations

6. STRUCTURE OF THE PROGRAMME

6.1 Duration

The normal duration of Bachelor of Science Honours degree in Agriculture (Soil and Plant Sciences) shall run for at least eight (8) semesters.

6.2 Degree Structure

Refer to section 5 of the School Regulations

6.3 Work Related Learning

Refer to section 7 of the School Regulations

6.4 MODULES

LEVEL I SEMESTER I

Core Modules

Code	Module Description
ASP 101	Introduction to Soil Science
ASP 107	Introduction to Chemistry
ASP 108	Introduction to Biology
HCSC 101	Communication Skills
HCSC111	Introduction to Computers and Computer Applications
APRAC 101	Practical Agriculture I
BHS 110	Introduction to Zimbabwean Cultures and Heritage

LEVEL I SEMESTER II

Code	Module Description
ALWF 102	Animal Anatomy and Physiology
ASP 106	Plant Botany and Physiology
ALWF 101	Agricultural Biochemistry
ASP 104	Basic Microbiology and Introductory Entomology
APRAC 102	Practical Agriculture II
AAA 102	Introduction to Agricultural Economics
ASP 103	Principles of Genetics
BHS 101	Introduction to Zimbabwean History

Optional Modules

A student may choose any one (1) module from the following:

Code	Module Description
AIW 101	Engineering Materials
AF 101	Fisheries Management and Population Dynamics

SOIL SCIENCE OPTION

LEVEL II SEMESTER I

Core Modules

Code	Module Description
ASP 201	Soil Biology
ASP 203	Pedology and Soil Classification
ASP 204	Soil Chemistry
ASP 202	Fertilizer Management and Plant Nutrition
AIW 208	Drought Preparedness Management
APROP 201	Scientific and Proposal Writing Skills in Agriculture
RMS 201	Introduction to Research Methods and Statistics

LEVEL II SEMESTER II

Code	Module Description
ASP 207	Land Use Planning
ASP 208	Soil Physics
ASP 209	Soil Survey and Mapping
ASP 210	Sustainable use and Management of Natural Resources
AAA 201	Professional Ethics in Agriculture
ASTA 201	Agricultural Statistics

Optional Modules

A student may choose any one (1) module from the following:

Code	Module Description
ASP 211	Principles of Crop Production
ASP 213	Crop Production Systems

LEVEL III

Core Modules

Code	Module Description
APRAC 301	Employer's Assessment
APRAC 302	Academic Supervisor's Assessment
APRAC 303	Student's Report

LEVEL IV SEMESTER I

Core Modules

Code	Module Description
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ASP 405	Soil Fertility Management
ASP 407	Dry Land Farming Practices
ASP 408	Environmental Science and Pollution
ASP 402	Soil Conservation
AIW 408	Meteorology and Climate Change

Optional Modules

A student may choose any one (1) module from the following:

Code Module Description

ASP 404	Agroforestry
ASP 401	Sustainable Agriculture
ATECH 401	Appropriate Technology for Rural Agro-processing

LEVEL IV SEMESTER II

Core Modules

Code Module Description

APRO 401	Research Project
AAA 401	Agricultural Extension
AAA 403	Project Planning, Appraisal and Evaluation
ASP 409	Agronomy of Legume Crops
AAA 404	Farm Management

Optional Modules

A student may choose any one (1) module from the following:

Code Module Description

ASP 410	Urban Agriculture
AAA 402	Entrepreneurship Development

CROP PRODUCTION OPTION

LEVEL II SEMESTER I

Core Modules

Code Module Description

ASP 211	Principles of Crop Production
ASP 212	Sugarcane Production and Management
ASP 202	Fertilizer Management and Plant Nutrition
APROP 201	Scientific and Proposal Writing Skills in Agriculture
RMS 201	Introduction to Research Methods and Statistics
ASP 205	Agronomy of Major Field Crops
AIW 208	Drought Preparedness Management

LEVEL II SEMESTER I

Core Modules

Code Module Description

ASTA 201	Agricultural Statistics
ASP 217	Sugarcane Production and Technology
ASP 215	Entomology and Insect Pest Management
ASP 216	Seed Science and Technology
ASP 213	Crop Production Systems
ASP 214	Weed Ecology and Management
AAA 101	Professional Ethics in Agriculture

LEVEL III

Code	Module Description
APRAC 301	Employer`s Assessment
APRAC 302	Academic Supervisor`s Assessment
APRAC 303	Student`s Report

LEVEL IV SEMESTER I

Core Modules

Code	Module Description
ASP 413	Small Grain Production
ASP 403	Plant Pathology
ASP 411	Plant Breeding
ASP 407	Dry Land Farming Practices
AIW 408	Meteorology and Climate Change

Optional Modules

A student may choose any one (1) module from the following:

Code	Module Description
ASP 401	Sustainable Agriculture
ASP 404	Agroforestry
ASP 406	Plant Biotechnology

LEVEL IV SEMESTER II

Core Modules

Code	Module Description
APRO 401	Research Project
AAA 401	Agricultural Extension
AAA 403	Project Planning, Appraisal and Evaluation
ASP 409	Agronomy of Legumes Crops
AAA 404	Farm Management

Optional Modules

A student may choose any one (1) module from the following:

Code	Module Description
AAA 402	Entrepreneurship Development

ASP 410	Agronomy of Root and Tuber Crops
ASP 412	Urban Agriculture
ASP 408	Environmental Science and Pollution

HORTICULTURE OPTION

LEVEL II SEMESTER I

Core Modules

Code	Module Description
RMS 201	Introduction to Research Methods and Statistics
APROP 201	Scientific and Proposal Writing Skills in Agriculture
AHORT 201	Nursery Management and Plant Propagation
AHORT 202	Vegetable Crops
AHORT 203	Introduction to Horticulture
AIW 208	Drought Preparedness Management

Optional Modules

A student may choose any one (1) module from the following:

Code	Module Description
ASP 201	Soil Biology
ASP 202	Fertiliser Management and Plant Nutrition

LEVEL II SEMESTER II

Code	Module Description
AHORT 205	Harvesting and Post- Harvest Techniques of Horticultural Crops
AHORT 206	Plant Propagation Techniques and Tissue Culture
ASP 215	Entomology and Insect Pest Management
AHORT 204	Fruit Crops
AAA 201	Professional Ethics in Agriculture
ASTA 201	Agricultural Statistics

Optional Modules

A student may choose any one (1) module from the following:

Code	Module Description
ASP 214	Weed Ecology and Management
ASP 216	Seed Science and Technology

LEVEL III

Core Modules

Code	Module Description
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- APRAC 301 Employer`s Assessment
- APRAC 302 Academic Supervisor`s Assessment
- APRAC 303 Student`s Report

LEVEL IV SEMESTER I

Core Modules

Code	Module Description
ASP 411	Plant Breeding
ASP 403	Plant Pathology
AHORT 401	Principles of Floriculture, Ornamentals and Landscaping
AHORT 402	Spices, Herbs, Beverages and Medicinal Crops
AIW 408	Meteorology and Climate Change

Optional Modules

A student may choose any one (1) module from the following:

Code	Module Description
ASP 406	Plant Biotechnology
ATECH 401	Appropriate Technology for Rural Agro-processing
AHORT 405	Horticulture Plantation Crops

LEVEL IV SEMESTER II

Code	Module Description
APRO 401	Research Project
AAA 401	Agricultural Extension
AHORT 404	Greenhouse Horticulture Production
AAA 403	Project Planning, Appraisal and Evaluation
AAA 404	Farm Management

Optional Modules

A student may choose any one (1) module from the following:

Code	Module Description
AHORT 403	Ornamental Horticultural Crops
ASP 408	Environmental Science and Pollution
AAA 402	Entrepreneurship Development

7. ASSESSMENT

Refer to Section 6 of the School Regulations

8. PROVISIONS FOR PROGRESSION

Refer to Section 8 of the School Regulations

9. DEGREE CLASSIFICATION AND WEIGHTING

Refer to Section 11 of the School Regulations

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

REGULATIONS FOR THE BACHELOR OF SCIENCE HONOURS DEGREE IN COMPUTER SCIENCE

1. PREAMBLE

These regulations should be read in conjunction with the General Academic Regulations for Undergraduate Degrees and Diplomas, hereinafter referred to as the General Regulations which have precedence over Departmental Regulations.

2. GENERAL DESCRIPTION OF THE PROGRAMME

The Bachelor of Science Honours degree in Computer Science is designed to produce competitive graduates with world class knowledge in the Computer Science field. From the beginning of the programme, the student is equipped with the requisite mathematical skills required to solve analytical problems in the Computer Science world. The programme also includes modules on Operating systems, Microprocessors, Computer architecture, Programming, Networks and Communication, Artificial Intelligence, and Mobile Application Development.

3. OBJECTIVES

Upon successful completion of the Bachelor of Science Honours degree in Computer Science, students will be able to:

- 3.1 Exhibit proficiency in problem-solving techniques using the computer.
- 3.2 Demonstrate skill in at least two high-level programming languages and two operating systems.
- 3.3 Show aptitude in the analysis of complex problems and the synthesis of solutions to those problems.
- 3.4 Demonstrate comprehension of modern software engineering principles.
- 3.5 Demonstrate a breadth and depth of knowledge in the discipline of computer science.
- 3.6 Apply their knowledge and skills to succeed in a computer-related career and/or obtain an advanced degree.

4. CAREER PROSPECTS

A graduate with a Bachelor of Science Honours degree in Computer Science can work in the following fields; Academia/Research, Network Management / Engineering, Programming, Software engineering, Software Project Management, Telecommunications, Hardware Engineering, Computer Equipment Maintenance, Database Management, Computer Systems Security, Computer Forensics and Auditing

5. ENTRY REQUIREMENTS

5.1 Normal Entry

Refer to **Section 4 .1** of the School Regulations

5.2 Special Entry

Refer to **Section 4.2** of the School Regulations

6. STRUCTURE OF THE PROGRAMME

6.1 Duration

The normal duration of Bachelor of Science Honours degree in Computer Science shall be four (4) years.

6.2 Degree Structure

6.2.1 Refer to **Section 5** of the School Regulations

6.2.2 Work Related Learning

Refer to **Section 7** of the School Regulations

6.3 MODULES

LEVEL I SEMESTER I

Code	Module Description
HCS 111	Introduction to Computers and Computer Applications
HCS 102	Introduction to programming
HCS 104	Computer Architecture
HMAT 101	Calculus I
HMAT 103	Linear Mathematics I
HCSC 101	Communication Skills
BHS 110	Introduction to Zimbabwean Culture and Heritage

LEVEL I SEMESTER II

Code	Module Description
HCS 105	Digital logic Design
HCS 115	Visual Programming
HCS 103	Operating Systems
HMAT 102	Mathematical Discourse and Structures
HPHM 102	Electricity and Magnetism
HSOR 107	Probability Theory I
BAC 101	African Philosophy and Thought

LEVEL II SEMESTER I

Core Modules

Code	Module Description
HCS 202	Systems Analysis and Design
HCS 204	Data Communication and Computer Networks

HCS 218	Object Oriented Programming I
HCS 210	Database Models and Design
HCS 213	Computer Security
	Research Methods and Statistics

Optional Modules

A student may choose any one (1) module from the following:

HCS 203	Information Systems
HSOR 105	Applied Statistics

LEVEL II SEMESTER II

Core Modules

Code	Module Description
HCS 201	Data Structures and Algorithms
HCS 206	Simulation and Modelling
HCS 207	Internet and Web Designing
HCS 216	Entrepreneurship
HCS 260	Mini Research Project

Optional Modules

A student may choose any one (1) module from the following:

Code	Module Description
HPH 210	Digital Electronics
HCS 215	Software Engineering

LEVEL III

Code	Module Description
HCS 301	Employer's Assessment
HCS 302	Academic Supervisor's Assessment
HCS 303	Student's Report

LEVEL IV SEMESTER I

Core Modules

Code	Module Description
HCS 403	Computer Graphics
HCS 407	Software Project Management
HCS 408	Advanced Databases
HCS 414	Object Oriented Programming II

Optional Modules

A student may choose any two (2) modules from the following:

Code	Module Description
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HCS 416	Digital Signal Processing
HCS417	Decision Support Systems
HCS420	Intellectual Property Rights

LEVEL IV SEMESTER II

Core Modules

Code	Module Description
HCS 409	Artificial Intelligence
HCS 415	Advanced Data Communication and Computer Networks
HCS 418	Management Information Systems
HCS 460	Research Project

Optional Modules

A student may choose any one (1) module from the following:

Code	Module Description
HCS419	Microprocessors and Embedded Systems
HCS421	Mobile Application Development
HCS422	ICT for Development

7. ASSESSMENT

Refer to Section 6 of the School Regulations

8. PROVISION FOR PROGRESSION

Refer to Section 8 of the School Regulations

9. DEGREE CLASSIFICATION AND WEIGHING

Refer to Section 11 of the School Regulations

REGULATIONS FOR THE BACHELOR OF SCIENCE HONOURS (BSC HONS) DEGREE IN MATHEMATICS

1. PREAMBLE

These regulations should be read in conjunction with the School Regulations and General Academic Regulations for Undergraduate Degrees and Diplomas, which have precedence over Departmental Regulations. Senate has the prerogative to change, cancel or replace any of these regulations.

2. GENERAL DESCRIPTION OF THE PROGRAMME

The BSc is a four year degree in mathematics. It offers a good basis for a wide range of employment, and also for further study in programmes such as specialized MSc courses which make use of mathematics in other areas. Everyone takes "core" modules throughout the programme. These provide a sound base from which to specialize. As one proceeds through the programme, choice increases giving one the opportunity to follow his/her own interests, whether they be in pure mathematics, applied mathematics or statistics. Mathematics is an exciting subject, which is vital in

modern society. One will learn to think clearly and creatively – an invaluable asset in today's knowledge-driven economy.

3. OBJECTIVES

To provide students with an education that prepares them for careers as practicing mathematicians and scientists. This programme has been designed to:

- 3.1** give students a solid foundation in fundamental mathematics concepts with an aim towards developing logical thinking and analytical skills to build their understanding of mathematical applications; and
- 3.2** provide students with a broad and yet deep mathematical education.

4. CAREER PROSPECTS

- Management consultancy
- Finance
- Accountancy
- Information technology
- Logistics
- Transportation
- Actuarial Training
- Analyst in Audit Practice
- Graduate Management Training
- Risk Analysing
- Training in Chartered Accountant
- Graduate Business Programme

5. ENTRY REQUIREMENTS

5.1 Normal Entry

Refer to Section 4.1 of the School Regulations.

5.2 Special Entry

Refer to Section 4.2 of the School Regulations.

6. STRUCTURE OF THE PROGRAMME

6.1 Duration

The normal duration of Bachelor of Science Honours degree in Mathematics shall be four (4) years of full time study. Each student shall be required to study a minimum of 41 modules including a research project.

6.2 Degree Structure

Refer to Section 5 of the School Regulations.

6.2.1 Work Related Learning

Refer to Section 7 of the School Regulations.

6.3 MODULES

LEVEL I SEMESTER I

Core Modules

Code	Module Description
HMAT 101	Calculus I
HMAT 103	Linear Mathematics I
HMAT 107	Probability Theory I
HSOR 105	Applied Statistics
HCS 111	Introduction to Computers and Computer Applications
HCSC 101	Communication Skills
BHS 110	Introduction to Zimbabwean Cultures and Heritage

LEVEL I

SEMESTER II

Core Modules

Code	Module Description
HMAT 102	Mathematical Discourse and Structures
HMAT 104	Calculus II
HMAT 108	Linear Mathematics II
HSOR 108	Linear and Integer Programming
HCSM 115	Visual Programming
HSOR 106	Computer Packages in Applied Mathematics
BAC 101	African Philosophy and Thought

LEVEL II SEMESTER I

Core Modules

Code	Module Description
HMAT 201	Analysis I
HMAT 204	Vector Calculus
HMAT 210	Ordinary Differential Equations
HMAT 218	Complex Variables

Optional Modules

A student may choose any two (2) modules from the following:

Code	Module Description
HMAT 202	Statistical Inference
HMAT 208	Number Theory
HSOR 211	Regression and Analysis of Variance I
HSOR 213	Time Series Analysis
HMAT 216	Probability Theory II

LEVEL II SEMESTER II

Core Modules

Code	Module Description
HMAT 207	Numerical Methods
HMAT 213	Analysis II
HMAT 214	Partial Differential Equations and Fourier Series
HMAT 217	Mechanics

Optional Modules

A student may choose any two (2) modules from the following:

Code	Module Description
HMAT 206	Graph Theory
HMAT 209	Algebra I
HMAT 215	Optimisation
HMAT 219	Analytical Number Theory
HMAT 220	Stochastic Calculus

LEVEL III

Core Modules

Code	Module Description
HMAT 301	Employer`s Assessment
HMAT 302	Academic Supervisor`s Assessment
HMAT 303	Student`s Report

LEVEL IV SEMESTER I

Core Modules

Code Module Description

PREREQUISITES

HMAT 413	Real Analysis	HMAT 213
HMAT 412	Complex Analysis	HMAT 218
HMAT 404	Topology	HMAT 213
HMAT 407	Numerical Solutions of PDE`s	HMAT 207

Optional Modules

A student may choose any two (2) modules from the following:

Code	Module Description	
HMAT 403	Set Theory and Logic	
HMAT 405	Commutative Algebra	HMAT 209
HMAT 406	Risk Theory	HMAT 201
HMAT 408	Control Theory	
HMAT 409	Calculus o f variations	

LEVEL IV SEMESTER II

Core Modules

Code	Module Description	
HMAT 401	Advanced Probability Theory	
HMAT 417	Partial Differential Equations	HMAT 214
HMAT 416	Fluid Mechanics	HMAT 217
HMAT 460	Research Project	

Optional Modules

A student may choose any two (2) modules from the following:

Code	Module Description	
HMAT 410	Perturbation Theory	
HMAT 421	Algebra II	
HMAT 415	Group Theory	
HMAT 418	Stochastic Differential Equations and Integration	
HMAT 419	Non Linear Ordinary Differential Equations	HMAT 207
HMAT 420	Non Linear Partial Differential Equations	HMAT 210

7. ASSESSMENT

Refer to Section 6 of the School Regulations.

8. PROVISIONS FOR PROGRESSION

Refer to Section 8 of the School Regulations.

9. DEGREE CLASSIFICATION AND WEIGHTING

Refer to Section 11 of the School Regulations.

REGULATIONS FOR THE BACHELOR OF SCIENCE HONOURS DEGREE IN STATISTICS AND OPERATIONS RESEARCH

1. PREAMBLE

These regulations should be read in conjunction with the School Regulations and General Academic Regulations for Undergraduate Degrees and Diplomas, which have precedence over Departmental Regulations.

2. GENERAL DESCRIPTION OF THE PROGRAMME

The programme is the science of collecting, organising, analysing, interpreting and presenting data as well as applying scientific methods in decision making. This training would enable the students to proceed directly to fully fledged positions such as Statisticians in industry, commerce or public organisations, to take up trainee positions in accountancy, insurance or management. The programme would also act as a prerequisite for Master's programme in Statistics and Operations Research. Statistics and Operations Research programme encompasses the study of various quantitative techniques relevant to the problems of decision making, optimisation, forecasting and other real world problems. Students undertaking this programme will

obtain a solid background in the fundamentals of Calculus, Probability, Operations Research and Statistics as well as proficiency in the use of relevant computer softwares. Those students who wish to become Actuaries will find this degree programme an excellent preparation for their future work.

3. OBJECTIVES

- 3.1 To provide an intellectually challenging undergraduate degree programme in the theory and practice of Statistical Sciences and Operations Research and to equip those students who wish to enter industry, commerce or public organisations with high quality skills required.
- 3.2 To provide undergraduates with an adequate coverage of Statistics and Operations Research using mathematics and computing, and train them for a career in industry, commerce and public organisations.
- 3.3 To familiarise students with the basic terminology of Operations Research including mathematical modeling, feasible solutions, optimisation and iterative computations.

4. CAREER PROSPECTS

- 4.1 Formulate and apply mathematical modeling methods to develop and interpret information that assists managers with policy formulation.
- 4.2 Analyse advanced analytical methods/techniques to improve decision making by managers.
- 4.3 Analysts use strong quantitative analytical abilities to integrate and analyze data.
- 4.4 Involvement in top- level strategising, planning, and forecasting.
- 4.5 Help to allocate resources, measure performance, schedule, design production facilities and systems, manage the supply chain, pricing, coordinate transportation and distribution, or analyse large databases.

5. ENTRY REQUIREMENTS

5.1 Normal Entry

Refer to Section 4.1 of the School Regulations.

5.2 Special Entry

Refer to Section 4.2 of the School Regulations.

6 STRUCTURE OF THE PROGRAMME

6.1 Duration

The normal duration of the BSc Honours Degree in Statistics and Operations Research shall be four (4) years.

6.2 Degree Structure

6.2.1 Refer to Section 5 of the School Regulations.

6.2.2 Work Related Learning

Refer to Section 7 of the School Regulations.

6.3 MODULES

LEVEL 1 SEMESTER 1

Core Modules

Code	Module Description
HMAT 101	Calculus I
HMAT 103	Linear Mathematics I
RMS 101	Research Methods and Statistics
HSOR 107	Probability Theory I
HCSM 111	Introduction to Computers and Computer Applications
HCSC 101	Communication Skills
BHS 110	Introduction to Zimbabwean Cultures and Heritage

LEVEL I SEMESTER II

Core Modules

Code	Module Description
HSOR 105	Applied Statistics
HMAT 102	Mathematical Discourse and Structures
HMAT 104	Calculus II
HSOR 104	Statistical Inference I
HSOR 106	Computer Packages in Applied Mathematics
HMAT 108	Linear Mathematics II
HSOR 108	Linear and Integer Programming
BAC101	African Philosophy and Thought

LEVEL II SEMESTER I

Core Modules

Code	Module Description
HSOR 210	Stochastic processes
HSOR 205	Management Science
HMAT 210	Ordinary differential Equations
HSOR 213	Time Series Analysis

Optional Modules

A student may choose two (2) modules from the following:

Code	Module Description
HSOR 209	Statistical Process Control
HSOR 211	Regression and Analysis of Variance I
HSOR 215	Theory of Estimation
HSOR 216	Probability Theory II

LEVEL II SEMESTER II

Core Modules

Code	Module Description
HSOR 203	Introduction to Operations Management
HSOR 207	Design and Analysis of Experiments
HMAT 207	Numerical Methods
HSOR 212	Network Models

Optional Modules

A student may choose two (2) modules from the following:

Code	Module Description
HSOR 202	Survey Techniques
HCSM 210	Database Models and Design
HSOR 214	Statistical Inference II
HMAT 220	Stochastic Calculus

LEVEL III

Core Modules

Code	Module Description
HSOR 301	Employer`s Assessment
HSOR 302	Academic Supervisor`s Assessment
HSOR 303	Student`s Report

LEVEL IV SEMESTER I PREREQUISITES

Core Modules

Code	Module Description
HSOR 409	Simulation and Modelling
HSOR 410	Queuing Theory
HSOR 418	Stochastic Differential Equations and Integration
HSOR 422	Dynamic Programming and Inventory Models

Optional Modules

A student may choose two (2) modules from the following:

Code	Module Description
HSOR 402	General Linear Models
HSOR 403	Dynamical systems
HSOR 404	Mathematical Modelling
HSOR 405	Econometrics
HSOR 412	Risk Theory
HSOR 415	Reliability Analysis

LEVEL IV SEMESTER II PREREQUISITES

Core Modules

Code	Module Description
HSOR 413	Quantitative Analysis

HSOR 408	Operations Research Techniques	HSOR 108
HSOR 425	Fundamentals of Optimisation	
HSOR 460	Research Project	

Optional Modules

A student may choose two (2) modules from the following:

Code	Module Description	
HSOR 401	Advanced Probability Theory	
HSOR 406	Multivariate Analysis	
HSOR 407	Financial Mathematics	
HSOR 411	Scientific Sampling	
HSOR 419	Hypothesis Testing	
HSOR 420	Survival Analysis	
HSOR 423	Regression Analysis and Analysis of Variance II	HSOR 211

7 ASSESSMENT

Refer to Section 6 of the School Regulations.

8. PROVISIONS FOR PROGRESSION

Refer to Section 8 of the School Regulations.

9. DEGREE CLASSIFICATION AND WEIGHTING

Refer to Section 11 of the School Regulations.

DEPARTMENT OF PHYSICS, GEOGRAPHY AND ENVIRONMENTAL SCIENCE

REGULATIONS FOR THE BACHELOR OF SCIENCE HONOURS DEGREE IN GEOGRAPHY AND ENVIRONMENTAL SCIENCE

1. PREAMBLE

These regulations should be read in conjunction with the School Regulations and General Academic Regulations for Undergraduate Degrees and Diplomas, which have precedence over Departmental Regulations.

2. GENERAL DESCRIPTION OF THE PROGRAMME

Geography and Environmental Science deals with the spatial and temporal aspects of the man -environment system. The discipline provides students with valuable knowledge concerning the complex spatial and temporal scales, environmental events, processes and dynamics. In order for us to solve environmental problems confronting life on earth, it is essential that we understand the science behind geomorphic processes, climate change, environmental health and degradation, biodiversity loss and such other environmental problems. The need for relevant environmental policy formulation to sustainably manage the environment would be emphasised. The course

takes a closer look at our biological heritage and the non-living components of our surroundings which are so vital for survival.

3. OBJECTIVES

The programme attempts to achieve the following objectives:

- 3.1 To produce students with diverse knowledge in advanced fields of Geography and Environmental Science.
- 3.2 To produce students who are able to deal with complex issues both systematically and creatively to solve contemporary environmental problems.
- 3.3 To equip students with research skills that are commensurate with the characteristics of the geography discipline and that will add to the pool of existing knowledge.

4. CAREER PROSPECTS

4.1 Geography and Environmental Science

- Marketing and Market Research in the public and private sectors e.g.
 - EMA, ZINWA,
 - ZFC, Parks and Wildlife, Tourism, NGOs, mining companies, agricultural estates, etc.
- EIA Specialist and Consultant
- Administrative officer
- Economic Planner
- Land Surveyor
- Cartographer
- Demographer
- Resource Policy Maker
- Estate Management
- Hydrographer/Hydrologist
- Geomorphology
- Meteorology
- Ecology
- Climate Change Research
- Atmospheric scientist
- Environmental Research and Consultant
- Environmental Scientist
- Environmental modelling
- Environmental officer
- Environmental Management Agency

4.2 Job designations in the field of GIS and Remote Sensing

- GIS Analyst
- GIS Technician
- GIS Technologist
- GIS Coordinator
- GIS Developer
- GIS Manager
- GIS Data Steward
- GIS Specialist
- GIS Practitioner

- Mapping Analyst
- Air photo interpretation specialist
- Remote Sensing Specialist

5. ENTRY REQUIREMENTS

5.1 Normal Entry

Refer to Section 4.1 of the School Regulations

5.2 SPECIAL ENTRY

Refer to Section 4.2 of the School Regulations

6. STRUCTURE OF THE PROGRAMME

6.1 Duration of the programme

The normal duration of Bachelor of Science Honours degree in Geography and Environmental Science shall be four (4) years of full time study.

6.2 Degree Structure

6.2.1 Refer to Section 5 of the School Regulations.

6.2.2 Work Related Learning

Refer to Section 7 of the School Regulations.

6.3 MODULES

Not all modules will be on offer every semester.

LEVEL I SEMESTER I

HGGES 101	Weather and Climate
HGGES 102	Techniques in Geography and Environmental Science
HGGES 103	Introduction to Environmental Science
HGGES 108	Principles of Hydrology
HGGES 111	Introduction to Computers and Computer Applications
HCSC 101	Communication Skills
BHS 110	Introduction to Zimbabwean Cultures and Heritage

SEMESTER II

HGGES 104	Introduction to Medical Geography
HGGES 105	Population Geography
HGGES 106	Settlement Geography
HGGES 107	Principles of Geomorphology
HGGES 109	Fundamentals of Social and Economic Geography
HGGES 110	Introduction to Geographic Information Systems and Remote Sensing
BAC 101	African Philosophy and Thought

LEVEL II

Students are required to study **6 modules** in each of the two semesters.

SEMESTER I

Core

HGGES 207	Environmental Policy and Management
HGGES 212	Research Methods in Geography and Environmental Science
HGGES 213	Statistical Methods in Geography and Environmental Science
HGGES 221	Geographic Information Systems and Remote Sensing

Students should choose **2 modules** from the following options:

Options:

HGGES 204	Population and Sustainable Development
HGGES 205	Cultural Geography
HGGES 209	Transport Geography
HGGES 210	Political Geography
HGGES 211	Rural Development Geography
HGGES 215	Ecosystems
HGGES 218	Geography of Zimbabwe

SEMESTER II

Core:

HGGES 201	Environmental Education
HGGES 202	Geographic Thought
HGGES 208	Resource Management
HGGES 214	Hydrology

Students should choose **2 modules** from the following options:

Options

HGGES 203	Meteorology and Climatology
HGGES 206	Soil Geography
HGGES 216	Geography of Tourism and Recreation
HGGES 217	Mining and the Environment
HGGES 219	Geography of Central and Southern Africa
HGGES 220	Environmental Health and Safety
HGGES 222	Research Essay

LEVEL III

HGGES 301	Employer's Assessment
HGGES 302	Academic Supervisor's Assessment

HGGES 303 Student's Report

LEVEL IV

Students are required to study **6 modules** in each of the two semesters.

SEMESTER I

Core:

HGGES 402 Geography of Sub-Saharan Africa
HGGES 405 Natural Hazards and Disaster Management
HGGES 408 Water Resources Management
HGGES 412 Biogeography

Students should choose **2 modules** from the following options:

Options:

HGGES 403 Agriculture and the Environment
HGGES 413 Applied Geographic Information Systems
HGGES 416 Rangeland Management
HGGES 418 Geography of Monstrosity
HGGES 419 Industrial Geography
HGGES 420 Energy and the Environment
HGGES 462 Tropical Geomorphology
HGGES 422 Geographical Perspective of HIV and AIDS

SEMESTER II

Core:

HGGES 401 Environmental Pollution
HGGES 404 Spatial Analysis
HGGES 410 Environmental Impact Assessment
HGGES 460 Research Project

Students should choose **2 modules** from the following options:

Options:

HGGES 406 Urban Geography
HGGES 407 Medical Geography
HGGES 409 Applied Geomorphology
HGGES 411 Regional Development Planning
HGGES 414 Applied Remote Sensing
HGGES 415 Gender and Development
HGGES 417 Climate Change

7. ASSESSMENT

Refer to Section 6 of the School Regulations.

8. PROVISIONS FOR PROGRESSION

Refer to Section 8 of the School Regulations.

9. DEGREE CLASSIFICATION AND WEIGHTING

Refer to Section 11 of the School Regulations.

REGULATIONS FOR THE BACHELOR OF SCIENCE HONOURS DEGREE IN PHYSICS

1. PREAMBLE

These regulations should be read in conjunction with the General Academic Regulations for Undergraduate Degrees and Diplomas, hereinafter referred to as the General Regulations and the School Academic Regulations for Undergraduate Degrees, hereinafter referred to as the School Regulations.

2. GENERAL DESCRIPTION OF THE PROGRAMME

Physics is concerned with the interaction between matter and energy. It explores the fundamental forces of nature and covers fascinating topics from the Big Bang and black holes, to the Higgs Boson and elementary particles. The four-year BSc Honours degree in Physics equips students with a sound knowledge of theoretical and experimental physics. The third-year of the programme is spent in an industrial environment where the student will learn the practical applications of physics in cutting edge technologies and advanced engineering.

Core Physics topics include: Newtonian Dynamics, Wave Phenomena, Geometrical Optics, Thermal Physics, Practical Physics, Electromagnetism, Solid State Physics, Quantum and Atomic Physics and Nuclear and Particle Physics, Relativity Theory. Students will also take Mathematics, Computing and Experimental Physics modules in support of their studies. The programme also includes a two-semester research project. This allows students to get hands-on experience with specialist equipment and develop practical skills for a wide range of physical science careers.

3. OBJECTIVES

- 3.1 To equip students with adequate theoretical knowledge of Physics principles and theories which enable them to further their studies and carry out research in the discipline and related fields.
- 3.2 To allow students to gain practical skills in handling various pieces of equipment used in and outside the Labs.

3.3 To develop the ability to apply theoretical knowledge in developing prototypes useful in addressing everyday needs in people`s livelihoods addressing relevant clusters of ZimAsset.

4. CAREER PROSPECTS

- Geophysist
- Astronomer
- Mateology
- Metrologist
- Radiology
- Telecoms
- Radio and Engineer Research Scientist

5. ENTRY REQUIREMENTS

5.1 Normal Entry

Refer to Section 4.1 of the School Regulations.

5.2 Special Entry

Refer to Section 4.2 of the School Regulations.

6. STRUCTURE OF THE DEGREE PROGRAMME

6.1 Duration

The normal duration of BSc Honours Degree in Physics shall be four (4) years

6.2 Degree Structure

Refer to Section 5 of the School Regulations.

6.2.1 Work Related Learning

Refer to Section 7 of the School Regulations.

6.3 MODULES

LEVEL I

Students shall be required to study **fourteen(14) compulsory modules** including one University wide module and two University wide modules from the School of Cultural Heritage Studies.

LEVEL 1 SEMESTER 1

Code	Modules
HPH 101	Mechanics

HPH 102	Electricity and Magnetism
HMAT 101	Calculus 1
HMAT 103	Linear Mathematics 1
HCS 111	Introduction to Computers and Computer Applications
HCSC 101	Communication Skills
BHS110	Introduction to Zimbabwe Cultures and Heritage

SEMESTER II

CODE

HPH 104	Waves and Geometrical Optics
HPH 105	Modern Physics
HPH 106	Electrical Circuits
HPH 103	Thermodynamics
HMAT 104	Calculus II
HMAT 108	Linear Mathematics II
BAC 101	African Philosophy and Thought

LEVEL II

Students are required to study **6 modules** in each of the two semesters.

SEMESTER I

CODE

Module

HPH 201	Solid State Physics 1
HPH 202	Electromagnetism
HPH 203	Optics and Lasers
HPH 205	Analogue Electronics
HMAT 204	Vector calculus
HMAT 210	Ordinary Differential Equations

SEMESTER II

HPH 204	Quantum Mechanics I
HPH 206	Nuclear Physics
HPH 208	Atomic Physics and Relativity Theory
HPH 209	Atmospheric Physics
HPH 210	Digital Electronics
HMAT 207	Numerical Methods

LEVEL III

Students shall go for Work Related Learning.

HPH 301	Employer`s Assessment
HPH 302	Academic Supervisor`s Assessment
HPH 303	Student`s Report

LEVEL IV

Students are required to study **6 modules** in each of the two semesters.

SEMESTER I

CODE

HPH 401	Solid State Physics 2
HPH 402	Quantum Mechanics II
HPH 403	Particle Physics
HPH 404	Electromagnetic Theory
HPH 405	Instrumentation Physics

SEMESTER II

CODE

Module

HPH 407	Classical Dynamics
HPH 408	Material Science
HPH 406	Statistical Mechanics
HPH 460	Research Project
Elective Module	(To be advised)

Options

HPH 410	Applied Thermodynamics
HPH 411	Environmental Physics
HPH 412	Energy Physics
HPH 414	Geophysics
HPH 415	Microprocessors
HPH 416	Medical Physics
HPH 417	Computational Physics
HPH 418	Metrology
HPH 419	Fibre Optics
HPH 420	Computer Interfacing

7. ASSESSMENT

Refer to Section **6** of the School Regulations.

8. PROVISION FOR PROGRESSION

Refer to Section **8** of the School Regulations.

9. DEGREE CLASSIFICATION AND WEIGHTING

Refer to Section **11** of the School Regulations

REGULATIONS FOR SPECIAL HONOURS PROGRAMMES

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

REGULATIONS FOR THE BACHELOR OF SCIENCE SPECIAL HONOURS DEGREE IN MATHEMATICS

1. PREAMBLE

- 1.1 These regulations should be read in conjunction with the General Academic Regulations for Undergraduate Degrees and Diplomas, hereinafter referred to as the General Regulations which has precedence over School Regulations.
- 1.2 Senate has the prerogative to change, cancel or replace any of these regulations.
- 1.3 A student who has started a programme following one set of regulations shall not be affected by regulations adopted subsequently unless agreed to in writing by the student.

2. ENTRY REQUIREMENTS

2.1 Normal Entry

Candidates should have completed a Bachelor's degree with Mathematics or its equivalent as one of the subjects taken up to final year.

3. STRUCTURE OF THE PROGRAMME

- 3.1 The normal duration of Bachelor of Science Special Honours degree in Mathematics shall be one (1) year of full time study. Each student shall be required to study a minimum of twelve (12) modules including a research project.

3.2 MODULES TO BE OFFERED:

Not all modules will be on offer every semester.

LEVEL IV

Students shall be required to study a minimum of **twelve (12) modules** including a research project.

SEMESTER I

Core

PREREQUISITES

HMAT 413	Real Analysis	HMAT 213
HMAT 412	Complex Analysis	HMAT 218
HMAT 404	Topology	HMAT 213
HMAT 407	Numerical Solutions of PDE's	HMAT 207

Students should choose **2 modules** from the following options:

Options

HMAT 403	Set Theory and Logic	
HMAT 405	Commutative Algebra	HMAT 209
HMAT 406	Risk Theory	HMAT 201
HMAT 408	Control Theory	
HMAT 409	Calculus of variations	

SEMESTER II

Core

HMAT 401	Advanced Probability Theory	
HMAT 417	Partial Differential Equations	HMAT 214
HMAT 416	Fluid Mechanics	HMAT 217
HMAT 460	Research Project	

Students should choose **2 modules** from the following options:

Options

HMAT 410	Perturbation Theory	
HMAT 421	Algebra II	
HMAT 415	Group Theory	
HMAT 418	Stochastic Differential Equations and Integration	
HMAT 419	Non Linear Ordinary Differential Equations	HMAT 207
HMAT 420	Non Linear Partial Differential Equations	HMAT 210

4. ASSESSMENT

Each module shall be a percentage mark. The weighting shall be:

Coursework:	25%
Examination:	75%

5. DETERMINATION OF RESULTS

- 5.1 The formal examination of a module shall take place at the end of the semester in which the course is taught.
- 5.2 To be admitted into an examination, a candidate must be registered for the module with the University and have satisfied module requirements.
- 5.3 Each module in the programme shall be assessed on the basis of a written examination and by continuous assessment undertaken during the period of study.
- 5.4 The results of each examination shall be published in accordance with the provisions of the General Regulations.

6. WEIGHTING

The degree class shall be determined from the average marks obtained in that year.

7. DEGREE CLASSIFICATION

The following Grading Scale shall be adopted for all the modules:

75 – 100%	1	(First Class)
65 – 74%	2.1	(Upper Second Class)
60 – 64%	2.2	(Lower Second Class)
50 – 59%	3	(Third Class)
Below 50%		Fail

REGULATIONS FOR THE BACHELOR OF SCIENCE SPECIAL HONOURS DEGREE IN STATISTICS AND OPERATIONS RESEARCH

1. PREAMBLE

- 1.1 These regulations should be read in conjunction with the General Academic Regulations for Undergraduate Degrees and Diplomas, hereinafter referred to as the General Regulations which has precedence over School Regulations.
- 1.2 Senate has the prerogative to change, cancel or replace any of these regulations.
- 1.3 A student who has started a programme following one set of regulations shall not be affected by regulations adopted subsequently unless agreed to in writing by the student.

2. ENTRY REQUIREMENTS

2.1 NORMAL ENTRY

Candidates should have completed a Bachelor's degree with Mathematics/ Statistics and Operations Research or equivalent as one of the subjects taken up to final year.

3. STRUCTURE OF THE PROGRAMME

- 3.1 The normal duration of Bachelor of Science 4th Year Honours degree in Statistics and Operations Research shall be one (1) year of full time study. Each student shall be required to study a minimum of twelve (12) modules including a research project.

3.2 MODULES

Not all modules will be on offer every semester.

LEVEL IV

Students shall be required to study a minimum of **twelve(12) modules** including a research

project.

SEMESTER I

Core

HSOR 409	Simulation and Modelling	
HSOR 410	Queuing Theory	
HSOR 418	Stochastic Differential Equations and Integration	HSOR 210
HSOR 422	Dynamic Programming and Inventory Models	

PREREQUISITES

Students should choose **2 modules** from the following options:

Options

HSOR 402	General Linear Models
HSOR 403	Dynamical systems
HSOR 404	Mathematical Modelling
HSOR 405	Econometrics
HSOR 412	Risk Theory
HSOR 415	Reliability Analysis

SEMESTER II

Core

HSOR 413	Quantitative Analysis	
HSOR 408	Operations Research Techniques	HSOR 108
HSOR 425	Fundamentals of Optimisation	
HSOR 460	Research Project	

Students should choose **2 modules** from the following options:

Options

HSOR 401	Advanced Probability Theory	
HSOR 406	Multivariate Analysis	
HSOR 407	Financial Mathematics	
HSOR 411	Scientific Sampling	
HSOR 419	Hypothesis Testing	
HSOR 420	Survival Analysis	
HSOR 423	Regression Analysis and Analysis of Variance II	HSOR 211

4. ASSESSMENT

Each module shall be a percentage mark. The weighting shall be:

Coursework:	25%
Examination:	75%

5. DETERMINATION OF RESULTS

- 5.1 The formal examination of a module shall take place at the end of the semester in which the course is taught.
- 5.2 To be admitted into an examination, a candidate must be registered for the module with the University and have satisfied module requirements.
- 5.3 Each module in the programme shall be assessed on the basis of a written examination and by continuous assessment undertaken during the period of study.
- 5.4 The results of each examination shall be published in accordance with the provisions of the General Regulations.

6. WEIGHTING

The degree class shall be determined from the average marks obtained in that year.

7. DEGREE CLASSIFICATION

The following Grading Scale shall be adopted for all the modules:

75 – 100%	1	(First Class)
65 – 74%	2.1	(Upper Second Class)
60 – 64%	2.2	(Lower Second Class)
50 – 59%	3	(Third Class)
Below 50%		Fail

DEPARTMENT OF PHYSICS, GEOGRAPHY AND ENVIRONMENTAL SCIENCE

REGULATIONS FOR THE BACHELOR OF SCIENCE SPECIAL HONOURS IN GEOGRAPHY AND ENVIRONMENTAL SCIENCE

1. PREAMBLE

These regulations should be read in conjunction with the School Regulations and General Academic Regulations for Undergraduate Degrees and Diplomas, which have precedence over Departmental Regulations.

2. GENERAL DESCRIPTION OF THE PROGRAMME

Geography and Environmental Science deals with the spatial and temporal aspects of the man-environment system. The discipline provides students with valuable knowledge concerning the complex spatial and temporal scales, environmental events, processes and dynamics. In order for us to solve environmental problems confronting life on earth, it is essential that we understand the science behind geomorphic processes, climate change, environmental health and degradation, biodiversity loss and such other environmental

problems. The need for relevant environmental policy formulation to sustainably manage the environment would be emphasised. The course takes a closer look at our biological heritage and the non-living components of our surroundings which are so vital for survival.

3. OBJECTIVES

The programme attempts to achieve the following objectives:-

- 3.1 To produce students with diverse knowledge in advanced fields of Geography and Environmental Science.
- 3.2 To produce students who are able to deal with complex issues both systematically and creatively to solve contemporary environmental problems.
- 3.3 To equip students with research skills that are commensurate with the characteristics of the geography discipline and that will add to the pool of existing knowledge.

4. CAREERS IN GEOGRAPHY AND ENVIRONMENTAL SCIENCE

4.1 Geography and Environmental Science

- Marketing and Market Research in the public and private sectors e.g. EMA, ZINWA, ZFC, Parks and Wildlife, Tourism, NGOs, mining companies, agricultural estates, etc.
- EIA Specialist and Consultant
- Administrative officer
- Economic Planner
- Land Surveyor
- Cartographer
- Demographer
- Resource Policy Maker
- Estate Management
- Hydrographer/Hydrologist
- Geomorphology
- Meteorology
- Ecology
- Climate Change Research
- Atmospheric scientist
- Environmental Research and Consultant
- Environmental Scientist
- Environmental modelling
- Environmental officer
- Environmental Management Agency

4.2 Job designations in the field of GIS and Remote Sensing

- GIS
- Analyst
- GIS Technician
- GIS Technologist
- GIS Coordinator
 - GIS Developer
 - GIS Manager
- GIS Data Steward
- GIS Specialist
- GIS Practitioner
- Mapping Analyst
- Air photo interpretation specialist
- Remote Sensing Specialist

5. ENTRY REQUIREMENTS

5.1 Normal Entry

Candidates should have completed a Bachelor's degree with Geography and Environmental Science or equivalent as one of the subjects taken up to final year.

6. STRUCTURE OF THE PROGRAMME

6.1 Duration of the programme

The normal duration of Bachelor of Science Special Honours degree in Geography and Environmental Science shall be one (1) year of full time study.

6.2 Degree Structure

Refer to Section 5 of the School Regulations.

6.3 MODULES

Not all modules will be on offer every semester.

LEVEL IV

Students shall be required to study a minimum of **twelve (12) modules** including a research project.

SEMESTER I

Core:

HGGES 432	Research Methods in Geography and Environmental Science
HGGES 433	Statistical Methods in Geography and Environmental Science
HGGES 445	Natural Hazards and Disaster Management
HGGES 461	Geographic Information Systems and Remote Sensing

Students should choose **2 modules** from the following options:

Options:

HGGES 424	Population and Sustainable Development
HGGES 427	Environmental Policy and Management
HGGES 429	Transport Geography
HGGES 430	Political Geography
HGGES 431	Rural Development Geography
HGGES 435	Biogeography
HGGES 438	Geography of Zimbabwe
HGGES 440	Environmental Health and Safety
HGGES 442	Geography of Sub-Saharan Africa
HGGES 443	Agriculture and the Environment
HGGES 453	Applied Geographic Information Systems
HGGES 455	Gender and Development
HGGES 456	Rangeland Management
HGGES 457	Climate Change
HGGES 458	Geography of Monstrosity

HGGES 459	Industrial Geography
HGGES 460	Energy and the Environment
HGGES 462	Tropical Geomorphology
HGGES 463	Geographical Perspective of HIV and AIDS

SEMESTER II

Core:

HGGES 436	Geography of Tourism and Recreation
HGGES 437	Mining and the Environment
HGGES 444	Spatial Analysis
HGGES 450	Environmental Impact Assessment

Students should choose **2 modules** from the following options:

Options:

HGGES 421	Environmental Education
HGGES 464	Geographic Thought
HGGES 423	Meteorology and Climatology
HGGES 425	Cultural Geography
HGGES 426	Soil Geography
HGGES 428	Resource Management
HGGES 434	Hydrology
HGGES 439	Geography of Central and Southern Africa
HGGES 441	Environmental Pollution
HGGES 446	Urban Geography
HGGES 447	Medical Geography
HGGES 448	Water Resources Management
HGGES 449	Applied Geomorphology
HGGES 451	Regional Development Planning
HGGES 452	Ecosystems
HGGES 454	Applied Remote Sensing
HGGES 470	Research Project

7. ASSESSMENT

Refer to Section **6** of the School Regulations.

8. PROVISIONS FOR PROGRESSION

Refer to Section **8** of the School Regulations.

9. DEGREE CLASSIFICATION AND WEIGHTING

Refer to Section **11** of the School Regulations.

REGULATIONS FOR BRIDGING PROGRAMMES

NATURAL SCIENCES

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

REGULATIONS FOR THE BACHELOR OF SCIENCE SPECIAL HONOURS DEGREE BRIDGING PROGRAMME IN MATHEMATICS

1. PREAMBLE

These regulations should be read in conjunction with the General Academic Regulations for Undergraduate Degrees and Diplomas, hereinafter referred to as the General Regulations and the School Academic Regulations hereinafter referred to as the School Regulations.

2. OBJECTIVES

- 2.1 The objective of the bridging programme is to enable candidates who are holders of a Bachelors degree but lacking enough modules required to register for the Bachelor of Science 4th Year Honours Degree in Mathematics.
- 2.2 The bridging programme targets candidates with a degree other than the Bachelor's degree in Mathematics or its equivalents who may be required to register for some Part II modules of the Bachelor of Science Honours Degree in Mathematics before they are admitted into the Bachelor of Science 4th Year Honours Degree programme.

3. RATIONALE

To boost enrolment so that there are viable classes.

4. ENTRY REQUIREMENTS

In order to qualify for entry into the bridging programme a prospective student should have a Bachelor's Degree with at least a 2.2 degree class and should have done a number of modules relevant in Mathematics.

5. STRUCTURE OF THE PROGRAMME

- 5.1 The Bridging modules shall be offered at Part II of the Bachelor of Science Honours programme. Candidates will be expected to register for the modules that are lacking in their Bachelor's degree transcript.
- 5.2 The Bridging programme shall normally run for up to **two** semesters
- 5.3 A candidate on the Bridging programme shall **only** register for those modules not studied in the first degree and shall be exempted from modules passed.

- 5.4 The selection of modules for a candidate to bridge shall be on a case by case basis. These modules shall be selected from the ones listed below:

MODULES TO BE OFFERED:

Not all modules will be on offer every semester.

LEVEL II

Students are required to study at least **seven (7) modules** in each of the two semesters.

SEMESTER I

Core

HMAT 201	Analysis I
HMAT 204	Vector Calculus
HMAT 210	Ordinary Differential Equations
HMAT 218	Complex Variables

Students should choose **3 modules** from the following options:

Options

HMAT 202	Statistical Inference
HMAT 208	Number Theory
HSOR 211	Regression and Analysis of Variance I
HSOR 213	Time Series Analysis
HMAT 216	Probability Theory II

SEMESTER II

Core

HMAT 207	Numerical Methods
HMAT 213	Analysis II
HMAT 214	Partial Differential Equations and Fourier Series
HMAT 217	Mechanics

Students should choose **3 modules** from the following options:

Options

HMAT 206	Graph Theory
HMAT 209	Algebra I
HMAT 215	Optimisation
HMAT 219	Analytical Number Theory
HMAT 220	Stochastic Calculus

6. ASSESSMENT OF CANDIDATES

6.1 Each module shall be a percentage mark. The weighting shall be:

Coursework: 25%

Examination: 75%

7. DETERMINATION OF RESULTS

7.1 To proceed to Bachelor of Science Special Honours a candidate must have successfully completed all bridged modules.

7.2 A candidate who fails one or two modules within supplementable range in the bridged modules shall be allowed to sit for supplementary examinations.

7.3 A candidate who fails bridged modules below supplementable range may be allowed to repeat the failed modules before proceeding to Bachelor of Science 4th Year Honours.

7.4 A candidate who has failed the bridging programme twice will be required to withdraw.

7.5 Bridged modules shall be credited on the 4th Year Honours Degree transcript.

8. DEGREE CLASSIFICATION

The following Grading Scale shall be adopted for all the modules:

75 – 100% 1 (First Class)

65 – 74% 2.1 (Upper Second Class)

60 – 64% 2.2 (Lower Second Class)

50 – 59% 3 (Third Class)

Below 50% Fail

DEPARTMENT OF PHYSICS, GEOGRAPHY AND ENVIRONMENTAL SCIENCE

REGULATIONS FOR THE BACHELOR OF SCIENCE SPECIAL HONOURS DEGREE BRIDGING PROGRAMME IN GEOGRAPHY AND ENVIRONMENTAL SCIENCE

1. PREAMBLE

These regulations should be read in conjunction with the General Academic Regulations for Undergraduate Degrees and Diplomas, hereinafter referred to as the General Regulations and the School Academic Regulations hereinafter referred to as the School Regulations.

2. OBJECTIVES

2.1 The objectives of the bridging programme is to enable candidates who are holders of a Bachelors degree but lacking enough modules required to register for the Bachelor of Science Special Honours Degree in Geography and Environmental Science.

2.2 The bridging programme targets candidates with a degree other than the Bachelor's degree in Geography and Environmental Science or its equivalents who may be required to register for some Part II modules of the Bachelor of Science Honours Degree in Geography and Environmental Science before they are admitted into the Bachelor of Science Special Honours Degree programme.

3. RATIONALE

To boost enrolment so that we have viable classes.

4. ENTRY REQUIREMENTS

In order to qualify for entry into the bridging programme a prospective student should have a Bachelor's degree with at least a 2.2 degree class and should have done a number of modules relevant in Geography and Environmental Science.

5. STRUCTURE OF THE PROGRAMME

- 5.1 The Bridging modules shall be offered at Part II of the Bachelor of Science Honours programme. Candidates will be expected to register for the modules that are lacking in their Bachelor's degree transcript.
- 5.2 The Bridging programme shall normally run for up to **two** semesters.
- 5.3 A candidate on the Bridging programme shall **only** register for those modules not studied in the first degree and shall be exempted from modules passed.
- 5.4 The selection of modules for a candidate to bridge, shall be on a case by case basis. These modules shall be selected from the ones listed below:

5.5 MODULES

Not all modules will be on offer every semester.

LEVEL II

Students shall be required to study at least **seven (7) modules** in each of the two semesters.

SEMESTER I

Core

HGGES 201	Environmental Education
HGGES 208	Resource Management
HGGES 214	Hydrology
HGGES 206	Soil Geography

Students should choose at least **3 modules** from the following options:

Options

HGGES 216	Geography of Tourism and Recreation
HGGES 217	Mining and the Environment
HGGES 218	Geography of Zimbabwe
HGGES 219	Geography of Central and Southern Africa
HGGES 220	Environmental Health and Safety
HGGES 222	Research Essay

SEMESTER II

Core:

HGGES 202	Geographic Thought
HGGES 207	Environmental Policy and Management

HGGES 212	Research Methods in Geography and Environmental Science
HGGES 213	Statistical Methods in Geography and Environmental Science

Students should choose at least **3 modules** from the following options:

Options:

HGGES 203	Meteorology and Climatology
HGGES 215	Ecosystems
HGGES 221	Geographic Information Systems and Remote Sensing
HGGES 204	Population and Sustainable Development
HGGES 205	Cultural Geography
HGGES 209	Transport Geography
HGGES 210	Political Geography
HGGES 211	Rural Development Geography

6. ASSESSMENT OF CANDIDATES

6.1 Each module shall be a percentage mark. The weighting shall be:

Coursework:	30%
Examination:	70%

7. DETERMINATION OF RESULTS

- 7.1 To proceed to Bachelor of Science Fourth Year Honours a candidate must have successfully completed all bridged modules.
- 7.2 A candidate who fails one or two modules within supplementable range in the bridged modules shall be allowed to sit for supplementary examinations.
- 7.3 A candidate who fails bridged modules below supplementable range may be allowed to repeat the failed modules before proceeding to Bachelor of Science Fourth Year Honours.
- 7.4 A candidate who has failed the bridging programme twice will be required to withdraw.
- 7.5 Bridged modules shall be credited on the Fourth Year Honours Degree transcript.

8. DEGREE CLASSIFICATION

The following Grading Scale shall be adopted for all the modules:

75 – 100%	1	(First Class)
65 – 74%	2.1	(Upper Second Class)
60 – 64%	2.2	(Lower Second Class)
50 – 59%	3	(Third Class)
Below 50%		Fail

MODULES SYNOPSES

DEPARTMENT OF LIVESTOCK, WILDLIFE AND FISHERIES

BACHELOR OF SCIENCE HONOURS DEGREE IN AGRICULTURE (LIVESTOCK, WILDLIFE AND FISHERIES)

ASP101 Introduction to Soil Science

Soil forming factors. Physical properties of soils. Mineralogy of soils. Soil water relations. Soil air and temperature. Soil organic matter. Chemical properties of soils. Plant mineral nutrition. Management of fertility. Traditional practices and beliefs in soil fertility management. Soil pH. Soil Classification. Soil surveys. Soil management. Management of saline and sodic soils. And soil biology.

ALWF101 Agricultural Biochemistry

Carbon: compounds, isomerism, reactions of compounds. Components of animal and plant tissues. Biochemical reactions. Metabolism. Photosynthetic pathways. Electron transport systems and chemical cycles. Enzymes. Hormone and hormone functions. Carbohydrates: nomenclature, monosaccharides, disaccharides, polysaccharides, functions. Proteins: classification, chemistry. Lipids: classification, chemistry. Vitamins: water and fat soluble, functions, deficiencies. Minerals: functions, absorption, functions.

APRAC101 Practical Agriculture 1

Modular instruction on usage of equipment and its calibration. Land tillage techniques. Management of crop pests and diseases. Livestock system operations. Crop production. Forestry, and Fisheries production systems. Wildlife management systems. Horticultural production systems. Food processing and preservation techniques. Pre-colonial farm implements. Traditional production systems.

ALWF102 Animal Anatomy and Physiology

Introduction: definitions, terms, general organization. The skeletal system: axial, appendicular skeleton. Arthrology: joints and articulation. Muscular system: muscles, tendons and ligaments. Digestive system: ruminants, non-ruminants and poultry. Reproductive systems: male and female; avian reproduction. Cardiovascular systems: heart, vessels, blood. Urinary system: kidney structure and function. Respiratory system: anatomy and physiology. Endocrine system: hormones, actions. Nervous systems: central, sympathetic, parasympathetic

AF101 Fisheries Management and Population Dynamics

Understanding fisheries management systems and strategies in fish conservation. Integrated fishery management- fish and poultry. Governance and management systems. Stakeholder interests, characteristics and influences. Role of fisheries management in Zimbabwe. Co-management and sustainable utilization of fisheries resources and

watershed management. Fish harvesting techniques, gill nets and seine nets. Managing Recreational Fisheries. Economics of Fisheries management. Socio-economic importance of fisheries management. Fish in the life of Zimbabweans. Fish industries in Zimbabwe. Population dynamics, numerical impact of various interactions (both biotic and abiotic) on a specific set of individuals. Four demographic parameters determine the total numbers in a population change at a particular time these are, birth, death, immigration and emigration. Recruitment, growth, mortality, population structure, population dynamics and fishery structure. Traditional and religious myths and belief systems in fisheries management.

AAA101 Professional Ethics in Agriculture

Definition of ethics, professional ethics. Ethical inventory from institutions, government and private sector. Morality and moral confidence. Ethical characteristics in leadership. Ethics and gender. Case studies. Unhuism.

ASP104 Basic microbiology and Introductory Entomology

Insects in general, Success of insects, Harmful and beneficial insects, Insect internal and external structure and function. Insect classification, Morphological characteristics. Orders and Families of economic importance in agriculture. Insect reproduction and life histories. Growth and metamorphosis. Polymorphism and dimorphism. Types of insect development. Definition and scope of microbiology, Spontaneous generation theory. Laboratory Techniques in microbiology. Groups of Microorganism, Prokaryotes, Eukaryotes. Morphology and Reproduction of Bacteria, Fungi, Protozoa, Algae, Viruses. Nutritional types in bacteria and fungi. Microbial growth. Traditional and religious belief systems in insects and microbes.

APRAC102 Practical Agriculture II

Flue cured Tobacco production. Farm machinery. Seed maize and wheat production. Sugarcane, Citrus and Banana production. Beef production. Farm management. Broilers production. Pig production. Computer Applications. Indigenous knowledge systems in agricultural production systems.

AAA102 Introduction to Agricultural Economics

Economics systems and organisation. Theory of supply and demand, market equilibrium. Microeconomics. Macroeconomics. The consumption, investment and saving functions. The international economy. Monetary and fiscal policies. Employment and growth policies. The role of agricultural industry in the national economy.

ASP103 Principles of Genetics

Introduction: role of genetics, cell and its components, chromosome. Cell division: mitosis, meiosis. Character determination: dominant and recessive alleles, homozygous and heterozygous condition. Gene interactions: linkage. Mendelian genetics: monohybrid inheritance, dihybrid inheritance, test crossing. Probability theories: stochastic. Mutations and sex determination: chromosome mutation, sex determination. Sex linkage, ratios, sex limited and sex influenced traits, Nucleic acids. DNA, RNA, translation, transcription. Indigenous/traditional beliefs and myths in breeding systems in plants and animals.

ASP108 Introduction to Biology

Cell biology: Cell structure, cellular organelles and their functions; Introduction to cellular metabolism, photosynthesis, respiration; Cell cycle, mitosis, meiosis. **Genetics:** DNA and RNA structure; Mendelian Genetics, non-Mendelian Genetics; Gene expression, transcription, translation, genetic code, gene expression regulation.

Biochemistry: Structure and function of biomolecules, DNA replication. **Microbiology:** Historical perspectives of microbiology, Taxonomy, Microscopy

ASP107 Introduction to Chemistry

Definition and Branches of Chemistry, The particulate nature of matter, Experimental Techniques, Atoms, Elements and Compounds, Stoichiometry and the mole concept, Energy changes, Electricity and chemical reactions, Acids, Bases and Salts, Group properties, Non-Metals, Metals, Industrial processes

AIW208 Drought Preparedness Management

Definitions. Drought mitigation. Components of preparedness and mitigation; prediction, monitoring, impact assessment, response. Agronomic measures for soil and water conservation; crop rotation, staggered planting, water planting, tillage practices, litter management, drought resistant crops, reclamation of saline soils, contoured row crops, erosion control structures, water retention and detention structures, windbreaks, shelterbelts. Engineering measures; irrigation development, contour ridges, trenches, stone walls, check dams, gully plugging structures, percolation ponds. Statutory measures; strategic grain reserves, imports. Herd management measures; reduction in herd numbers, strategic weaning, herd segregation, parasite control, fencing, drought resistant pastures. case study of sustainable strategies. Traditional and religious myths and belief systems associated with drought.

ASTA201 Agricultural Statistics

Data collection and summarisation. Descriptive statistics. Normal, binomial, standard and poisson distribution. Probability and applications. Central limit theorem. Hypothesis testing: t-test and chi-square tests. Design and analysis of experiments. Treatment comparison. Data quality control, analyses and interpretation. Statistical software: SPSS/SAS/MSTAT/GENSTAT, linear regression and correlation analysis.

APROP201 Scientific and Proposal Writing Skills in Agriculture

Purpose and planning of proposal. Needs based approach to research proposal. Components, of proposal; Style and structure; Title, concept and rationale, objectives and hypothesis, materials and methods, timelines, budgets, references. Submission and tracking. Ethics and research in agriculture.

ASP211 Principles of Crop Production

Cropping systems and crop distribution in Africa. Subsistence farming systems. Main agronomic practices relating to crop production systems such as tillage, planting and transplanting, mulching, fertilizing and manuring, weed control, pruning, pest control, harvesting and processing, cropping pattern, cropping intensity and crop rotation.

AL201 Dairy Production.

Dairy production: history, common breeds. Milk marketing: quality premiums, processing, milk parameters. Milking parlours: designs, advantages. Milking methods: hand, machine (components). Fertility and reproductive management: reproduction dynamics, cycles, body condition scoring, artificial insemination, pregnancy diagnosis. Herd health management: metabolic disorders, infectious diseases. Principles of nutrition: maintenance and production, stages of lactation, feed composition and importance. Traditional milk preservation methods.

AL207 Pig and poultry production systems

Production of eggs and poultry meat and pork. Covers aspects of breeding, nutrition, housing, growth performance, health, welfare, reproductive capacity, waste management, marketing and current industry issues. Religious and cultural issues in pig and poultry production.

AL208 Beef production

Role of the beef industry. Traditional and indigenous knowledge systems in production: weaners, yearling, two-year old, buy-in; factors. Common beef breeds. Heifer and cow management: selection, mating systems. Bull management: selection, bulling ratios. Calf management: rearing, castration and dehorning. Cattle identification: reasons, factors, methods. Beef herd management: reasons for grouping, breeding management, nutrition, drought management. Beef carcass classification. Herd health management.

ALW202 Pasture and range management

Traditional and indigenous knowledge systems in grazing management terminology: common terms. Morphology and identification of forage plants; grasses, legumes, plant collection. Environment and veld ecology principles: definitions, ecosystems. Veld and vegetation types. Veld condition assessments. Veld improvement types: veld fertilization, rehabilitation, reinforcement, replacement, control of undesirable plants, the role of forage legumes. Fodder conservation: fodder crops, conserved fodders, methods of conservation.

ALW203 Introduction to Animal Production

Economic importance of livestock. Livestock classes/types. Growth physiology: compensatory growth, manipulation of growth. Environmental physiology: climatic factors, animal classification. Animal behaviour and welfare: feeding, reproductive behavior, welfare problems, animal freedoms. Ruminant production: beef, dairy, small ruminants. Non-ruminant production: pigs and poultry. Traditional and ethical considerations in animal production.

ALWF201 Animal Nutrition.

Nutrients: carbohydrates, fats, proteins. Nutrient digestion and utilization by different types of animals: cattle, sheep, goats, pigs and poultry. Systems for energy and protein utilization. Feed additives, undesirable substances and contaminants. Conservation of roughages. Feed formulation and feed manufacturing technology. Traditional nutrition management systems: crop residues, tree pods, browsing, grazing, herding practices.

AW204 Wildlife Ecology

Ecosystem components, energy flow and cycling. Savanna ecosystems, common interactions. Disturbance processes affecting structure and function of ecosystems. Wildlife populations, habitats and indicator species. Guild concept, habitat fragmentation, niches. Traditional and indigenous knowledge systems in wild life ecology.

AW205 Intensive Wildlife Production Systems

Population patterns, factors affecting reproduction, parental care, r-k reproduction. Types of intensive systems, animals suitable for intensive production. Rules and regulations. Wildlife in captivity. Legal framework for wildlife in captivity. Indigenous knowledge systems in intensive wildlife production.

AW206 Wildlife Population Dynamics

Population dynamics and management; mortality factors; causes of high mortality; survivorship curves. Recruitment, productivity and biotic potential. Production growth models and their use. Effect of environment on population dynamics.

AW201 Wildlife Management

Wildlife Management in Protected and Non-Protected Areas. Classification of wildlife areas (recreational, parks, botanical gardens, sanctuaries and safari areas and land use patterns in Zimbabwe (Commercial, communal and state land). Theories, Conventions, Protocols i.e. Conservation theory; CITES, BONN, CBD Conventions; Montreal, Tokyo and Copenhagen Protocols. Wildlife Laws. Current Wildlife issues- Land Reform, Wildlife Land Reform, Indigenisation. Benefits of wildlife management- economic, social, ecological, political and cultural. Principles of Wildlife harvesting. Socio-economic and political factors – Transfrontier areas, CBNRM, CAMPFIRE. Managing Human/Wildlife conflict Interactions, Problem animal management, PAC, Translocation, Lethal. Burning, Fire, Bush Clearing, provision of water, role of wetlands.

AF202 Aquaculture

Definition of terms, basic principles of fish farming. Fish farming practices (extensive, intensive, semi-intensive. Fish species for aquaculture- growth parameters. Ponds- design, construction, water supply, fish density, aeration and seepage. Planning a fish farm-information, finance, site selection, fish stock, production, harvesting, consumption, processing and marketing. Fish nutrition, health and reproduction. Socio-economic implications for fish farming.

AF203 Limnology

Definition of terms. Classification of aquatic environments and inland fresh water. Physical and chemical stratification of water. Life forms in water- plants, animals and fish. Eutrophication –pollutants and algae bloom. Nutrient cycles, carbon and nitrogen cycles. Food webs- phytoplankton and zooplankton. Anthropogenic activities. Definition of Fish biology, anatomy and physiology. Fish classification. General anatomy and general physiology of fish. Morphology and diversity of feeding. Digestive system and diet relations. Reproductive

morphology and development in male and female. Growth in Fishes. Food and feeding habits basic, secondary, incidental and obligatory food. Plankton, zooplankton feeders. Herbivores and carnivores. Respiratory system-gills and gas exchange. Excretion and osmoregulation of fish, kidneys, salinity. Indigenous knowledge systems in fish production.

AF205 Ichthyology

Basic ecology and fish behaviour- ecosystem components, populations and communities. Energy flows, interactions- competition, predation and parasitic. Biogeography principles and biodiversity patterns. Issues on conservation biology. Traditional methods of preservation of water quality.

AF204 Fish Nutrition

Fish nutrition in fishery sciences. General nutritional requirements- proteins, fats and CHO. Water, minerals and vitamins in fish physiology. Digestion and energy metabolism. Energy requirement. Digestive strategies for herbivore and carnivore. Feed quality and nutritional indices. Feed intake regulation.

ASP214 Weed Ecology and Management

Definition. Economic importance. Weeds in agro-ecosystems. Ecological survey of principal weeds. Crop-weed interactions. Allelopathy. Noxious weeds. Weed control. Herbicides; classification, mechanism and mode of action, effect on soil, microbes, growth and nutrition of plants. Adjuvants and herbicide protectants. Integrated weed management in cropping systems.

AW207 Wildlife Study techniques and Technologies

Current study techniques and technologies in wildlife management.

AL209 Livestock Improvement

Livestock improvement systems under climate change and economic hardships; Biotechnology: embryo transfer, artificial insemination, genetic engineering

ASP408 Environmental Science and Pollution

Development, management and conservation of renewable and non-renewable natural resources. Industrial development and its environmental effects. Human settlements. Deforestation. Climatic changes. Soil erosion. Desertification. Pollutive effects of agricultural chemicals, domestic and industrial wastes. Acid rain. Traditional and religious considerations of natural resource management.

AIW408 Meteorology and Climate Change

The course covers an introduction and history of meteorology and climatology, atmospheric composition, mass and structure, atmospheric moisture budget, atmospheric instability, cloud formation and precipitation process, convective, cyclonic and orographic precipitation, the air mass concept, tropical weather and climate, climate of Zimbabwe. Climate change: general considerations, Climate forcings and feedbacks, the climate record, possible causes of recent climatic change, model strategies for the prediction of climate change, IPCC models, other

environmental impacts of climate change (sea level, snow and ice, hydrology, and vegetation). Traditional and religious belief systems in meteorology and climate change.

ASP404 Agroforestry

Land use systems related to agroforestry. Role of trees in soil productivity and conservation. Soil productivity and management in agroforestry. Ecosystem structure and functioning interactions relevant to agroforestry. Multi-purpose tree species. Case studies of different agroforestry systems. Indigenous knowledge systems in agroforestry.

APRO401 Research Project

Undertake independent studies in any branch of Soil Science and summarise results in a dissertation. Dissertation is examined in final year, but presentation starts during second year by developing suitable topics and preliminary literature search. During final year, student devotes 90 hours in data collection and/or experimentation, data analysis and dissertation write-up, for submission before the start of formal FINAL University examinations, and may be required to appear for an oral exam.

AAA403 Project Planning, Appraisal and Evaluation

Project concept; identification, appraisal, implementation, monitoring and evaluation. Fundamental aspects of project worth. Financial and economic aspects of project analysis. Problems of cut-off periods and tangible and intangible measurements. Case studies. Traditional and religious considerations in the project cycle

AAA401 Agricultural Extension

Agricultural extension philosophy and scope of responsibilities. Organisation and administration of agricultural extension systems: comparative extension systems. The communication process. Extension Methods. Extension planning and evaluation. Training of extension staff. Training of farmers. Ethics in extension.

AAA404 Farm Management

Farm management in tropical agriculture. Management on the farm. Farm decision making process. Economic principles applied to farm management. Farm records and accounts. Valuation of assets. Labour requirements, efficiency and work simplification. Farm planning, budgeting and programme planning. Gross margin analysis.

AL406 Sheep and Goat Production Systems

Overview of sheep and goat production. Breeds and breeding systems. Health management: diseases, plant poisons, chemical, mineral toxins. Nutrition: essentials for balanced and palatable rations, mineral rations, trace elements, vitamins. Importance of small ruminants: traditional and religious roles.

ALWF401 Livestock Disease Management.

General health: causes of diseases, modes of transmission and diagnosis, land marks of diseases; economics of diseases. Bacterial diseases: anthrax, black leg, contagious abortion, mastitis, paratuberculosis. Viral diseases: foot and mouth, rift valley fever, rabies, lumpy skin. Protozoal and rickettsial diseases: babesiosis, anaplasmosis, theileriosis, cowdriosis. Toxicology: poisonous plants, heavy metals, mycotoxins, feed additives. Parasites: internal and external. Diseases of fish

ALW404 Animal Breeding.

Mendelian inheritance: introduction, laws, gene interactions. Variations in di-hybrid ratios: epistasis, lethality, modifiers, phenocopies. Population genetics: gene and genotype frequencies, sex linkages, sex determination, changes in gene frequencies. Genetic values and selection; variances. Relationships: co-ancestry, inbreeding, cross breeding. Multiple trait selection: selection index, tandem, independent culling levels

AF401 Trout and Bream Culture

Breeding species, fish ponds, cages, hatcheries, run ways, fish feed, fish growth, fish processing, marketing. Trout hatchery. Parasites, disease predators.

AW 407 Wildlife Law

Public Law, Private law, Commercial law, International law, Procedural law. Law applied in a shooting incident of poachers Local and foreigners. Sources of law, Customary law, Roman-Dutch law, Law of Precedence and Legislation. Policies for wildlife conservation. Statute governing the trade ivory in conformity with CITES. Conservation legislation, Interpretation Act Chapter 1:01; Parks and Wildlife Act (indemnity Act) Chapter 20:15; Trapping of Animals Control Act Chapter 20:21; Bees Act Chapter 20:02; Forest Act Chapter 19:05; Prevention of Cruelty to Animals Act Chapter 19:09; Parks and Wildlife (Amendments) Act number 19 of 2001; Fire Arms Act Chapter 10:09; Environmental Management Act Chapter 20:27; Quelea Control Act Chapter 19:10; Animal Health Act Chapter 19:01; Inland Waters Shipping Act Chapter 13:06; Tourism act Chapter 14:20; Criminal Law (Codification and Reform) act Chapter 9:23; Criminal Procedure and Evidence. Law Enforcement procedure

ALWF401 Wildlife Disease Management

Viral, Bacterial, Protozoal, Fungal, Helminth and Nematodal diseases. Effects of poison on animals. Mineral deficiencies in wild. Infectious and non-infectious diseases, ticks, vaccines, control and treatment.

AF403 Fish Disease Management

Viral, Bacterial, Protozoal, Fungal, Helminth and Nematodal diseases. Effects of poison on animals. Mineral deficiencies in wild. Infectious and non-infectious diseases, ticks, vaccines, control and treatment.

AW401 Game Capture and Translocation

Why wildlife capture, methods of capture, drugs for capture, effects of drugs, handling and transportation, release of captured animals, physiological aspects of capture myopathy. Wildlife harvesting, off-take quota setting. Game census, sampling effort, marking techniques, radio collaring, implants, telemetry, GPS. Aging, trophy measurements, animal body condition,

AW404 Safari and Park Management

Hunting administration, safari operations, types of safaris. Setting up safari camps. Scheduling hunting, Statutory instruments for hunting, trophy handling, value addition, trophy export. Professional Hunters and guides. Park plans, implementations of plans. Ecological monitoring, GIS, remote sensing. Restoration of degraded wildlife

habitats, Environmental Impact Assessment. Aquatic habitat management, principles of inland lake management, wetland conservation. Management of biosphere reserves, collaborative management. Gene conservation and wildlife migration. Tourism management and marketing, consumer behaviour, tourism demand, tourism carrying capacity, tourism in parks community, private resorts, branding.

AF402 Catchment Management and Sampling Methods in Fish

Integrated resource management, Hydrology and hydrology changes, watershed management, riparian vegetation downstream and upstream. Adaptive management, waste water management, land use patterns, water scarcity. Pollution droughts, policy making and implementation. Anthropogenic impacts, Demographic pressures, deforestation, urbanisation. Sampling gear types, mesh sizes, selective fishing gear.

AF404 Integrated Fisheries Management

Fisheries and livestock management. Plant, poultry, piggery and fish management. Communal integrated fisheries management.

DEPARTMENT OF SOIL AND PLANT SCIENCES

BACHELOR OF SCIENCE HONOURS IN AGRICULTURE DEGREE (SOIL AND PLANT SCIENCES)

LEVEL ONE SEMESTER I & II

ASP101 Introduction to Soil Science

Soil forming factors; Physical properties of soils; Mineralogy of soils; Soil water relations; Soil air and temperature; Soil organic matter; Chemical properties of soils; Plant mineral nutrition; Management of fertility. Traditional practices and beliefs in soil fertility management; Soil pH. Soil Classification. Soil surveys. Soil management; Management of saline and sodic soils; and soil biology.

ASP102 Agriculture History of Zimbabwe

The course covers Farming and production systems before colonial period, during colonial period and after independence. Agricultural laws and regulations during pre-independence and after independence of Zimbabwe. The land reform programme: its objectives and rationale. The current agricultural policy of Zimbabwe.

ASP106 Plant Botany and Physiology

The course covers plant taxonomy, plant morphology, floral morphology, Plant growth regulators: their nature and function in crops, crop growth analysis, factors affecting growth, light interception and photosynthesis, types of photosynthesis, respiration, mineral physiology, plant water relations, physiological basis of crop yield, and crop growth modelling.

ALWF101 Agricultural Biochemistry

Carbon: compounds, isomerism, reactions of compounds. Components of animal and plant tissues. Biochemical reactions. Metabolism. Photosynthetic pathways. Electron transport systems and chemical cycles. Enzymes. Hormone and hormone functions. Carbohydrates: nomenclature, monosaccharides, disaccharides, polysaccharides, functions. Proteins: classification, chemistry. Lipids: classification, chemistry. Vitamins: water and fat soluble, functions, deficiencies. Minerals: functions, absorption, functions.

APRAC101 Practical Agriculture 1

Modular instruction on usage of equipment and its calibration. Land tillage techniques. Management of crop pests and diseases. Livestock system operations. Crop production. Forestry, and Fisheries production systems. Wildlife management systems. Horticultural production systems. Food processing and preservation techniques. Pre-colonial farm implements. Traditional production systems.

AIW101 Engineering Materials

From atoms to microstructure. Structures of solids. Defects in Crystals. Diffusion. Mechanical Properties of Metals. Dislocations and Strengthening Mechanisms. Failure. Polymer Structures, Characteristics, Applications,

and Processing. Mechanical properties. Electrical conductivity. Thermal properties. Traditional engineering materials and methods.

ALWF102 Animal Anatomy and Physiology

Introduction: definitions, terms, general organization. The skeletal system: axial, appendicular skeleton. Arthrology: joints and articulation. Muscular system: muscles, tendons and ligaments. Digestive system: ruminants, non-ruminants and poultry. Reproductive systems: male and female; avian reproduction. Cardiovascular systems: heart, vessels, blood. Urinary system: kidney structure and function. Respiratory system: anatomy and physiology. Endocrine system: hormones, actions. Nervous systems: central, sympathetic, parasympathetic

AF101 Fisheries Management and Population Dynamics

Understanding fisheries management systems and strategies in fish conservation. Integrated fishery management-fish and poultry. Governance and management systems. Stakeholder interests, characteristics and influences. Role of fisheries management in Zimbabwe. Co-management and sustainable utilization of fisheries resources and watershed management. Fish harvesting techniques, gill nets and seine nets. Managing Recreational Fisheries. Economics of Fisheries management. Socio-economic importance of fisheries management. Fish in the life of Zimbabweans. Fish industries in Zimbabwe. Population dynamics, numerical impact of various interactions (both biotic and abiotic) on a specific set of individuals. Four demographic parameters determine the total numbers in a population change at a particular time these are, birth, death, immigration and emigration. Recruitment, growth, mortality, population structure, population dynamics and fishery structure. Traditional and religious myths and belief systems in fisheries management.

AAA 101 Professional Ethics in Agriculture

Definition of ethics, professional ethics. Ethical inventory from institutions, government and private sector. Morality and moral confidence. Ethical characteristics in leadership. Ethics and gender. Case studies. Unhuism.

ASP104 Basic microbiology and Introductory Entomology

Insects in general, Success of insects, Harmful and beneficial insects, Insect internal and external structure and function. Insect classification, Morphological characteristics. Orders and Families of economic importance in agriculture. Insect reproduction and life histories. Growth and metamorphosis. Polymorphism and dimorphism. Types of insect development. Definition and scope of microbiology, Spontaneous generation theory. Laboratory Techniques in microbiology. Groups of Microorganism, Prokaryotes, Eukaryotes. Morphology and Reproduction of Bacteria, Fungi, Protozoa, Algae, Viruses. Nutritional types in bacteria and fungi. Microbial growth. Traditional and religious belief systems in insects and microbes.

APRAC102 Practical Agriculture II

Flue cured Tobacco production. Farm machinery. Seed maize and wheat production. Sugarcane, Citrus and Banana production. Beef production. Farm management. Broilers production. Pig production. Computer Applications. Indigenous knowledge systems in agricultural production systems.

AAA102 Introduction to Agricultural Economics

Economics systems and organisation. Theory of supply and demand, market equilibrium. Microeconomics. Macroeconomics. The consumption, investment and saving functions. The international economy. Monetary and fiscal policies. Employment and growth policies. The role of agricultural industry in the national economy.

ASP103 Principles of Genetics

Introduction: role of genetics, cell and its components, chromosome. Cell division: mitosis, meiosis. Character determination: dominant and recessive alleles, homozygous and heterozygous condition. Gene interactions: linkage. Mendelian genetics: monohybrid inheritance, dihybrid inheritance, test crossing. Probability theories: stochastic. Mutations and sex determination: chromosome mutation, sex determination. Sex linkage, ratios, sex limited and sex influenced traits, Nucleic acids. DNA, RNA, translation, transcription. Indigenous/traditional beliefs and myths in breeding systems in plants and animals.

ASP108 Introduction to Biology

Cell biology: Cell structure, cellular organelles and their functions; Introduction to cellular metabolism, photosynthesis, respiration; Cell cycle, mitosis, meiosis. **Genetics:** DNA and RNA structure; Mendelian Genetics, non-Mendelian Genetics; Gene expression, transcription, translation, genetic code, gene expression regulation. **Biochemistry:** Structure and function of biomolecules, DNA replication. **Microbiology:** Historical perspectives of microbiology, Taxonomy, Microscopy

ASP107 Introduction to Chemistry

Definition and Branches of Chemistry, The particulate nature of matter, Experimental Techniques, Atoms, Elements and Compounds, Stoichiometry and the mole concept, Energy changes, Electricity and chemical reactions, Acids, Bases and Salts, Group properties, Non-Metals, Metals, Industrial processes

LEVEL TWO SEMESTER I & II SOIL SCIENCE OPTION

ASP201 Soil Biology

Soil micro-biology and fauna: rhizosphere soil population, effects of soil conditions and management on soil micro-organisms. Techniques of studying soil micro-organisms. Formation of soil organic matter. Biochemical properties of soil organic matter. Solid nitrogen fixation. Biological fertilizers. Microbial reclamation of contaminated soils.

ASP203 Pedology and Soil Classification

Definition. Soil profiles. Soil classes, series, family, Soil physical properties. Soil chemical properties. Soil forming processes. Parent material. Effect of; time, relief, climate, biota. Soil taxonomy. Traditional belief systems in soil formation.

ASP204 Soil Chemistry

Introduction, atoms, molecules, soil mineralogy, chemical reaction in soils, The solid phase, the soil solution phase, the solid/solution phase, surface exchange reactions. Soil acidity, electrochemistry and the soil. Soil and the environment. Traditional belief systems in soil formation.

ASP202 Fertiliser Management and Plant Nutrition

Factors affecting soil fertility and productivity. Micro and macro nutrients, fertilizers and manures; types, applications, economics, reaction with the soil. Maintenance of soil fertility. Soil- plant relations. Nutrient elements, functions and requirements of different crops. Plant nutrient analysis. Design of fertilizer trials. Fertilizer use in the region. Traditional soil fertility management practices.

AIW208 Drought Preparedness Management

Definitions. Drought mitigation. Components of preparedness and mitigation; prediction, monitoring, impact assessment, response. Agronomic measures for soil and water conservation; crop rotation, staggered planting, water planting, tillage practices, litter management, drought resistant crops, reclamation of saline soils, contoured row crops, erosion control structures, water retention and detention structures, windbreaks, shelterbelts. Engineering measures; irrigation development, contour ridges, trenches, stone walls, check dams, gully plugging structures, percolation ponds. Statutory measures; strategic grain reserves, imports. Herd management measures; reduction in herd numbers, strategic weaning, herd segregation, parasite control, fencing, drought resistant pastures. Case study of sustainable strategies. Traditional and religious myths and belief systems associated with drought.

ASTA201 Agricultural Statistics

Data collection and summarisation. Descriptive statistics. Normal, binomial, standard and poisson distribution. Probability and applications. Central limit theorem. Hypothesis testing: t-test and chi-square tests. Design and analysis of experiments. Treatment comparison. Data quality control, analyses and interpretation. Statistical software: SPSS/SAS/MSTAT/GENSTAT, linear regression and correlation analysis.

APROP201 Scientific and Proposal Writing Skills in Agriculture

Purpose and planning of proposal. Needs based approach to research proposal. Components of proposal; Style and structure; Title, concept and rationale, objectives and hypothesis, materials and methods, timelines, budgets, references. Submission and tracking. Ethics and research in agriculture.

ASP 207 Land Use Planning

Introduction. Definition. Maps, aerial photos and other sources, basic analysis of physical planning issues. Land use and economic development. Land use Planning. Multiple land use economics. Traditional and religious considerations in land use planning.

ASP208 Soil Physics

Introduction. Soil physical properties and theory of selected instruments to measure them. Fluid dynamics. Soil

solids, soil water, soil air and soil heat. Transport processes and energy concept of soil and water.

ASP209 Soil Survey and Mapping

Overview. Soil morphology. Soil interpretations. Soil landscape relationships. Soil classification. Soil mapping. Maps and mapping tools. Soil survey methods using Global Positioning Systems. Geospatial analysis.

ASP210 Sustainable use and Management of Natural Resources

Economics and utilisation of wildlife resources. Wildlife management and contribution to rural development. Cost benefit analysis. Game ranching/farming. Hunting ethics and traditions. Processing, preservation, documentation and marketing of wildlife products. Live animal capture and use in zoos and as pets. International trade in wildlife. Traditional and religious considerations in wildlife management.

ASP211 Principles of Crop Production

Cropping systems and crop distribution in Africa. Subsistence farming systems. Main agronomic practices relating to crop production systems such as tillage, planting and transplanting, mulching, fertilizing and manuring, weed control, pruning, pest control, harvesting and processing, cropping pattern, cropping intensity and crop rotation.

ASP213 Crop Production Systems

Subsistence farming. Shifting cultivation. Bush fallowing. Monocultures. Polycultures. Specialised and diversified systems, intensive systems, semi-intensive systems, semi-extensive. Communal, old resettlement, A1 and A2, large scale commercial systems.

LEVEL FOUR SEMESTER I & II SOIL SCIENCE OPTION

ASP405 Soil Fertility Management

Factors affecting soil fertility and productivity. Micro- and macro-nutrients. Fertilisers and manures; types, application economics, reaction with the soil. Maintenance of soil fertility. Soil plant relations. Nutrient element functions and requirements of different crops. Plant nutrient analysis. Design of fertiliser trials. Fertiliser use in the region. Traditional soil fertility management practices.

ASP407 Dry Land Farming Practices

Overview; Food and non-food crops for arid regions. Animals for arid regions. Dryland farming in the tropics and sub-tropical arid regions. Key elements; capturing and conserving moisture techniques, effective use of available moisture, soil conservation techniques, control of input costs. Traditional soil and water management practices.

ASP408 Environmental Science and Pollution

Development, management and conservation of renewable and non-renewable natural resources. Industrial development and its environmental effects. Human settlements. Deforestation. Climatic changes. Soil erosion. Desertification. Pollutive effects of agricultural chemicals, domestic and industrial wastes. Acid rain. Traditional and religious considerations of natural resource management.

ASP402 Soil Conservation

Introduction. History of soil conservation. Need for soil conservation. Computers and soil conservation. The physics of rainfall. Erodibility of soil. USLE. Run-off. Erosion modelling. Runoff and soil erosion. Modelling runoff and soil erosion. RUSLE, WEPP and RESIDUE models. Contour ridges, Crop residue management, soil productivity/quality. Gully erosion. Wind erosion, crop management, conservation tillage/ no-tillage. Economics of soil conservation. Traditional soil conservation techniques.

AIW408 Meteorology and Climate Change

The course covers an introduction and history of meteorology and climatology, atmospheric composition, mass and structure, atmospheric moisture budget, atmospheric instability, cloud formation and precipitation process, convective, cyclonic and orographic precipitation, the air mass concept, tropical weather and climate, climate of Zimbabwe. Climate change: general considerations, Climate forcings and feedbacks, the climate record, possible causes of recent climatic change, model strategies for the prediction of climate change, IPCC models, other environmental impacts of climate change (sea level, snow and ice, hydrology, and vegetation). Traditional and religious belief systems in meteorology and climate change.

ASP404 Agroforestry

Land use systems related to agroforestry. Role of trees in soil productivity and conservation. Soil productivity and management in agroforestry. Ecosystem structure and functioning interactions relevant to agroforestry. Multi-purpose tree species. Case studies of different agroforestry systems. Indigenous knowledge systems in agroforestry.

ASP401 Sustainable Agriculture

What is sustainability? Agriculture? Features of agriculture. Sustainable and unsustainable agriculture. Soils, nutrients and their management, climate, weather and water. Water and its management. Domesticated plants and animals; evolution and biology. Cropping systems, livestock systems. Pest management. Energy and labour. "Alternative" agriculture approaches. Issues in sustainable agriculture. Deciding, managing and learning in sustainable agriculture. Traditional and religious issues in sustainable agriculture.

ATECH401 Appropriate Technology for Rural Agro processing

Overview. Definitions. Indigenous knowledge and skills and local natural resources. small-scale on farm food processing machines and equipment. primary and secondary processing, storage, handling, drying of cereals, roots and tubers, pulses, oilseeds, vegetables and fruits. Advantages; food security, nutrition, wellbeing, poverty reduction, employment creation. Challenges; human capacity, technical skill, financial capital, access to information and technologies.

APRO401 Research Project

Undertake independent studies in any branch of Soil Science and summarise results in a dissertation. Dissertation is examined in final year, but presentation starts during second year by developing suitable topics and preliminary literature search. During final year, student devotes 90 hours in data collection and/or experimentation, data analysis and dissertation write-up, for submission before the start of formal FINAL University examinations, and may be required to appear for an oral exam.

AAA403 Project Planning, Appraisal and Evaluation

Project concept; identification, appraisal, implementation, monitoring and evaluation. Fundamental aspects of project worth. Financial and economic aspects of project analysis. Problems of cut-off periods and tangible and intangible measurements. Case studies. Traditional and religious considerations in the project cycle

AAA401 Agricultural Extension

Agricultural extension philosophy and scope of responsibilities. Organisation and administration of agricultural extension systems: comparative extension systems. The communication process. Extension Methods. Extension planning and evaluation. Training of extension staff. Training of farmers. Ethics in extension.

AAA404 Farm Management

Farm management in tropical agriculture. Management on the farm. Farm decision making process. Economic principles applied to farm management. Farm records and accounts. Valuation of assets. Labour requirements, efficiency and work simplification. Farm planning, budgeting and programme planning. Gross margin analysis.

ASP410 Urban Agriculture

Definition. History, extent and significance in both developed and developing world. Community development and food security. Fundamentals of horticulture, soil science, insect and soil ecology, agro-ecological production techniques for urban environment. Propagation techniques. Soil quality and fertility management. Irrigation and water conservation. Crop planning. Pest/weed/disease management.

AAA402 Entrepreneurship Development

Role of entrepreneurship in economic development. Theories of entrepreneurship. Process of establishing business, sources of funds, feasibility report preparation. Planning production, marketing of enterprises. Entrepreneurship and public policy. A study of the characteristics, nature and problems of the small business sector. The advantages of big versus small, the linkage effects and management techniques.

LEVEL TWO SEMESTER I & II CROP PRODUCTION OPTION

ASP211 Principles of Crop Production

Cropping systems and crop distribution in Africa. Subsistence farming systems. Main agronomic practices relating to crop production systems such as tillage, planting and transplanting, mulching, fertilizing and manuring, weed

control, pruning, pest control, harvesting and processing, cropping pattern, cropping intensity and crop rotation.

ASP212 Sugarcane Production and Management

History and origins of sugar cane, production, Sugar industry organisation in Zimbabwe, utilization, sugar cane plant botany, climate, soils. Commercial Sugarcane Production: cropping system, land preparation, planting, fertilizer management, irrigation management, pest, weed and disease management, burning and harvesting process.

ASP202 Fertiliser Management and Plant Nutrition

Factors affecting soil fertility and productivity. Micro and macro nutrients, fertilizers and manures; types, applications, economics, reaction with the soil. Maintenance of soil fertility. Soil- plant relations. Nutrient elements, functions and requirements of different crops. Plant nutrient analysis. Design of fertilizer trials. Fertilizer use in the region. Traditional soil fertility management practices.

APROP201 Scientific and Proposal Writing Skills in Agriculture

Purpose and planning of proposal. Needs based approach to research proposal. Components of proposal; Style and structure; Title, concept and rationale, objectives and hypothesis, materials and methods, timelines, budgets, references. Submission and tracking. Ethics and research in agriculture.

ASTA201 Agricultural Statistics

Data collection and summarisation. Descriptive statistics. Normal, binomial, standard and poisson distribution. Probability and applications. Central limit theorem. Hypothesis testing: t-test and chi-square tests. Design and analysis of experiments. Treatment comparison. Data quality control, analyses and interpretation. Statistical software: SPSS/SAS/MSTAT/GENSTAT. Linear regression and correlation analysis.

ASP205 Agronomy of Major Field Crops

Classification, importance, growth and development of selected groups of annual field crops. Regional and national potential and limitations to production. Yield and yield components. The agronomy of cereals, oilseed crops, fibre crops, root and tuber crops, legumes and tobacco.

AIW208 Drought Preparedness Management

Definitions. Drought mitigation. Components of preparedness and mitigation; prediction, monitoring, impact assessment, response. Agronomic measures for soil and water conservation; crop rotation, staggered planting, water planting, tillage practices, litter management, drought resistant crops, reclamation of saline soils, contoured row crops, erosion control structures, water retention and detention structures, windbreaks, shelterbelts. Engineering measures; irrigation development, contour ridges, trenches, stone walls, check dams, gully plugging structures, percolation ponds. Statutory measures; strategic grain reserves, imports. Herd management measures; reduction in herd numbers, strategic weaning, herd segregation, parasite control, fencing, drought

resistant pastures. Case study of sustainable strategies. Traditional and religious myths and beliefs in relation to drought.

ASP217 Sugarcane Production Technology

The course covers maturity indicators for ripe sugarcane, harvesting process of sugarcane: burning process, cutting and transportation of cane from the field, mill operation, juice extractions, filtration process, and different stages in sugar production. Packing and marketing of sugar. Ethanol production.

ASP215 Entomology and Insect Pest Management

Biology of invertebrate pests. Morphology of insects, ticks and mites with special reference to structures used in identification. Characteristics of major insect orders and families. Internal anatomy. Ecology, physiology and behaviour. Biology of selected crop pests in relation to their control. Insect pest management ie cultural, biological, physical, mechanical, reproductive, legislative, chemical and bio-technological control. Insecticides, their classification, formulations and application equipment. Introduction to Integrated Pest Management (IPM). Ethnobotanicals in pest control

ASP216 Seed Science and Technology

Gamete formation, fertilization and seed development, seed structure, germination, vigour, dormancy and longevity. Formal and informal seed systems. Components of a seed industry. Certified and quality declared seed. Management and technical considerations in seed production. Tests for purity, germination and vigour. Traditional seed systems.

ASP213 Crop Production Systems

Subsistence farming. Shifting cultivation. Bush fallowing. Monocultures. Poly-cultures. Specialised and diversified systems, intensive systems, semi-intensive systems, semi-extensive. Communal, old resettlement, A1 and A2, large scale commercial systems.

ASP214 Weed Ecology and Management

Definition. Economic importance. Weeds in agro-ecosystems. Ecological survey of principal weeds. Crop-weed interactions. Allelopathy. Noxious weeds. Weed control. Herbicides; classification, mechanism and mode of action, effect on soil, microbes, growth and nutrition of plants. Adjuvants and herbicide protectants. Integrated weed management in cropping systems.

LEVEL FOUR SEMESTER I & II CROP PRODUCTION OPTION

ASP413 Small Grain Production

Definition. Cereal and legume small grains (Sorghum and millets: groundnuts, cowpeas, roundnuts). Economic importance. Traditional production and utilisation. Drought resistance. Rotations. variety selection, risks and recommendations for planting saved seed, tillage and land preparation, planting and dates, seeding rates, growth and development, Nitrogen management, nutrient management, pest management, weed management, pests of stored grain, disease management, harvesting, processing, storage, marketing.

ASP403 Plant pathology

Fungal diseases; symptoms and methods of control. Viruses infecting plants; composition, structure, transmission, strains and geographical distribution; Serology and serological tests, indexing and viral diseases. Plant pathogenic bacteria, control of bacterial diseases. Nematology. Traditional disease management systems.

ASP411 Plant Breeding

The role of plant breeding. Genetic concepts. Genetic diversity of crop plants. Systems of pollination control and their applications. Breeding objectives. Breeding methods for self and cross-pollinated crops. Inbreeding depression and heterosis. Biotechnology as a tool in plant breeding- progress, problems and prospects.

ASP407 Dryland farming Practices

Overview; Food and non-food crops for arid regions. Animals for arid regions. Dryland farming in the tropics and sub-tropical arid regions. Key elements; capturing and conserving moisture techniques, effective use of available moisture, soil conservation techniques, and control of input costs. Traditional soil and water management practices.

AIW401 Meteorology and Climate

Introduction and history of meteorology and climatology, atmospheric composition, mass and structure, atmospheric moisture budget, atmospheric instability, cloud formation and precipitation process, convective, cyclonic and orographic precipitation, the air mass concept, tropical weather and climate, climate of Zimbabwe. Climate change: general considerations, Climate forecasting and feedbacks, the climate record, possible causes of recent climatic change, model strategies for the prediction of climate change, IPCC models, other environmental impacts of climate change (sea level, snow and ice, hydrology, and vegetation). Traditional and religious belief systems in meteorology.

ASP401 Sustainable Agriculture

What is sustainability? Agriculture? Features of agriculture. Sustainable and unsustainable soils, nutrients and their management, climate, weather and water. Water and its management. Domesticated plants and animals; evolution and biology. Cropping systems, livestock systems. Pest management. Energy and labour. "Alternative" agriculture approaches. Issues in sustainable agriculture. Deciding, managing and learning in sustainable agriculture. Traditional and religious issues in sustainable agriculture.

ASP404 Agroforestry

Land use systems related to agroforestry. Role of trees in soil productivity and conservation. Soil productivity and management in agroforestry. Ecosystem structure and functioning interactions relevant to agroforestry. Multi-purpose tree species. Case studies of different agroforestry systems. Indigenous knowledge systems in agroforestry.

ASP406 Plant Biotechnology

Introduction. History and general information, molecular biology, structure and function of a cell, Diversity of organisms, nucleic acids, genomes of bacteria, viruses, plants, animals, mitochondria, chloroplasts. Polymerase chain reaction technology (PCR). PCR applications in plants. Biotechnology laboratory, sterilisation techniques. Genomic DNA extraction, DNA markers, fingerprinting techniques. Molecular diagnostics. Polymerase chain reaction using 2-step PCR protocol Agarose gel electrophoresis of PCR products. Polygenic analysis. Gene cloning techniques and strategies, genomic tools. Intellectual property rights. Myths in genetic engineering.

APRO401 Research Project

Undertake independent studies in any branch of Crop Science and summarise results in a dissertation. Dissertation is examined in final year, but presentation starts during second year by developing suitable topics and preliminary literature search. During final year, student devotes 90 hours in data collection and/or experimentation, data analysis and dissertation write-up, for submission before the start of formal FINAL University examinations, and may be required to appear for an oral exam.

AAA401 Agricultural Extension

Agricultural extension philosophy and scope of responsibilities. Organisation and administration of agricultural extension systems: comparative extension systems. The communication process. Extension Methods. Extension planning and evaluation. Training of extension staff. Training of farmers. Ethics in extension.

AAA402 Entrepreneurship Development

Role of entrepreneurship in economic development. Theories of entrepreneurship. Process of establishing business, sources of funds, feasibility report preparation. Planning production, marketing of enterprises. Entrepreneurship and public policy, a study of the characteristics, nature and problems of the small business sector. The advantages of big versus small, the linkage effects and management techniques. Indigenous and traditional marketing strategies.

AAA403 Project Planning, Appraisal and Evaluation

Project concept; identification, appraisal, implementation, monitoring and evaluation. Fundamental aspects of project worth. Financial and economic aspects of project analysis. Problems of cut-off periods and tangible and intangible measurements. Case studies

AAA404 Farm Management

Farm management in tropical agriculture. Management on the farm. Farm decision making process. Economic principles applied to farm management. Farm records and accounts. Valuation of assets. Labour requirements, efficiency and work simplification. Farm planning, budgeting and programme planning. Gross margin analysis.

ASP409 Agronomy of Legume Crops

Importance. Growth and development. National and regional potential and limitations to production. Yield and yield components. Agronomy of legumes. Biological Nitrogen Fixation.

ASP410 Agronomy of Root and Tuber Crops

Introduction. Biology and diversity. Evolution and domestication. General climate and soil requirements. Agronomy of; cassava, sweet potato, Irish potato, beetroot. Traditional production systems, processing, storage and utilisation.

ASP412 Urban Agriculture

Definition. Extent and significance in both developed and developing world. Community development and food security. Fundamentals of horticulture, soil science, insect and soil ecology, agro-ecological production techniques for urban environment. Propagation techniques. Soil quality and fertility management. Irrigation and water conservation. Crop planning. Pest/weed/disease management. History, extent and significance in both developed and developing world.

ASP408 Environmental Science and Pollution

Development, management and conservation of renewable and non-renewable natural resources. Industrial development and its environmental effects. Human settlements. Deforestation. Climatic changes, soil erosion, desertification. Pollutive effects of agricultural chemicals, domestic and industrial wastes. Acid rain.

LEVEL TWO SEMESTER I & II HORTICULTURE OPTION

ASTA201 Agricultural Statistics

Data collection and summarisation. Descriptive statistics. Normal, binomial, standard and poisson distribution. Probability and applications. Central limit theorem. Hypothesis testing: t-test and chi-square tests. Design and analysis of experiments. Treatment comparison. Data quality control, analyses and interpretation. Statistical software: SPSS/SAS/MSTAT/GENSTAT. Linear regression and correlation analysis.

APROP201 Scientific and Proposal Writing Skills in Agriculture

Purpose and planning of proposal. Needs based approach to research proposal. Components of proposal; Style and structure; Title, concept and rationale, objectives and hypothesis, materials and methods, timelines, budgets, references. Submission and tracking. Ethics and research in agriculture.

AHORT201 Nursery Management and Plant Propagation

Factors to consider when siting a nursery, Nursery establishment, procedures in raising vegetable, fruit and

ornamental horticultural crops, management of nursery crops, water fertilizer management in nursery crops, pest and disease management in a nursery, different types of plant propagation techniques, and marketing of horticulture seeds and seedlings. Traditional techniques in nursery management and propagation techniques.

AHORT202 Vegetable Crops

Classification of vegetable crops, importance and types of vegetables grown in the region. Vegetable management and production methods and seed technology, with examples from solanaceous, leguminous, cole, bulb, vine, leaf and root vegetable crops. Miscellaneous vegetables (indigenous and introduced). Traditional and indigenous vegetables.

AHORT203 Introduction to Horticulture

Definition and importance of horticulture, characteristics and classification of horticultural crops, factors affecting horticultural crop production, procedures in raising vegetable seedlings, types of plant propagation, seed dormancy, methods of pathogen detection in propagation sources, pruning and training of horticultural crops, plant growth regulators and their effect in horticulture, harvesting, post-harvest handling and storage of horticultural crops. Traditional vegetable production systems.

AIW 208 Drought Preparedness Management

Definitions. Drought mitigation. Components of preparedness and mitigation; prediction, monitoring, impact assessment, response. Agronomic measures for soil and water conservation; crop rotation, staggered planting, water planting, tillage practices, litter management, drought resistant crops, reclamation of saline soils, contoured row crops, erosion control structures, water retention and detention structures, windbreaks, shelterbelts. Engineering measures; irrigation development, contour ridges, trenches, stone walls, check dams, gully plugging structures and percolation ponds. Statutory measures; strategic grain reserves, imports. Herd management measures; reduction in herd numbers, strategic weaning, herd segregation, parasite control, fencing, drought resistant pastures. Case study of sustainable strategies. Myths and belief systems about drought.

ASP201 Soil Biology

Soil micro-biology and fauna: rhizosphere soil population, effects of soil conditions and management on soil micro-organisms. Techniques of studying soil micro-organisms. Formation of soil organic matter. Biochemical properties of soil organic matter. Solid nitrogen fixation. Biological fertilizers. Microbial reclamation of contaminated soils.

ASP202 Fertiliser Management and Plant Nutrition

Factors affecting soil fertility and productivity. Micro and macro nutrients, fertilizers and manures; types, applications, economics, reaction with the soil. Maintenance of soil fertility. Soil- plant relations. Nutrient elements, functions and requirements of different crops. Plant nutrient analysis. Design of fertilizer trials. Fertilizer use in the region. Traditional soil fertility management practices.

AHORT205 Harvesting and Post-Harvest Techniques of Horticultural Crops

Post-harvest behaviour of fruit and vegetables; ripening process. Maturity determination of horticultural plants and plant products. The nature, evaluation and control of physiological changes. Methods of harvesting and storage including refrigeration, controlled atmosphere, hypobaric, radiation storage and the common traditional methods in the region.

AHORT206 Plant propagation Techniques and Tissue Culture

The course covers definition of propagation, reasons for and against propagation, variation in clones, classes and effects of pathogens in propagation, methods for pathogen dictation and elimination, propagation by cuttings, totipotency, root development in cuttings, effect of growth hormones in root development, practices to increase rooting. Grafting and Budding, reasons for interstocks, stock and scion, graft union formation, factors affecting grafting success. Micro-propagation, advantages and disadvantages, development stages in micro-propagation, factors affecting success of micro-propagation. Traditional propagation systems.

ASP211 Entomology and Insect Pest Management

Biology of invertebrate pests. Morphology of insects, ticks and mites with special reference to structures used in identification. Characteristics of major insect orders and families. Internal anatomy. Ecology, physiology and behaviour. Biology of selected crop pests in relation to their control. Insect pest management i.e. cultural, biological, physical, mechanical, reproductive, legislative, chemical and bio-technological control. Insecticides, their classification, formulations and application equipment. Introduction to Integrated Pest Management (IPM). Ethnobotanicals in pest control.

AHORT204 Fruit Crops

The course covers Principles of fruit crop establishment. Intercropping with other crops. Development and diversification of fruit production. Production of tropical, subtropical and temperate fruits of economic importance to the region: citrus, banana, mango, pineapple, grape, avocado, peach, apple, pear, plum and under exploited minor fruit species. Wild fruits.

ASP214 Weed Ecology and Management

Definition. Economic importance. Weeds in agro-ecosystems. Ecological survey of principal weeds. Crop-weed interactions. Allelopathy. Noxious weeds. Weed control. Herbicides; classification, mechanism and mode of action, effect on soil, microbes, growth and nutrition of plants. Adjuvants and herbicide protectants. Integrated weed management in cropping systems. Traditional uses of some weed species.

ASP216 Seed Science and Technology

Gamete formation, fertilization and seed development, seed structure, germination, vigour, dormancy and longevity. Formal and informal seed systems. Components a seed industry. Certified and quality declared seed. Management and technical considerations in seed production. Tests for purity, germination and vigour. Traditional seed systems.

LEVEL FOUR SEMESTER I & II HORTICULTURE

ASP411 Plant Breeding

The role of plant breeding. Genetic concepts. Genetic diversity of crop plants. Systems of pollination control and their applications. Breeding objectives. Breeding methods for self and cross-pollinated crops. Inbreeding depression and heterosis. Biotechnology as a tool in plant breeding- progress, problems and prospects. Traditional breeding techniques.

ASP403 Plant Pathology

Fungal diseases; symptoms and methods of control. Viruses infecting plants; composition, structure, transmission, strains and geographical distribution; Serology and serological tests, indexing and viral diseases. Plant pathogenic bacteria, control of bacterial diseases. Nematology.

AHORT401 Principles of Floriculture, Ornamental and Landscaping

Introduction to cut flower production: Improvement, botany, ecological requirements, propagation, cultural practices and marketing. Introduction to landscape planning. Plant materials design and functional use. Ornamental plants: identification, systematics, adaptability, production, use and care for landscape and interior decoration.

AHORT402 Spices, Herbs, Beverages and Medicinal Crops

The course covers classification of spices, herbs, beverages and medicinal crops, importance and types of spices, herbs, beverages and medicinal crops grown in the region, management, production methods and seed technology, with examples of spices, herbs, beverages and medicinal crops. Discussion of miscellaneous indigenous spices, herbs, beverages and medicinal crops grown in Zimbabwe and in Africa.

AIW401 Meteorology and Climate Change

The course covers an introduction and history of meteorology and climatology, atmospheric composition, mass and structure, atmospheric moisture budget, atmospheric instability, cloud formation and precipitation process, convective, cyclonic and orographic precipitation, the air mass concept, tropical weather and climate, climate of Zimbabwe. Climate change: general considerations, Climate forcings and feedbacks, the climate record, possible causes of recent climatic change, model strategies for the prediction of climate change, IPCC models, other environmental impacts of climate change (sea level, snow and ice, hydrology, and vegetation). Traditional and religious belief systems in meteorology and climate change.

ASP406 Plant Biotechnology

Introduction. History and general information, molecular biology, structure and function of a cell, Diversity of organisms, nucleic acids, genomes of bacteria, viruses, plants, animals, mitochondria, chloroplasts. Polymerase chain reaction technology (PCR). PCR applications in plants. Biotechnology laboratory, sterilisation techniques. Genomic DNA extraction, DNA markers, fingerprinting techniques. Molecular diagnostics. Polymerase chain

reaction using 2-step PCR protocol Agarose gel electrophoresis of PCR products. Polygenic analysis. Gene cloning techniques and strategies, genomic tools. Recombinant DNA technology and genetically modified organisms intellectual property rights. Myths in genetic engineering.

ATECH401 Appropriate Technology for Rural Agro- processing

Overview. Definitions. Indigenous knowledge and skills and local natural resources. small-scale on farm food processing machines and equipment. primary and secondary processing, storage, handling, drying of cereals, roots and tubers, pulses, oilseeds, vegetables and fruits. Advantages; food security, nutrition, wellbeing, poverty reduction, employment creation. Challenges; human capacity, technical skill, financial capital, access to information and technologies.

AHORT405 Horticultural Plantation Crops

The course covers Principles of horticultural plantation crops, crop establishment. Intercropping with other crops. Development and diversification of plantation crop production. Production of tropical, subtropical and temperate plantation crops of economic importance to the region: coffee, banana, tea etc.

APRO401 Research Project

Undertake independent studies in any branch of horticulture and summarise results in a dissertation. Dissertation is examined in final year, but presentation starts during second year by developing suitable topics and preliminary literature search. During final year, student devotes 90 hours in data collection and/or experimentation, data analysis and dissertation write- up, for submission before the start of formal FINAL University examinations, and may be required to appear for an oral exam.

AAA401 Agricultural Extension

Agricultural extension philosophy and scope of responsibilities. Organisation and administration of agricultural extension systems: comparative extension systems. The communication process. Extension Methods. Extension planning and evaluation. Training of extension staff. Training of farmers. Traditional ethics.

AHORT404 Greenhouse Horticulture Productions

Different designs and types of Greenhouses, greenhouse structure components:(cladding materials, use air conditioning systems, fans, heating equipment, humidifiers and mist blowers in managing greenhouse environment), Safety precautions and standards that are practised in greenhouses, use of planting media in greenhouses, pest, and diseases management in a greenhouse, fertilizer, water and irrigation management in a greenhouse. Production of vegetable and flowers in a greenhouse (roses, tomatoes, cucumber.

AAA403 Project Planning, Appraisal and Evaluation

Project concept; identification, appraisal, implementation, monitoring and evaluation. Fundamental aspects of project worth. Financial and economic aspects of project analysis. Problems of cut-off periods and tangible and intangible measurements. Case studies. Role of traditional chiefs.

AAA404 Farm Management

Farm management in tropical agriculture. Management on the farm. Farm decision making process. Economic principles applied to farm management. Farm records and accounts. Valuation of assets. Labour requirements, efficiency and work simplification. Farm planning, budgeting and programme planning. Gross margin analysis.

AHORT403 Ornamental Horticultural Crops

The course covers cut flower production of roses, carnations, chrysanthemum, hypericum, protea, freesias, gerbera, iris, snapdragons in terms of their botany, ecological requirements, propagation, cultural practices, harvesting and grading and marketing of cut flowers. Wild flowers.

ASP408 Environmental Science and Pollution

Development, management and conservation of renewable and non-renewable natural resources. Industrial development and its environmental effects. Human settlements. Deforestation. Climatic changes. Soil erosion. Desertification. Pollutive effects of agricultural chemicals, domestic and industrial wastes. Acid rain.

AAA402 Entrepreneurship Development

Role of entrepreneurship in economic development. Theories of entrepreneurship. Process of establishing business, sources of funds, feasibility report preparation. Planning production, marketing of enterprises. Entrepreneurship and public policy. A study of the characteristics, nature and problems of the small business sector. The advantages of big versus small, the linkage effects and management techniques.

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

BACHELOR OF SCIENCE HONOURS DEGREE IN COMPUTER SCIENCE

HCS103 Operating Systems

The study of operating systems is the study of how a set of computational resources may be shared safely, efficiently, and effectively amongst many computing users. This module introduces the major concepts of modern operating systems and study of the interrelationships between the OS and the architecture of computer systems.

HCS104 Computer Architecture

Computer architecture is concerned with the structure and behavior of the various functional modules of the computer; and how they interact to provide the processing needs of the user. In particular this module covers computer systems ranging from PCs through multiprocessors with respect to hardware design and instruction set architecture. This includes units and related technologies such as primary and secondary memory, caches, central processing unit (CPU), and pipelines.

ICCT100 Introduction to Computers and Computer Technologies

Computer Literacy entails having knowledge and understanding of computers and its uses. As computers become an increasingly important part of daily living, many people believe that computer literacy is vital to success. You may interact directly with computers in fields such as education, finance, government, health care, science, publishing, travel and industry. Computers are now a primary means of communication for all types of people. People in today's modern world use computers for different reasons. The module provides a fundamental understanding of computer applications with the course focus on the Microsoft Office Applications (Microsoft Word, Microsoft Excel and Microsoft PowerPoint, Microsoft Access and Microsoft Frontpage). This is a complete lab based module where students will learn these applications by working on class assignments in the lab. The module topics include Basics and Fundamentals of computer applications. Students will also be covering the basic concepts in Computer Hardware, Software, Operating Systems, Telecommunications, Databases, as well as the usage of the Internet and conversion of Microsoft file format into various other file format (PDF, PS etc.).

HCS 105 Digital Logic Design

This module concerns the design of digital systems using integrated circuits. The main emphasis is on the theoretical concepts and systematic synthesis techniques that can be applied to the design of practical digital systems.

- **Combinational Logic:** Introduction to the functional and physical properties of logic gates.
- **Combinational Logic Design:** Formal synthesis techniques for designing combinational logic networks.
- **Combinational Building Blocks:** Discussion of several commonly encountered combinational logic networks.

- Basic Storage Elements: Introduction to the behaviour and structure of latches, flip-flops, and registers.
- Sequential Circuits: Formal synthesis techniques for realizing synchronous sequential circuits.
- Sequential Building Blocks: Discussion of several commonly encountered sequential networks.
- Timing Analysis: Introduction to timing analysis of combinational and sequential circuits.
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HCS 115 Visual Programming

This module is a study of graphical-user-interface (GUI) and component-based programming. The module covers visual programming skills needed for modern software development. Topics will include event handling and event procedures, problem solving, business applications, game applications, database interface, and software design.

The main objectives are:

- Demonstrate fundamental skills in utilizing the tools of a visual programming studio environment in terms of the set of available command menus and toolbars
- Combine event-driven programming with procedural programming
- Design practical visual forms for business and scientific/ problem solving applications.
- Solve mathematical, scientific, and business problems using visual/ component based programming.
- Demonstrate skills in "database connectivity" by embedding SQL code in their programs to manipulate external databases.
- Apply visual programming to software creation by designing projects with menus and submenus.
- Use visual programming to create simple computer games.

HCS202 Systems Analysis and Design

This module is for beginners to System Analysis and Design (SAD) Process. The course is designed to explain various aspects of software development and different techniques used for building the system. This module is an introductory guide to the need and overall features of software engineering.

This module provides the student with a practical approach to systems analysis and design using a blend of traditional developments and current technologies. The student will learn how to apply the six phases of the systems development life cycle.

Main objectives are:

- To introduce the student to different approaches to Information systems analysis and design.
- To define and explain types of system, Business environment, Computer Based Information System(CBIS)I
- To define and describe the six phases of the systems development life cycle (SDLC).
- To describe in detail the systems planning, systems analysis, systems design, systems implementation, and systems operation and support phases of the SDLC.

- To implement the five phases of the SDLC in solving a real world information technology problem.
- To provide the student with a system analysis toolkit which can help in developing the five stages of the SDLC.
- To provide the students with a background into how IT supports a business environment.
- To provide the students with background into the role of a systems analyst and how they interact with users, managers and other IT staff.

HCS201 Data Structures and Algorithms

This module introduces how to encapsulate and order data in a computer program along with efficient methods of accessing the data using appropriate algorithms. This learning project aims to cover the basic data structures used in software development, along with algorithms for inserting, sorting and accessing data. At the end of the learning project the student will be familiar with how to create and use the data structures covered and will have learned which situations are best for each, depending on the type of data to be stored and the running time (computational complexity) of algorithms for insertion, sorting and retrieval.

A secondary aim is to improve programming skills in the student's primary language and to introduce the APIs for existing data structures available in the student's chosen computer language.

HCS204 Data Communication and Computer Networks

The module helps student to be able to understand the principle of the Data Communications, the need of the protocol, network architectures, and internetworking concepts. The module gives an introduction to networking technologies; OSI model; Signals; Encoding and Modulating; Transmission of Digital Data; Transmission media; Multiplexing; Error Detection and Correction; Data link; LAN; Switching; TCP/IP; ATM

HCS213 Computer Security

General concepts and applied methods of computer security, especially as they relate to confidentiality, integrity, and availability of information assets. Topics include system security analysis (attack taxonomy), access control and various security models, identification and authentication, protection against external and internal threats, communication protocols and internet security.

HCS207 Internet and Web Design

Web Design has been designed to introduce students to the foundations of Web design, including planning, creating, and publishing a Web site. In addition to providing a brief history of the Internet and introducing basic vocabulary, the module teaches students how to hand-code Web pages, create basic cascading style sheets to control the presentation of a Web page or site, and identify the accessibility and usability issues that influence Web site design.

HCS210 Database Models and Design

This module focuses on the design and implementation of relational databases and includes extensive exposure to

Oracle SQL. Practical methodologies for data analysis, data modeling and database design are examined, coupled with study of the relational database model. The module builds applied skills in data modeling, normalization, database design and the creation and management of database objects using Oracle SQL. The module operates within a framework that focuses on developing business problem-solving and communication skills, and extensive use is made of business case studies of limited scope.

HCS215 Software Engineering

In this module the student will be introduced to the issues involved in managing software projects, both small and large. It is important that the team player recognize that the success of a large project depends on the interaction of a large number of factors, some of which are beyond the control of those who are directly involved in the project. Issues which must be addressed include client liaison, product specification, planning, selection of appropriate technologies, staffing, personnel management, progress assessment and team leadership.

HCS260 Mini Project

This module is aimed at equipping students with hands on experience in designing software through the use of prior knowledge acquired over the previous years as a computer science student. It also helps prepare students for attachment as they are likely going to be working on projects. Software projects can be developed using any programming language that the students are familiar with.

HCS216 Entrepreneurship

The objective of this module is to introduce the principles and applications of innovation in a business environment. This course will focus on the fundamental principles and applications of innovation. It will build knowledge and skills using projects and activities that tap the creativity and imagination of class participants through a variety of workshops, discussion topics, and activities.

The emphasis in this module will be on the identification and adaptation of new opportunities to determine what makes these opportunities appropriate for further consideration in a business environment, a study of critical success factors, application of the recipe for success in business, and the application of innovation principles. Using diverse examples of ideas that led to successful commercial innovation, the underlying principles will be examined and illuminated through appropriate academic resources and exercises.

Main objectives are:

- Understand the fundamentals of identifying opportunities for innovation
- Understand the process of creativity and innovation in a commercial environment
- Understand incremental, radical, and disruptive processes
- Understand the fundamental issues of intellectual property
- Understand issues of securing capital and other key prerequisites
- Understand the dynamic relationship between strategic, organizational, economic, and technical dimensions of the venture

- Understand issues of knowledge management and knowledge sharing in the context of entrepreneurial ventures
- Understand the critical success factors for business venture

HCS408 Advanced Databases

By use of lectures and practical seminars, focussing on practical implementations of advanced DBMS features the module teaches the extended theory of relational databases and a physical implementation of one such database management system in a distributed environment. The students will also be introduced to Object Orientation in Databases. The main focus of the module will be the constructs of Transactions, Distribution and Object Orientation. This will lead to an assignment which will draw upon comparative skills to evaluate the appropriateness of using the technologies in a given environment.

HCS 417 Digital Signal Processing

We will study the basic concepts, algorithms, and implementation of digital signal processing using programmable DSP chips. We will use Texas Instruments floating point DSP platform (TMS320C6713) to implement real-time data acquisition, FIR/IIR filtering, and FFT algorithms. We will also cover interrupt-driven programming; frame processing, quantization effects, code optimization, and DSP applications. This course will bridge the gap between computer engineering (which emphasizes embedded systems) and electrical engineering (which emphasizes signal processing algorithms).

HCS 407 Software Project Management

The state of project management for IT professionals in general and software engineering in particular is dismal. Studies by the Standish Group (1995, 2001, 2004, and subsequently) reported that for large organizations, only a small percentage (lower than 15%) of large IT projects are successful; that is, delivered within budget, schedule and scope. It is clear that software failures are the norm, not the exception. Why is it so hard to manage software-related projects?

In addition to the problems of accurate estimation and costing, IT professionals are increasingly being called upon to deliver quality software; solutions that work according to specifications that are error-free and satisfy the user. In addition, we must also guarantee product quality or then suffer legal redress.

Project management, as a discipline, has been well established in many engineering fields over the years. However, the accumulated wisdom is not fully applied to software or IT for several reasons. There is the impression in IT that programming has more to do with art than science. Further, we have not had the appropriate tools for accurate estimation in size, cost and productivity, owing to the intangible nature of software. Finally, it is fair to say that we still need to promote a sound Project Management culture within the field of IT and Software Projects.

Over the last decades, there has been significant research in areas such as software measurement, especially about functional metrics. We now have the ability to measure software and thus make accurate predictions in the planning of software projects. The module uses metrics (particularly Function Points) as a foundation to develop plans based on actual measurements. It stresses the need to use metrics both in the planning of projects and in the managing

against those plans, the use of risk management techniques and the role of quality in the development of software.

HCS414 Object Oriented Programming II

Object Oriented Programming II is a second programming course for Computer Science majors with a focus on object-oriented programming. The goal of the course is to develop skills such as program design and testing as well as the implementation of programs using a graphical IDE. All programming will be done in Java. This course presents a conceptual and practical introduction to object oriented programming, exemplified by Java. As well as providing grounding in the use of Java, the course will cover general principles of programming in imperative and object oriented frameworks. After completing the course successfully, students will be able to develop programs that support experimentation, simulation and exploration in other parts of the Informatics curriculum (e.g. the capacity to implement, test and observe a particular algorithm).

HCS417 Decision Support Systems

Decision-support systems (DSS) support management decision-making in a business environment. Its focus is to provide viable alternatives for managers rather than replacing judgment with an optimized solution. This course addresses the principles and practice of decision support systems (DSS). Areas addressed are the design, development and applications of DSS: conceptual framework, cognitive styles, evaluating and using DSS, DSS architectures, data base management systems, model-base management systems, problem solving and decision-making tools, brainstorming, operations research tools, artificial intelligence techniques, dialogue generation and management software, man-machine interfaces, adaptive design approach, knowledge acquisition, applications and case studies.

HCS403 Computer Graphics

The module focuses on all aspects of fundamental computer graphics, including 2D/3D object representations, transformations, modeling and rendering algorithms. Particular emphasis is given on rendering algorithms for generating photo-realistic scenes with the help of illumination and reflection models and texture mapping techniques. The module also aims to provide a good foundation of OpenGL programming, which is a widely accepted standard for developing graphics applications.

HCS 415 Advanced Data Communication and Computer Networks

This module provides an in-depth discussion of computer networks. It includes a detailed discussion of the different Network Models. Concepts that have a direct effect on the efficiency of a network (e.g. collision and broadcast domains, topology) are also discussed. Concepts on different network technologies, distributed computation, networking, and communication software, and security issues are also discussed.

HCS 418: Management Information Systems

The module provides an overview of fundamental MIS concepts, using integrated framework for Decision Making and Analysing Information Systems. The module is comprised of different types of Information Systems available

for Business use in Decision Making and Business Processes, covering Competitive Advantage, Executive Information Systems, Decision Support Systems, Expert Systems and Supply Chain Management etc. Emphasis is on the internal management of information resources and on the management of information technology and the focus of the module is maintained on Global Business and current Technological trends.

HCS460 Research Project

Computer science students are required to develop computer information systems for businesses, public agencies and other institutions. The projects involve the analysis, design, and implementation of systems for the collection, management, and dissemination of information. To be successful, the student has to display problem-solving skills for systems that can be operated easily. After a careful and thorough evaluation, a student must undertake a project that best matches his/her talents and background.

HCS419 Intellectual Property Rights

This module is intended to give students a general overview of intellectual property. The module begins with an analysis of the competing policies underlying the intellectual property laws. It covers the basics of patent, copyright, trademark, and trade secrets (and other state IP-related areas of) law, as well as some of the salient controversies in intellectual property law, including patent protection for software and business methods, the challenges to copyright law posed by file-sharing technology, the role and difficulties of protecting trademarks on the Internet, and the application of common law doctrines to the Internet.

HCS 420: Microprocessors and Embedded Systems

In this class, the fundamentals of embedded system hardware and firmware design will be explored. Issues such as embedded processor selection, hardware/firmware partitioning, glue logic, circuit design, circuit layout, circuit debugging, development tools, firmware architecture, firmware design, and firmware debugging will be discussed. The Intel 8051, a very popular microcontroller, will be studied. The architecture and instruction set of the microcontroller will be discussed, and a wire-wrapped microcontroller board will be built and debugged by each student. The module will culminate with a significant final project which will extend the base microcontroller board completed earlier in the module. Learning may be supplemented with periodic guest lectures by embedded systems engineers from industry. Depending on the interests of the students, other topics may be covered.

BACHELOR OF SCIENCE HONOURS DEGREE IN MATHEMATICS

HMAT101 Calculus I

Number Systems, Functions, Limits and Continuity, Bounded and Monotonic functions. Inverse functions, Types of functions, Limits of functions, Right and left hand continuity, Theorems on continuity, Uniform continuity, Sequences, Theorems on limits of Sequences Bounded and Monotonic sequences, Cauchy sequences, Derivatives, Mean value theorem, L'Hospital's rule, Applications of derivatives, Integral Calculus, Indefinite integral, Definite integrals, Properties of Definite integrals. Mean value theorem for integrals, Fundamental theorems of integral calculus, Applications of definite integrals.

HMAT102 Mathematical Discourse and Structures

This module covers- Sets, Relations, Functions, Algebra of Sets, Operations and Structure, Logic and the Algebra of Propositions, Boolean Algebra.

HMAT103 Linear Mathematics I

Vectors and Scalars, Vector Equation of a Straight line, Vector Equation of a Plane, Operations Involving Complex Numbers, Polar Form, The Triangular Inequality, De Moivre's Theorem, Polynomial Equations, Roots of Unity, Locus, Matrices, Triangular and diagonal Matrices, Transpose of a Matrix, Symmetric Matrices, The Trace of a Matrix, Determinants and Inverses of Matrices, Row Echelon Form, Homogeneous Equations and their Solutions, Separable Differential Equations, Exact Equations, Homogeneous Differential Equations, Bernoulli's Equation, Reduction of Order, Non-Homogeneous Linear Differential Equations.

HMAT104 Calculus II

The module covers: Limit and Continuity of functions of several variables. Partial derivatives of function of several variables, Maxima and Minima of functions of several variables. Lagrange's Multipliers, Multiple integral, Infinite series, Taylor series and Leibniz series, Mean Value theorem, The Jacobians.

HMAT/HSOR107 Probability Theory I

The aim of this module is to give a deep notion of probability theory using measure theoretic approach. The chapters will cover sets and events, probability, random variables, special probability distributions, expectation and moments, generating functions and bivariate probability distributions.

HMAT108 Linear Mathematics II

Vector Spaces, Elementary consequences of vector space axioms, direct sums of subspaces, Linear Independence, Basis and Dimension, Linear dependence and linear independence, Rank of a matrix, Linear Transformation (Mapping), Kernel of a vector, Vector space isomorphism, Change of basis, Inner Product Spaces (Euclidean spaces), Eigenvalues and Eigenvectors, Bilinear, Quadratic and Hermitian Forms, The Cayley Hamilton Theorem.

HMAT 201 Analysis 1

Real Number System, Sequences, Functions, Limit and Continuity, Differentiation, Integration

HMAT 202/HSOR104: Statistical Inference I

The aim of the module is to provide a deep understanding of statistical Inference that is making conclusions or decisions about the unknown parameters of a model for a population or process, on the basis of sample information by looking at basic concepts of Statistics, estimation, desirable properties of point estimators, sampling distributions, Interval estimation and hypothesis testing.

HMAT 204 Vector Calculus

Definition of a vector, geometric representation, scalar product, vector product, Notion of vector function, Limit continuity and differentiability, Curvature and torsion Scalar Field, level surfaces, level lines, directional derivatives, gradient, Vector Field: flow lines, divergence and curl, Definition of surface integral, physical interpretation. Flux integrals over parameterized surfaces, Volume integral, Green's Theorem, Divergence Theorem and Stokes Theorem, Orthogonal Coordinate Systems curvilinear coordinates.

HMAT206 Graph Theory

This module covers some fundamental concepts and principles of graph theory. Some algorithms of graphs are also discussed. Students will learn some techniques to solve some graph problems. The module will also cover graphs and directed graphs, matrix representations, trees and bipartite graphs, Eulerian and Hamiltonian graphs, plane graphs, graph colorings and graph algorithms.

HMAT207 Numerical Methods

Approximating a number, Solutions of non-linear equations in one variable, Interpolation Polynomials and Splines, Numerical methods for systems of Linear Algebraic Equations, Numerical differentiation and integration, Numerical solutions of ordinary differential equations.

HMAT208 Number Theory

This module provides an introduction to the theory of numbers. Basic concept such as divisibility, congruence, diophantine equations will be covered. Some applications such as cryptography will be introduced. Mainly the module will cover divisibility properties of integers, congruences, quadratic reciprocity and quadratic forms, functions of number theory, diophantine equations and simple continued fraction cryptography.

HMAT209 Algebra 1

Sets, Mappings and Equivalence Relations: Sets, Mappings, Equivalence relations. Introduction to Group Theory: Groups and their properties, Subgroups of groups. Orders of Groups, their Elements, Lagrange's Theorem: Orders of groups, Cyclic groups. Normal Subgroups and Homomorphism of Groups: Normal Groups, Homomorphism of groups. Introduction to Ring Theory: Basic properties of rings, Subrings and ideals

HMAT210 Ordinary Differential Equations

Introduction to differential equations, Separable variables, homogeneous equations, linear differential equations with constant coefficients, higher order differential equations, on-homogeneous linear differential equations, power series solutions, special functions, Laplace transforms, Cauchy-Euler equations, the Convolution theorem, applications to differential and integro-differential equations, inverse Laplace transforms.

HMAT213 Analysis II

Elements of \mathbb{R}^n spaces: Notion of metric, open and closed sets in \mathbb{R}^n , Inner product, Normal spaces. Sequences, compactness and topology: Generalized notion of sequence, Convergence of sequences and topology, Compact sets, Cauchy sequence, Limit theorems. Functions: Limits of functions, continuity of functions, Theorems on continuous functions, Uniform continuity.

HMAT214 Partial Differential Equations and Fourier Series

This module covers- Introduction to Partial differential equations, Fourier Series, Partial Differential Equations in Rectangular Coordinates, Sturm–Liouville Theory, The Fourier Transform and Its Applications, The Laplace Transforms with Applications.

HMAT215 Optimisation

Multivariable Calculus Background , Numerical Linear Algebra Background ,Optimality Conditions , Unconstrained Optimization , Linearly Constrained Optimization , Nonlinearly Constrained Optimization ,Unconstrained Methods , Second Derivative Methods First Derivative Methods , Derivative-free Methods, Constrained Methods , Penalty and Barrier Function Methods , Augmented Lagrangian Methods, Projected Lagrangian Methods Neurodynamic Optimization Neurodynamic Models, Stability Analysis and Simulation.

HMAT216 Probability Theory II

Univariate probability distributions, Bivariate probability distributions, Multivariate probability distributions, Special probability distributions

HMAT217 Mechanics

Newton's laws, Central Forces, The equation of path, Condition for stability of circular orbits, Conservation of Energy, Rotating frames, Two dimensional rotating frame, Motion on the surface of the earth, Lagrangian Mechanics, Lagrangian Mechanics, Lagrange's equations, Application to rigid bodies, Small oscillations.

Introduction to analytic functions, polar/exponential form of complex numbers, more on roots and multi-valued arithmetic, functions from \mathbb{C} to \mathbb{C} , continuity and limits, Cauchy-Riemann equations in Cartesian coordinates, complex and contour integrals, on the proof of the Cauchy-Goursat Theorem, Laurent series and residues, differentiating and integrating a sum of analytic functions, the basic Theorem of power series, partial fractions.

HMAT219 Analytical Number Theory

The fundamental Theorem of Arithmetic, Congruences, Finite Abelian Groups, Primitive Roots, Quadratic Residues, Arithmetic Functions, Average of Arithmetic functions, Distribution of Prime Numbers, Dirichlet's series

and Euler Products, The Riemann Zeta Function, The Prime Number Theorem, Roth's theorem, Freiman's theorem, Weyl's inequality, The Waring problem for squares, Schnirelman-Goldbach theorem, Vinogradov's three-primes theorem, Szemerédi's theorem for 4-term arithmetic progressions.

HMT220 Stochastic Calculus

The aim of this module is to introduce students to Stochastic Calculus and its applications by looking at introduction to probability theory, conditional Expectation, random walks, Brownian motion and Ito integral.

HMT413 Real Analysis

Review of some fundamental concepts and skills in analysis Infinite series of real numbers, Metric spaces, The Riemann-Stieltjes integral, Sequences and series of functions, Lebesgue integration.

HMAT412 Complex Analysis

The field of complex numbers, analytic functions, the complex exponential, The Cauchy-Riemann Theorem, contour integrals, antiderivatives, Cauchy's theorem, Cauchy's integral formula, Cauchy's theorem for chains, principles of linear analysis, Cauchy's theorem for vector-valued analytic functions, power series, the maximum principle, Laurent's series and isolated singularities, Residue Calculus, Laplace transforms.

HMAT404 Topology

Sets and mappings, Metric spaces, Sequences, Topological spaces, Separation, Tietze Extension Theorem, Compactness, Connected sets, disconnectedness, Local connected, arc-wise connected, Cartesian products of connected spaces, connectedness in Banach and Hilbert spaces, Compactness, countable compactness, ItzinBorel Theorem, Locally compact spaces, sequentially compactness and the Bolzano properly. Totally boundedness stone –Cechcompactification and Alexandr of- one- poincompactification

HMAT405 Commutative Algebra

Ring Theory Background: Prime Avoidance, Jacobson Radicals, Local Rings, and Other Miscellaneous Results, Nakayama's Lemma. Primary Decomposition and Associated Primes: Primary Submodules and Ideals, Primary Decomposition, Associated Primes, Associated Primes and Localization, The Support of a Module, Artinian Rings. Integral Extensions: Integral Elements, Integrality and Localization, Going Down. Valuation Rings: Extension Theorems, Properties of Valuation Rings, Discrete Valuation Rings. Completion: Graded Rings and Modules, Completion of a Module, The Krull Intersection Theorem. Dimension Theory: The Calculus of Finite Differences, Hilbert and Hilbert-Samuel Polynomials, The Dimension Theorem, Consequences of the Dimension Theorem, Strengthening of Noether's Normalization Lemma, Properties of Affine k -Algebras. Depth: Systems of Parameters, Regular Sequences. Homological Methods. Homological Dimension: Projective and Global, Injective Dimension, Tor and Dimension, Application. Regular Local Rings: Basic Definitions and Examples.

HMAT 406/HSOR 412 Risk Theory

The aim of this module is to provide a further grounding in mathematical and statistical techniques of particular relevance to the work of non-life insurance and finance. This module covers decision theory, Bayesian statistics, loss distributions, reinsurance, risk models, ruin theory, credibility theory, experience rating, run-off triangles, and “Monte Carlo” simulation.

HMAT407 Numerical Solutions of PDE'S

Introduction to numerical solutions of PDE's, parabolic equations in one space variable, parabolic equations in two and three dimensions, hyperbolic equations in one space variable, consistency, convergence and stability, elliptic equations in two dimensions, iterative solution of linear algebraic equations.

HMAT408 Control Theory

Introduction, system representations, Preliminaries in finite dimensional space, linear spaces and mappings, subsets and convexity, matrix theory, linear matrix inequalities, the autonomous system, controllability, eigenvalue assignment, linear analysis, operators, model realizations and reduction stabilizing controllers.

HMAT409 Calculus of Variations

Typical problems, and their historical origins: brachistochrone, geodesics, catenary, minimal surfaces, loaded elastic beams and cylinders, simple optimal control in economics, resource depletion and population dynamics. Mathematical modelling of the general problem, The Euler-Lagrange equation, historical origins and applications. Extensions to curves with corners, variable endpoints, higher derivatives, several variable functions, and multiple integrals; applications. Parametric representation of the problem. Constrained extremals and isoperimetric problems. Hamilton-Jacobi theory and variational principles in mechanics; Hamilton's equations. Direct methods.

HMAT410 Perturbation Theory

Introduction to perturbation theory. The Poincaré-Lindstedt method and the computation of periodic orbits. Asymptotic expansions. Asymptotic evaluation of integrals (including Laplace's method, method of stationary phase, method of steepest descent). Regular and singular perturbation theory. Multiple-scale perturbation theory. WKB theory and semi-classics. Boundary layers and related topics. Applications to nonlinear oscillators. Applications to partial differential equations and nonlinear waves.

HMAT411 Analysis III

Measures, sigma-algebra, measures on sigma algebras, measures on intervals, outer measure, measurable sets, Borel and Lebesgue measure, Integration, convergence, product measures, Differentiation, signed measures, Lebesgue-RadonNikodym Theorem, L_p spaces, holder and Minkowski inequalities, Dual spaces.

HMAT412 Complex Analysis

Analytic functions as mappings: Zeros of an analytic function, the argument principle, Rouché's theorem, fundamental theorem of algebra, maximum modulus and mean value. Conformal mappings: linear fractional transformations, fixed points and triples to triples, conformal mappings, level curves, conformal mappings and

flows. Riemann mappings theorem and Schwarz-christoffel transformations: Riemann mapping theorem, Schwarz-christoffel transformations. Analytic and Harmonic functions: Harmonic functions as solutions to physical problems, integral representations of harmonic functions, Poisson integral formula, reflection principle, boundary value problem and Green's function. Homographic functions and Lobachewsky's geometry: Homographic functions, Lobachewsky geometry.

HMAT401/HSOR 401 Advanced Probability Theory

In this module, the main aim is to empower students with the knowledge of measure theory, probability triples and further probabilistic foundations, distributions of random variables, probability theorems and weak convergence, expected values, norms, inequalities and convergence, characteristic functions and decompositions of probability laws, conditional expectation, and martingale theory.

HMAT421 Algebra II

Linear equations over a field, Introduction to vector spaces, Linear mappings, Matrix representation of linear mappings, Determinants, Eigen-vectors and eigen-values, Diagonalizable operators, Cayley-Hamilton theorem, Bilinear and quadratic forms, Inner product spaces, Orthogonal diagonalization of symmetric matrices, Canonical forms.

HMAT415 Group Theory

Group axioms, basic definitions, cyclic groups, subgroups, cosets, Lagrange's Theorem equivalence relations, equivalence classes, conjugacy classes, homomorphisms, isomorphisms, product groups, representation theory, irreducible representations, character tables, Schur's lemmas and the orthogonality theorem, introduction to Lie groups and Lie algebras, rotation groups, continuous groups, representation of Lie algebras and physical applications.

HMAT416 Fluid Mechanics

Fundamental Concepts and Preliminaries vector analysis, vector identities, orthogonal curvilinear coordinates, fluid definition, fluid as a continuum, description of fluid motion, equation of particle paths, Fluid Hydrostatics and Inviscid Fluids, forces on fluid surface and submerged bodies, mass conservation, Euler's equation, fluid rotation, vorticity and velocity potential. The Stream Function For A Flow, stream function, uniform flow past a circular cylinder, irrotational flows, flow radially outwards or inwards, superposition of elementary motions, source strength, flow in circles. Complex Flows complex potential, complex velocity, stagnation points, sources, sinks, vortex flows, method of images, circular cylinder with circulation, pressure distribution around a cylinder, Blasius' Theorem. Viscous Incompressible Flows rate of strain, constitutive relations, equations of motion of a viscous fluid, conservation of energy, first law of thermodynamics, Reynolds' Transport Theorem, energy dissipation, Fourier's law.

HMAT417 Partial Differential Equations

Introduction to Partial Differential Equations, definitions, solving simple partial differential Equations by

integration, linear first order equations with one partial derivative, change of variable, method of characteristics for first order linear partial differential equations, Second Order PDE's and Method of Separation of Variables derivation of the wave and diffusion equations, solutions of second order equations, initial and boundary conditions, solution of the wave equation, Laplace's equation and the heat flow equation. Numerical Solution of Partial Differential Equations equilibrium temperatures in a heated slab, equation for steady-state heat flow, Laplace's equation on a rectangular region, derivative boundary conditions, irregular regions and non-regular grids, matrix patterns, sparseness, the finite element method, theoretical matters . Parabolic Partial Differential Equations- equation for time-dependent heat flow, explicit method, Crank-Nicolson method, the Theta method, parabolic equations in Two or Three dimensions, finite elements for heat flow. Hyperbolic Partial Differential Equations, wave equation, solution of wave equation by finite differences, method of characteristics, wave equation in two space dimensions, finite elements and the wave equation.

HMAT418 Stochastic Differential Equations and Integration

Introduction, Filtering Problems, Optimal Stopping, Stochastic Control, Probability Spaces, Brownian Motion, Ito Integrals, The Ito Formula and the Martingale Representation Theorem, Stochastic Differential Equations, Diffusions, The Dynkin Formula, The Martingale Problem, The Girsanov Theorem, Application to Optimal Stopping, Optimal Stopping Problems Involving an Integral, The Hamilton-Jacobi-Bellman Equation.

HMAT419 Non Linear Ordinary Differential Equations

Linear systems with periodic coefficients (Floquet theory, Mathieu equation); Perturbation methods (direct methods, Poincaré-Lindstedt method, singular perturbations); Stability (Poincaré stability, Liapunov stability); Plane autonomous systems and determination of stability (perturbation methods, Liapunov methods, Poincaré-Bendixson theorem, averaging methods); Elementary bifurcations and chaos.

HMAT420 Nonlinear Recommended Text: Partial Differential Equations

Distances between probability measures induced by optimal transportation problems, according to the formulations of Kantorovich-Rubinstein-Wasserstein, and their link with Hamilton-Jacobi equations. The construction of an "infinite dimensional (almost) Riemannian" structure on measures and the interpretation of many (nonlinear) diffusion PDE's as gradient flows. The link between optimal transport, kinetic formulations, and statistical mechanics. Entropy/Entropy dissipation methods for studying nonlinear evolution equations and functional inequalities. The interplay between geometric properties of the underlying domains (usually "nice" Riemannian manifolds) and the probability spaces constructed on them. Geometric inequalities in the framework of non-smooth Metric-Measure Spaces. The metric/energetic theory for gradient flows and rate-invariant evolution problems. Qualitative properties of solutions of nonlinear elliptic and parabolic equations; Blow-up and singularities for quasilinear elliptic and parabolic equations; Homogenization of nonlinear partial differential equations; Free boundary problems; Long time dynamics of nonlinear evolution PDE; Optimal control and optimization in PDE.

HSOR213 Time Series Analysis

This module covers- Introduction to times series, Regression, Autoregressive Models, Data Transformations, Modelling Seasonality, Decomposition, Exponential Smoothing, RMSE and MAPE performance measures,

Autocorrelation, Brief Introduction to ARIMA.

HSOR 106 Computer Packages in Applied Mathematics

The module is aimed at equipping students with the knowledge of using computer packages in solving mathematical and statistical problems using computer packages chosen amongst Matlab, Minitab, Lingo, R, SPSS, Eviews software etcetera.

BACHELOR OF SCIENCE HONOURS DEGREE IN STATISTICS AND OPERATIONS RESEARCH

HMAT101 Calculus I

Number Systems, Functions, Limits and Continuity, Bounded and Monotonic functions. Inverse functions, Types of functions, Limits of functions, Right and left hand continuity, Theorems on continuity, Uniform continuity, Sequences, Theorems on limits of Sequences Bounded and Monotonic sequences, Cauchy sequences, Derivatives, Mean value theorem, L'Hospitals' rule, Applications of derivatives, Integral Calculus, Indefinite integral, Definite integrals, Properties of Definite integrals. Mean value theorem for integrals, Fundamental theorems of integral calculus, Applications of definite integrals.

HMAT102 Mathematical Discourse and Structures

Sets, Relations, Functions, Algebra of Sets, Operations and Structure, Logic and the Algebra of Propositions, Boolean Algebra.

HMAT103 Linear Mathematics I

Vectors and Scalars, Vector Equation of a Straight line, Vector Equation of a Plane, Operations Involving Complex Numbers, Polar Form, The Triangular Inequality, De Moivre's Theorem, Polynomial Equations, Roots of Unity, Locus, Matrices, Triangular and diagonal Matrices, Transpose of a Matrix, Symmetric Matrices, The Trace of a Matrix, Determinants and Inverses of Matrices, Row Echelon Form, Homogeneous Equations and their Solutions, Separable Differential Equations, Exact Equations, Homogeneous Differential Equations, Bernoulli's Equation, Reduction of Order, Non-Homogeneous Linear Differential Equations.

HSOR104 Statistical Inference I

The aim of the module is to provide a deep understanding of statistical inference that is making conclusions or decisions about the unknown parameters of a model for a population or process, on the basis of sample information by looking at basic concepts of statistics, estimation, desirable properties of point estimators, sampling distributions, interval estimation and hypothesis testing.

HMAT104 Calculus II

Differentiation: Derivatives, Rules of differentiation, The Mean Value Theorems, Taylor's or the General Mean Value Theorem. Integration: The Riemann Integral, Integral functions properties of the Riemann integral, the fundamental Theorem of Integral calculus. Sequence and series of function: Series of functions, Power series, Point-wise convergence, Uniform convergence, Test convergence. Improper integrals: Unbounded functions, Convergence tests for unbounded functions, Improper integrals, Convergence tests for improper integrals, Special functions.

HSOR105 Applied Statistics

Introduction, Descriptive statistics (graphical techniques, measures of central tendency, measures of variability),

Sampling schemes (samples, sampling skills, demography), Empirical distributions (discrete random variables, discrete distributions, continuous distributions, moment skews and kurtosis), Time series analysis, Non-parametric statistics (non parametric statistical tests, hypothesis tests, Runs test, Sign test, Signed rank test, Wilcoxon Rank Sign test, Mann-Whitney test, Median test), Chi-square contingency test (contingency tables, goodness of fit test, Q-Q plots and Chi-square test for independency), Applications to real life situations.

HSOR106 Computer Packages in Applied Mathematics

The module is aimed at equipping students with the knowledge of using computer packages in solving mathematical and statistical problems using computer packages chosen amongst Matlab, Minitab, Lingo, R, SPSS, Eviews software etcetera.

HMAT/HSOR 107 Probability Theory I

The aim of this module is to give a deep notion of probability theory using measure theoretic approach. The chapters will cover sets and events, probability, random variables, special probability distributions, expectation and moments, generating functions and bivariate probability distributions.

HMAT108 Linear Mathematics II

Vector Spaces, Elementary consequences of vector space axioms, direct sums of subspaces, Linear Independence, Basis and Dimension, Linear dependence and linear independence, Rank of a matrix, Linear Transformation (Mapping), Kernel of a vector, Vector space isomorphism, Change of basis, Inner Product Spaces (Euclidean spaces), Eigenvalues and Eigenvectors, Bilinear, Quadratic and Hermitian Forms, The Cayley Hamilton Theorem.

HSOR108 Linear and Integer Programming

Mathematical Programming: Mathematical programming, Optimization, Convex set, Dimensionality. Formulation of LP problems: LP formulation, LP problems, Limitations of LP approach. Graphical solution of LP problems: Graphical solution of LP problems, Opportunity costs, Sensitivity, Post optimal analysis. The Simplex Method: The simplex algorithm, artificial variable in LPP, Charne's M-Method, Two-Phase Technique, Variants of the Simplex method. Duality: Primal Dual LPP, Properties of the Primal Dual pair, The Dual Simplex Method, Integer Programming: Rounding in Integer programming, Cutting plane technique, Branch and Bound Technique.

HSOR210 Stochastic processes

Introduction to stochastic processes: Definitions, Examples. Markov Chains - Markovian property, Transition diagrams and probabilities, Chapman Kolmogorov Equations, Random walk. Classification of states of a Markov Chain - Transient states, Recurrent states, Absorbing states, Persistent states, Periodicity properties, Absorption probabilities – Gambler's Ruin problem. Long run – properties of Markov Chain - Steady – state probabilities, Stationary distribution. First passage times - Recurrence times. Renewal processes - Memoryless property.

HSOR203 Introduction to Operations Management

Production-inventory & just-in-time systems, Materials Requirements Planning (MRP), Master and operations

scheduling, Supply chain management.

HSOR205 Management Science

Decision analysis - Maximax or Maximum likelihood, Minmax, Hurwitz or Bayes, Rule Decision, Conservative criterion, Laplace criterion, Expected Value of Perfect Information (EVPI), Decision trees. Queuing theory analysis - Queuing processes, Kendall – Lee Notation, Definitions and notations, The role of the exponential distribution, The (M/M/1): (FIFO/ ∞/∞) Queuing model. Deterministic Inventory Models - Economic Order Quantity, Economic Production Lot Size, Inventory Model with Planned Shortages, Quantity Discounts. Project Management - Project Networks, The Critical Path, Earliest start time, Earliest finish time, Latest start time, Latest finish time, Slack/float time, Project Evaluation and Review Technique, The Gantt Chart, Project Crashing.

HMAT207 Numerical Methods

Approximating a number, Solutions of non-linear equations in one variable, Interpolation Polynomials and Splines, Numerical methods for systems of Linear Algebraic Equations, Numerical differentiation and integration, Numerical solutions of ordinary differential equations.

HSOR207 Design and Analysis of Experiments

Introduction – replication, blocking, randomization and experimentation. Experiments with single factor – analysis of variance, analysis of the fixed effects model (FEM), Random effects model (REM), complete randomized design (CRD). Randomized Blocks, Latin squares and other related designs – The Randomised Complete Block Design (RCBD), statistical analysis of RCBD, Randomised Block Design (RBD), model adequacy checking, The Latin Square Design, Balanced Incomplete Block Design. Factorial Designs – the two factor factorial design, estimating the model parameters, blocking in factorial design. The 2^k Factorial Designs – the 2^2 factorial designs, the 2^3 factorial design.

HSOR209 Statistical Process Control

Introduction to: statistical process control, statistical quality control. Causes of variations common causes of variation, assignable causes of variation special causes of variation, Control charts- control charts of attributes, control charts for variables, x-bar charts, R-charts, p-charts, s-charts, warning limits, tolerance limits, Acceptance sampling, process capability actual process capability, potential process capability, Average Run Length (ARL), Pareto charts.

HMAT210 Ordinary Differential Equations

Introduction to differential equations, Separable variables, homogeneous equations, linear differential equations with constant coefficients, higher order differential equations, on-homogeneous linear differential equations, power series solutions, special functions, Laplace transforms, Cauchy-Euler equations, the Convolution theorem, applications to differential and integro-differential equations, inverse Laplace transforms.

HSOR211 Regression and Analysis of Variance I

Statistical versus deterministic relationships, Simple linear regression model: assumptions, model fitting, estimation of coefficients and their standard errors, Confidence intervals and statistical significance tests on model parameters, Prediction intervals, Analysis of variance in regression: F-tests, r-squared, Model validation: residuals, residual plots, normal plots, diagnostics, Multiple regression analysis - introduction.

HSOR212 Network Models

The module aims at introducing basic principles, classical models, popular algorithms and various applications in other fields of network programming by looking at network terminology, modeling examples, transportation models, economic models, shortest path problem, maximal flow problem, minimum spanning tree problem salesman travel problem, LP and network flows, the primal simplex method for pure problems, the Simplex method for upper bounded problems, computational implementation, the basis for the generalized network problem, primal and dual methods, and networks with upper bounds.

HSOR213 Time Series Analysis

Introduction to times series, Regression, Autoregressive Models, Data Transformations, Modelling Seasonality, Decomposition, Exponential Smoothing, RMSE and MAPE performance measures, Autocorrelation, Brief Introduction to ARIMA.

HSOR214 Statistical Inference II

Introduction to nonparametric statistics, Order statistics and their applications, Review of nonparametric tests concerning a single sample, Nonparametric tests that utilise data from two independent samples, Variables location tests that utilise data from two related samples, Tests involving variable location for three or more independent samples, Tests involving variable location for three or more related samples, Goodness of Fit tests, Tests of association, Introduction to Robust techniques.

HSOR215 Theory of Estimation

In this module you will learn famous and frequently used parameter and state estimation techniques and algorithms that are widely used in many fields. The module will cover: Hypothesis Testing: Optimal fixed sample and sequential tests, performance analysis, applications to signal detection, demodulation, etc. Parameter Estimation: Sufficient statistics, Cramer-Rao lower bound, maximum-likelihood estimates, asymptotic performance analysis, signal parameter estimation and applications Time series: Estimation of stationary processes (Wiener filtering), recursive estimators (RLS, LMS, Kalman filtering) least squares, best-linear unbiased estimation (BLUE), maximum likelihood.

HSOR216 Probability Theory II

Univariate probability distributions, Bivariate probability distributions, Multivariate probability distributions, Special probability distributions.

HMAT220 Stochastic Calculus

The aim of this module is to introduce students to Stochastic Calculus and its applications by looking at introduction to probability theory, conditional Expectation, random walks, Brownian motion and Ito integral.

HSOR402 General Linear Models

Simple linear regression, Linear regression in matrix form, Multiple linear regression, One way analysis of variance, Two way analysis of variance, Diagnostic regression.

HSOR403 Dynamical Systems

Basic Definitions, Model building, methods of analysis good model, stages of model building, expected methods for analyzing the models, stability classification, phase planes (phase portraits) of linear systems, equilibrium solutions (critical points), non-homogeneous linear systems with constant coefficients, nonlinear systems. Discrete Population Models introduction to difference equations, examples of discrete models and their analysis Continuous Population Models single species and multi-species models and their analysis Bioeconomics harvesting, predator-prey models, analytical methods: solvability, examples of forest and fisheries exploitation models, reaction kinetics: biochemistry; existence and uniqueness of solutions; Biological rhythms; Neuronal dynamics Introduction to Mathematical Epidemiology model building, interpretation, terminology, examples of common diseases, drug administration models, topological methods: phase plane analysis, ecosystem population dynamics: equilibrium states, stability analysis, bifurcation theory; growth.

HSOR405 Econometrics

Simple linear regression, Multiple linear regression (estimation, inference), Multiple regression (Ordinary least squares asymptotics, qualitative variables, further issues), Autocorrelation, Heteroskedasticity and Multicollinearity.

HSOR406 Multivariate Analysis

Introduction to multivariate concepts and techniques, Multivariate Distributions, Multivariate normal distribution, Hotelling's T-squared test, Multivariate Analysis of Variance (MANOVA), Profile Analysis, Multivariate Multiple Regression, Discriminant Analysis, Clustering, Principal Components, Factor analysis and Canonical Correlations.

HSOR407 Financial Mathematics

Fixed income pricing, Option Pricing under Discrete-time Models, Option Pricing under Continuous-time Models, Numerical Methods for Option Pricing

HSOR408 Operations Research Techniques

The Kuhn-Tucker conditions, Quadratic Programming, Convex Programming, SUMT (Sequential Unconstrained Minimization Technique), Separable Programming, Convex Programming, Nonconvex Programming, Markov Decision Process; A Model for Markov Decision Processes, Linear Programming and Optimal Policies, Policy Improvement Algorithm for Finding Optimal Policies, Discounted Cost Criterion.

HSOR409 Simulation and Modelling

This module aims at supporting students with sufficient knowledge about a wide range of simulation concepts. The areas to be covered includes, types of models, classification of methods, steps in a simulation study, modelling and simulation basics, simulation and experimentation, hand simulation of queuing systems, simulation programming, statistical models in simulation, random number generation.

HSOR410 Queuing theory

Introduction - Examples, Definitions and literature. Basic concepts from probability theory - Random variable, Generating functions, Laplace-Stieltjes transform, Useful probability Distributions, Geometric distribution, Poisson distribution, Exponential distribution, Erlang distribution, Fitting distribution, Poisson process. Single server models - Queuing processes, Kendall – Lee Notation, Definitions and notations, The role of the exponential distribution, Instantaneous Event Rate for the exponential distribution, Pure birth processes, Pure death processes, Birth and Death processes, The $(M/M/1) : (FIFO/\infty/\infty)$ Queuing model, A finite capacity model, $(M/M/1) : (GD/N/\infty)$. Multi- server models - Queuing models with m parallel servers, Markovian Input and Output, The Pollaczek – Khintchine Formulae. Applications of queuing models – Examples, Decision making, Formulation of Waiting – Cost Functions, Decision models.

HMAT 406/HSOR412 Risk Theory

The aim of this module is to provide a further grounding in mathematical and statistical techniques of particular relevance to the work of non-life insurance and finance. This module covers decision theory, Bayesian statistics, loss distributions, reinsurance, risk models, ruin theory, credibility theory, experience rating, run-off triangles, and “Monte Carlo” simulation.

HMAT 413/HSOR401 Advanced Probability Theory

In this module, the main aim is to empower students with the knowledge of measure theory, probability triples and further probabilistic foundations, distributions of random variables, probability theorems and weak convergence, expected values, norms, inequalities and convergence, characteristic functions and decompositions of probability laws, conditional expectation, and martingale theory.

HSOR413 Quantitative Analysis

Application of: Regression Analysis, Optimisation Techniques for Solving Logistics Problems, Linear and Integer Programming, Network Flow Analysis and Queuing Theory to Operations Research.

HSOR415 Reliability Analysis

This module covers: Introduction and Basic Reliability Concepts Context, objectives, advantages, costs, alternatives, etc. of Reliability· Reliability, Hazard, TTF, Numb. Failures, etc. Main Distributions used in Reliability· Discrete and continuous, with related characteristics· MLE, Information, asymptotic properties, etc. Distribution identification and Assessment· Via Goodness of Fit tests and Empirical methods Reliability for the Exponential Life. Reliability for the Weibull Life. Review and Three part test. Acceptance sampling and Sequential Testing in reliability. Reliability growth modeling and analysis. Bayesian reliability models. Review and Three part test: Systems Reliability and Extensions. Models of total systems reliability.

HSOR418 Stochastic Differential Equations and Integration

Introduction, Filtering Problems, Optimal Stopping, Stochastic Control, Probability Spaces, Brownian Motion, Ito Integrals, The Ito Formula and the Martingale Representation Theorem, Stochastic Differential Equations, Diffusions, The Dynkin Formula, The Martingale Problem, The Girsanov Theorem, Application to Optimal Stopping, Optimal Stopping Problems Involving an Integral, The Hamilton-Jacobi-Bellman Equation.

HSOR419 Hypothesis Testing

This module covers: Introduction to hypothesis Testing, Normal Distribution, Chisquare Distribution, F-Distribution, T- Distribution, The exponential family of distribution, Testing of hypothesis, Tests concerning Normal distributions, Tests concerning proportions, Tests Based on likelihood functions, Bartlett's test, The most powerful Test.

HSOR420 Survival Analysis

This module is intended to provide students with an understanding of the theory and applications of survival analysis. The module covers: Survival models, nonparametric estimation of the survival function, one and two or more sample hypothesis tests, inference for semi parametric regression models, and inference for parametric regression models.

HSOR422 Dynamic Programming and Inventory Models

This module introduces principles and popular algorithms of deterministic EOQ inventory models, probabilistic inventory models, single-period decision models, deterministic dynamic programming and probabilistic dynamic programming in other fields of inventory management and dynamic programming.

HSOR423 Regression and Analysis of Variance II

This module teaches you how to analyze continuous response data and discrete count data. Linear regression, Poisson regression, negative binomial regression, gamma regression, analysis of variance, linear regression with indicator variables, analysis of covariance, and mixed models ANOVA are presented in the course.

HSOR425 Fundamentals of Optimization

What is Optimization? Problem Formulation, Unconstrained Minimization, Constrained Minimization, Lagrange Multipliers, Games and Duality.

DEPARTMENT OF PHYSICS, GEOGRAPHY AND ENVIRONMENTAL SCIENCE

BACHELOR OF SCIENCE HONOURS DEGREE IN GEOGRAPHY AND ENVIRONMENTAL SCIENCE

HGGES101 Weather and Climate

The module seeks to explore key issues and concerns in weather and climate studies. The Earth's-Atmospheric link and the key theoretical and historical frameworks will be covered. Methods for forecasting and predicting weather and climatic hazards will be evaluated in detail. Similarly, topical issues which highlight effects of human interaction with the weather like ozone depletion, global warming, drought, desertification and climatic change will be discussed.

HGGES102 Techniques in Geography and Environmental Science

The module introduces the student to the basic techniques in geography and environment science. The student is introduced to practical skills and theoretical models, which are important in understanding the spatial spread of phenomena on the Earth's surface. The nature and importance of maps, statistical methods, fieldwork, GIS and Remote Sensing, spatial analysis and transport network analysis are reviewed in order to equip students with techniques of acquiring, processing, representing and communicating geographical data.

HGGES103 Introduction to Environmental Science

Environmental science is a problem oriented, multidisciplinary field that attempts to assess environmental phenomena in a scientific manner. This introductory module acquaints the student with the broad principles and methodology of environmental science. The nature of environmental systems and the methods used to learn more about them is introduced. The interrelations between land uses and geomorphology, soils, climate, plant communities, wetlands, rivers and estuaries and their interactions with humans are examined from an integrated, problem solving perspective. Major themes of environmental science, environmental ethics and philosophies and environmental problems are also covered.

HGGES104 Introduction to Medical Geography

The nature and scope of medical geography introduces the module. The other major aspects of the module include collection and analysis of medical geography data, categories of diseases, health care and health care inequalities, inequalities in people's state of health, health indicators and health improvement strategies with emphasis on developing countries.

HGGES105 Population Geography

The study of population is fundamental in Geography because of its interaction with the natural environment. The module is aimed at conceptualising the place of population in geography. The main focus is on understanding the three components of population (fertility, mortality and migration) and their determinants from a geographic perspective. Population concepts, doctrines and theories will be covered in this module. Case studies on fertility, mortality and migration will be studied.

HGGES106 Settlement Geography

Settlement Geography deals with various themes in the rural urban dichotomy of modernity. It covers such topics as the origin and factors of human settlements, central place theories, settlement hierarchies and related concepts such as primacy, rank size rule and binary pattern, urbanisation, spheres of influence and the interrelationships between and among neighbouring settlements.

HGGES107 Principles of Geomorphology

The focus of the module is on the earth's lithospheric materials, landforms and their characteristics as well as landform history and origin. Major areas of interest being the relationship between landform formation and climate, plate tectonics, rocks and weathering. Slope form, process and evolution are covered in more detail. Fluvial processes are covered in terms of landforms with emphasis placed on arid and semi-arid regions.

HGGES108 Principles of Hydrology

The major aspects covered in this module are: the nature and scope of hydrology, chemical and physical properties of water, water quality, water stress, water uses, distribution of the earth's water, hydrologic cycle, water balance and discharge. The human impact on hydrological system will be covered. Work on rivers covered under geomorphology will be given less emphasis.

HGGES109 Fundamentals of Social and Economic Geography

The module aims at introducing students to the spatial organisation of economic systems as studied in economic geography. It examines the evolution of the concept of development and makes a critical appraisal of theories of development and underdevelopment. The module also covers trends in and factors affecting economic growth and development in Third World Countries. The social section of the module deals with gender, sexuality, reproductive health, aid and development and environment and society.

HGGES110 Introduction to Geographic Information Systems and Remote Sensing

The module is aimed at giving students a solid foundation to the Geoinformation sciences of Geographic Information Systems (GIS), Global Positioning Systems (GPS) and Remote Sensing. Geoinformation sciences are requisites in contemporary studies of the environment and are critical in spatial decision making process. The module introduces the students to the fundamentals of GIS, GPS and remote sensing technologies. These include, but are not limited to coordinate systems, georeferencing, map projections, fundamentals of GPS, digital image acquisition, image visualisation and interpretation; image enhancement and image classification. The students are also exposed to open source software to enrich their practical understanding of the subject matter, plus to stimulate potential applications of the sciences in solving real scientific and environmental problems.

HGGES111 Introduction to Computers and Computer Applications

The module introduces students to the architecture of a computer, the different computer input and output peripherals, classification of software, networks and network topologies and the commonly used application packages. This course is necessary to give a solid foundation for further studies in GIS and statistical methods for Geography and Environmental Science. It also gives students skills on using information systems for research right across the field.

HGGES 201 Environmental Education

A new topical issue focussing on environmental crisis and response by different interested groups. The definition of Environmental Education will highlight the importance of the discipline in today's world. Students taking the course will be taught the strategies or method of dissemination EE as well as its assessment as a mode of evaluation. Zimbabwe will be used as a case study.

HGGES 202 Geographic Thought

This module explores the philosophical and conceptual foundations of Geography. The major aspects covered in the module are: science and its essential features, the nature and scope of geography, paradigms in geography, evolution of geographic thinking, models in geography and the methodology of geography. The module also covers topics such as spatial organization, gender and environmental education.

HGGES 203 Meteorology and Climatology

Weather and climate are integral parts of the Earth system. The monitoring of meteorological variables, together with the knowledge of underlying processes, are key to understanding our interaction with the natural environment. This module is designed to provide students with an understanding of meteorological processes and climate systems, including comprehensive understanding of atmospheric processes. It discusses local and regional climates and their relation to the large scale atmospheric circulation. The factors and processes which affect the formation of climate systems and consequently the climatic variations over the earth's surface are also examined. Fundamental theories necessary to understand meteorology and climatology are also covered.

HGGES204 Population and Sustainable Development

Since the publication of the Agenda 21 after the Rio 1992 Conference in Brazil, sustainable development has become a topical issue globally. It is important because of its emphasis on promoting technology which reduces environmental degradation and emissions of greenhouse gases. The module seeks to define sustainable development. Theoretical frameworks on the relationship between population growth and sustainable development will also be covered. The module will examine rural dynamics which affect sustainable rural livelihoods.

HGGES205 Cultural Geography

This module will expose students to various cultural issues and how they are related to culture. It looks at different cultures from developing and developed countries and how these are influencing environmental quality. A detailed analysis of cultures in Zimbabwe and their impact on environmental policy implementation will also be done.

HGGES206 Soil Geography

Soil has been of particular interest to man since the beginning of organized agriculture. This module is designed to expose students of Geography and Environmental Science to the spatial science perspective of soils discussing their origins and fundamental processes of their formation, constituents and their functions. The basic factors and their roles in soil formation and development will also be discussed. The concepts of soil classification, soil erosion and conservation are explained and different types discussed. The effects of soil erosion on land and basic soil conservation techniques are covered. The soil can be unproductive, dry out and become liable to accelerated soil erosion. The various methods of conserving soil and reverse all the undesirable trend are issues for discussion

HGGES207 Environmental Policy and Management

The module provides an in-depth understanding of global, regional and national environmental concerns, their causes and the emergence of environmental policy. It looks at various policy instruments used to address environmental concerns with a focus on examining their effectiveness. The environmental policy making process and models are discussed in detail. Factors influencing policy failures are also examined. Various environmental management principles and tools such as Environmental Impact Assessment, Environmental Management Systems, Life Cycle Analysis and Environmental Audits are also discussed with a focus on their applicability and effectiveness. The role of environmental policy and legislation in environmental or natural resources management is emphasised.

HGGES208 Resource Management

The student is introduced to the typology of natural resources. Great interest is placed on soil, water, air, land and land based resources (minerals, forests, fauna) as physical assets, which require prudent utilisation to ensure sustenance. The module carefully streamlines renewable and non-renewable resources, as well as the conservation and management strategies appropriate for each category of these resources. The module ends with an analysis of techniques, strategies and approaches in natural resources management.

HGGES209 Transport Geography

The nature and scope of transport Geography will be covered. The types and modes as well as modern developments in transport will be covered. The relationship between transport and environment, transport routes and networks become important aspects. Local and international policies on transport and trade will be pursued in this module.

HGGES210 Political Geography

The course seeks to examine the main issues in the study of political geography. The major aspects covered in this course are boundaries and frontiers, territorial component of political organisation, the population components of political organisation, electoral geography, political power, spare time dimensions in African political systems and international political organisations.

HGGES211 Rural Development Geography

The module introduces students to the rural development geography. It focuses on the following aspects: nature and scope of rural development geography, rural settlement systems, rural economic activities, strategies and policies for rural development, challenges to rural development and the role of aid in rural development.

HGGES212 Research Methods in Geography and Environmental Science

The aim of this module is to equip students with skills that are required in conducting research in the discipline of Geography and Environmental Studies. Some of the issues under discussion include choosing a research topic, formulating an hypothesis, research objectives and questions, writing a problem statement, conducting literature review, the methodology chapter, describing and discussing the main research findings, conclusions and making recommendations.

HGGES 213 Statistical Methods in Geography and Environmental Science

Throughout this module, emphasis is on the precise and clear comprehension of statistical concepts and their application in Geography and Environmental Science. The major issues covered in this module are sampling methods, descriptive statistics as exploratory data analysis methods, probability theory, hypothesis testing, inferential statistics as confirmatory data analysis methods, testing for differences, correlation analysis, ordinary least squares regression analysis, logistic regression analysis and an introduction to time series analysis.

HGGES214 Hydrology

Hydrology presents a unified approach to the role of hydrology in environmental planning and management, emphasizing the consideration of the hydrological continuum in determining the fate and migration of chemicals as well as micro-organisms in the environment, both below the ground as well as on it. The eco-hydrological consequences of environmental management are also discussed, and an up-to-date account of the mathematical modelling of pollution is also presented. Hydrologists and hydro geologists seek appropriate solutions to global water issues, backed by sound scientific knowledge and mathematical principles.

HGGES215 Ecosystems

The interaction between the biotic and abiotic environment defines an ecosystem. The primary focus of ecosystem ecology is the exchange of energy and matter. In this module the components of an ecosystem are explored. The structure and functions of an ecosystem are also covered in this module. Disturbance mechanisms as well as succession issues and their impact on ecosystem structure and function are also explored. The module also provides an in depth evaluation of the applications of Geographic Information Systems, Global Positioning System and Remote Sensing technologies in ecosystems management. The module also explores natural ecosystems response to global environmental change, especially the change in climate.

HGGES216 Geography of Tourism and Recreation

Tourism and recreation are intricately related. Often it is difficult to draw a line between the activities of one from those of the other. The aim of this course is to provide a conceptual and theoretical framework for their study. Some of the issues examined in this module include definitions and conceptualisation of the two terms, the diverse impacts of the industry (such as economic, physical and social). Evaluating tourist resources, planning for tourism and recreation and case studies drawn from East Africa, the SADC Region and Zimbabwe. While a global perspective of the industry is provided, this course focuses on Zimbabwe and the surrounding regions.

HGGES217 Mining and the Environment

The module covers the mining process, mineral exploration and mine design, mine construction and development, development, production, mine closure and post closure management, small scale mining, mining and sustainable development. The student is also introduced to mining environmental policies and legislation. To approach the topic in some practical way, case studies are used throughout the studies.

HGGES218 Geography of Zimbabwe

The module will focus on the physical and socio-economic aspects of Zimbabwe. The physical aspects will include the factors affecting the spatial variations of climate patterns of Zimbabwe, the physiographic regions of Zimbabwe and the potential for agriculture. The socio-economic part deals with tourism, trade and agricultural development opportunities and constraints. The module will also look at the general opportunities and constraints to socio-economic development in the country. The module also looks at the contemporary biophysical and socioeconomic environmental challenges facing the country and the solutions that can be used to address some of these challenges.

HGGES219 Geography of Central and Southern Africa

The module will examine the biophysical environment, population dynamics and development in Central and Southern Africa. Factors which affect development and industrialisation in particular will be discussed. The role of regional organisations such as COMESA and SADC in promoting regional cooperation and integration will be assessed. The focus of this course is to introduce the student to the geographical perspectives of this region. The main aspects to be studied include, but are not limited to; the biophysical, socio-economic and geopolitical characteristics of the countries of this region. It is upon successful completion of this module that the student would be equipped with ideas, concepts, experiences and skills to critique and propose development policy alternatives for the countries in this region.

HGGES220 Environmental Health and Safety

This module introduces students to the field of environmental health and safety. Students will learn and assess the impacts of environmental pollution to workers and local communities. Policies and statutory instruments are about the history and evolution of environmental health, including how it is related to occupational health. To understand the importance of environmental health research and practice, the module explores the scale and trends of current health problems associated with major environmental hazards. Examples of major environmental disasters and their relevance to environmental health will be discussed. In addition, the module examines the nature and types of exposures of people to harmful substances and dangerous machinery in their workplaces and surrounding communities. It also evaluated.

HGGES221 Geographic Information Systems and Remote Sensing

Using mainly open source software, the module is aimed at giving students a more practical understanding of Geographic Information Systems (GIS), Global Positioning Systems (GPS) and Remote Sensing (RS) as modern tools that are critical for studying the environment as well as providing an input for spatial decision making processes. Emphasis is made on the various methods of analysing spatial data and the practical applications to which the information is used. An effort will be made to include a variety of disciplines and fields that consume spatial data for decision making. Spatial database management systems are also included in this module. The practical applications of remotely sensed images in the study of the environment will also be demonstrated in this module. These include sourcing the images, performing the relevant pre-processing techniques, actual processing of the images, performing change detection as well as displaying of the processed imagery (information) for effective communication. Again, an effort will be made to include diverse disciplines and fields.

HGGES401 Environmental Pollution

Environmental pollution is a well-acknowledged environmental problem that has attracted concerted effort to understand, prevent and/or control it. The module dissects the concept of pollution and analyses the types of environmental pollution (water, land, air, radiation and noise). The student is introduced to various forms, sources, effects of environmental pollutants and the way they affect environmental health. In a bid to approach the problems in a practical way, case studies of pollution monitoring and control will be studied. The module ends with strategies for pollution control.

HGGES402 Geography of Sub-Saharan Africa

The student of this module is exposed to a wide array of ideas, concepts and issues covering the past, contemporary and future prospects of this rapidly changing sub-continent. It is by taking a closer and keen look at this sub-region that one would appreciate the contributions of the biophysical environment and natural resources, the history, human resources, governance and human rights, and globalisation, towards the geography of this region. Case studies and appropriate examples would be cited to clearly demonstrate events, change processes and outcomes of human endeavours to attain modern civilisations, socio-economic prosperity and sustained growth in this region.

HGGES403 Agriculture and the Environment

Agriculture is an activity essential for humankind survival. However, most agricultural activities interfere with the ecological integrity of the environment. This module shall explore the impacts of various agricultural activities on the natural environment. It shall also look at various ways of attaining sustainable agriculture, that is, agriculture that manages to produce adequate food for humanity while at the same time maintaining the ecological integrity of the environment on which it depends.

HGGES404 Spatial Analysis

The main purpose of this module is to equip students with the skills of handling and processing spatial data. The major aspects covered in the course include spatial modelling, spatial interaction models, maps and map projections, introduction to remote sensing, introduction to geographical information systems, spatial statistics and transport network analysis.

HGGES405 Natural Hazards and Disaster Management

The introduction covers the concept of natural hazards and its anthropocentrism. This will be followed by a detailed discussion of the geographical distribution of natural hazards, including earthquakes, volcanoes, landslides, tropical storms, tsunamis, floods, drought and desertification. The module ends with an exposition of how disasters affect development and man's response prior to, during and after the occurrence of a disaster.

HGGES406 Urban Geography

The module aims to understand the processes that give rise to the spatial arrangement of urban towns and cities. This will involve focusing on analysing and examining the following elements: patterns, theory and techniques. The module also examines the characteristics of cities as well as historical and contemporary processes of urban growth. It also discusses the contemporary problems of urbanisation particularly in the developing world region.

HGGES407 Medical Geography

The nature and scope of medical geography introduces the module. The other major aspects of the module include collection and analysis of medical geography data, disease diffusion and the epidemiological transition models, spatial patterns of health in selected regions, health promotion (planning and strategies) with emphasis on developing countries, determinants of health, paradigms in medical geography, measurement of health and models of healthcare.

HGGES408 Water Resources Management

Water is increasingly becoming a scarce resource across the globe due to rapidly increasing demand, environmental degradation among various other resources. The module shall examine the various threats to water availability (quality and quantity) and the impacts to society and the environment. Measures to ensure adequate water availability including legislation, watershed management, Trans-boundary cooperation, demand management, among others shall also be discussed.

HGGES409 Applied Geomorphology

The focus of the module is on the earth's lithospheric materials, landforms and their characteristics as well as landform history and origin. The relationship between landform formation and climate, structure and process is examined. Slope form, process and evolution are covered in more detail. Fluvial processes are covered in terms of landforms with emphasis placed on tropical regions. Major areas of interest in this module are in human applications of geomorphology in areas such as geo-morphological disasters and hazards, civil engineering, mining and environmental planning and resource evaluation

HGGES410 Environmental Impact Assessment

This module deals with the Environmental Impact Assessment (EIA) policy and process as a means of encouraging environmentally responsible investment and development in an economy such as Zimbabwe. It gives the history, rationale, principles and implementation of the EIA policy. The key elements for conducting EIA are discussed in the context of EIA policy in Zimbabwe. Issues discussed in detail also include EIA tools and techniques, screening, scoping, reporting, public participation and auditing. Throughout the module, the role of EIA in attaining sustainable development would be highlighted.

HGGES411 Regional Development Planning

Regions are one of the geographer's main analytical tools and the study of regions and the processes by which they change and develop plays a central role in geography. This module examines the concept of a region, different types of region, methods of analysing regional characteristics, the factors which affect regional development. Theories of regional development will also be discussed. The nature and scope of regional planning and the role of decentralisation in regional development.

HGGES412 Biogeography

Biogeography is the study of patterns of distribution of living organisms in a spatial and temporal context. This module seeks to explore the factors which are responsible for determining and limiting these distributional patterns. The module looks at where living organisms live, or used to live, or might live in the future. The course also looks at a

species' physical environment, how it adapts to its particular environment and its evolutionary history. The course also seeks to explain the impact of human activities on the distributional patterns of plants and animals. Quantitative measures of vegetation and wildlife animals will also be covered.

HGGES413 Applied Geographic Information Systems

The module aims to give students hands-on understanding of GIS as tool for studying the environment and as input for a decision making process. This will include introducing students to the various software used in GIS; principles of GIS; GIS database management systems; coordinate systems; GIS Data input; global positioning systems (GPS) and global satellite navigation systems (GSNS); web GIS and open source GIS and spatial analysis. Students must by the end of the course be able to efficiently capture, store, update, manipulate, analyse, and display all forms of geographically referenced information in a GIS and also must be able to demonstrate applications of GIS to the study of environmental science.

HGGES414 Applied Remote Sensing

In Remote Sensing students will learn about various Remote sensing platforms and sensors. The electromagnetic spectrum will be studied in detail and various types of sensors identified. Image acquisition, processing and interpretation would be practically done in the GIS Laboratory to demonstrate the applications of RS in environmental monitoring and management.

HGGES415 Gender and Development

Mainstreaming gender into environmental management is significant because, historically, institutions and management structures perpetrate gender inequalities and inequities vis-à-vis men and women in environmental management and in accessing to strategic resources such as land yet most of women's livelihood strategies heavily depend on the natural environment. This course seeks to discuss the historical trends in mainstreaming gender issues into environmental management.

HGGES416 Rangeland Management

A rangeland describes land for which the major use is grazing by wild animals and livestock. The module explores ways in which range managers can balance grazing with the re-vegetative capacity of the rangeland. The concept of carrying capacity and the indicators of rangeland degradation shall also be covered. Rangeland resource inventory and monitoring shall also be discussed.

HGGES417 Climate Change

The module is focused around the science of climate change. Is the climate changing? What evidence suggests climate change? If it is changing, what is ahead? What role does living things play? Which policy responses are sustainable? It is by critically reviewing on such questions that students understand the concept of climate change. Students assess the scientific evidence of climate change and its impacts on natural resources and human livelihoods. Communities' adaptations, mitigation and policy responses in different regions are examined.

HGGES419 Industrial Geography

Nature and scope of industrial geography, industrial location theories, industrial productions impact on the environment in varied adverse ways, such that if not carefully planned, the benefits might be overshadowed. Environmental Management System – ISO 14001 and cleaner production techniques have central role to play in ensuring sustainability of industrial activities. Students of this course shall acquire knowledge and skills to be professional environmental managers in industry.

HGGES420 Energy and the Environment

Global energy use has increased greatly starting from the mid-1950s. Today's economies are powered largely by fossil fuels however, these fuels are contributing to the destruction of the stratospheric ozone layer leading to climate change and environmental degradation. There is thus, need to find renewable energy alternatives so that the world achieves sustainable energy use.

BACHELOR OF SCIENCE SPECIAL HONOURS DEGREE IN GEOGRAPHY AND ENVIRONMENTAL SCIENCE

HGGES421 Environmental Education

A new topical issue focussing on environmental crisis and response by different interested groups. The definition of Environmental Education will highlight the importance of the discipline in today's world. Students taking the module will be taught the strategies or method of dissemination EE as well as its assessment as a mode of evaluation. Zimbabwe will be used as a case study.

HGGES422 Geographic Thought

This module explores the philosophical and conceptual foundations of Geography and Environmental Studies. It traces the historical evolutions and Geography as a discipline within the context of paradigm shifts. Some of the topics covered include models, spatial organization, gender and environmental education.

HGGES423 Meteorology and Climatology

This course covers the physics of the atmosphere in terms of composition, structures and energy flows. The use of advanced weather observation/s through and remote sensing techniques will be taught in this course. Atmospheric circulations, horizontally and vertically on the ground surface and upper air will be considered. An explanation of climatic change and variation is provided. Discussions on causes and consequences of climatic change will round up the course.

HGGES424 Population and Sustainable Development

The module provides students with an understanding of the complex relationship between population dynamics and sustainable development particularly in Third World Countries. The aim is to critically debate the main arguments of the received wisdom about the implications of population growth to the socio-economic development and ecological change. The module also explores the origins of sustainable development. Rural dynamics which affect sustainable rural livelihoods are also discussed.

HGGES425 Cultural Geography

This module will expose students to various cultural issues and how they are related to culture. It looks at different cultures from developing and developed countries and how these are influencing environmental quality. A detailed analysis of cultures in Zimbabwe and their impact on environmental policy implementation will also be done.

HGGES426 Soil Geography

The main aim of this module is to enable students to embark on a scientific study of soils. This includes an examination of the fundamental properties of soils factors and processes of soil formation, properties of soil horizons, soil erosion and soil classification at global and national levels. Fieldwork and laboratory tests, experiments and exercises are an integral part of course work activities.

HGGES427 Environmental Policy and Management

This module seeks to explore key issues and concerns in the study of Environmental Policy and Management. The key component of the course is sustainable Development – a concept which seeks to reconcile socio-economic development with environmental conservation. The role of environmental policy and legislation in environmental or natural resources management is thoroughly dealt with. It also in great detail concepts related to environmental management system, EIA policy and process in Zimbabwe, auditing life cycle analysis, Greening management and Primary Environmental care. The great need to attain sustainable development at different levels is highlighted throughout the course.

HGGES428 Resource Management

The student is introduced to the typology of natural resources. Great interest is placed on soil, water, air, land and land based resources (minerals, forests, fauna) as physical assets, which require prudent utilisation to ensure sustenance. The module carefully streamlines renewable and non-renewable resources, as well as the conservation and management strategies appropriate for each category of these resources. The module ends with an analysis of techniques, strategies and approaches in natural resources management.

HGGES429 Transport Geography

The nature and scope of transport Geography will be covered. The types and modes as well as modern developments in transport will be covered. The relationship between transport and environment, transport routes and networks become important aspects. Local and international policies on transport and trade will be pursued in this modules.

HGGES430 Political Geography

The module seeks to examine the main issues in the study of political geography. The major aspects covered in this course are boundaries and frontiers, territorial component of political organisation, the population components of political organisation, electoral geography, political power, spare time dimensions in African political systems and international political organisations.

HGGES431 Rural Development Geography

The aim of the module is to provide students with concepts and theoretical background of rural development geography. The module specifically focuses on the following aspects: nature and scope of rural development geography, rural settlement systems, rural economic activities, strategies and policies for rural development, challenges to rural development and the role of aid in rural development.

HGGES432 Research Methods in Geography and Environmental Science

The aim of this module is to equip students with skills that are required in conducting research in the discipline of Geography and Environmental Studies. Some of the issues under discussion include choosing a research topic, formulating a hypothesis, research objectives and questions, writing a problem statement, conducting literature review, the methodology chapter, describing and discussing the main research findings, conclusions and making recommendations.

HGGES433 Statistical Methods in Geography and Environmental Science

Throughout this module, emphasis is on the precise and clear comprehension of statistical concepts and their application in geography and environmental science. The major issues covered in this module are sampling methods, descriptive statistics as exploratory data analysis, probability theory, hypothesis testing, inferential statistics as confirmatory data analysis, testing for differences, correlation analysis, regression analysis and an introduction to time series analysis.

HGGES434 Hydrology

Hydrology presents a unified approach to the role of hydrology in environmental planning and management, emphasizing the consideration of the hydrological continuum in determining the fate and migration of chemicals as well as micro-organisms in the environment, both below the ground as well as on it. The eco-hydrological consequences of environmental management are also discussed, and an up-to-date account of the mathematical modelling of pollution is also presented. Hydrologists and hydro geologists seek appropriate solutions to global water issues, backed by sound scientific knowledge and mathematical principles.

HGGES 435 Biogeography

Biogeography is the study of patterns of distribution of living organisms in a spatial and temporal context. This course seeks to explore the factors which are responsible for determining and limiting these distributional patterns. The module looks at where living organisms live, or used to live, or might live in the future. The module also looks at a species' physical environment, how it adapts to its particular environment and its evolutionary history. The course also seeks to explain the impact of human activities on the distributional patterns of plants and animals. Quantitative measures of vegetation and wildlife animals will also be covered.

HGGES436 Geography of Tourism and Recreation

Tourism and recreation are intricately related. Often it is difficult to draw a line between the activities of one from those of the other. The aim of this module is to provide a conceptual and theoretical framework for their study. Some of the issues examined in this module include definitions and conceptualisation of the two terms, the diverse impacts of the industry (such as economic, physical and social). Evaluating tourist resources, planning for tourism and recreation and case studies drawn from East Africa, the SADC Region and Zimbabwe. While a global perspective of the industry is provided, this course focuses on Zimbabwe and the surrounding regions.

HGGES437 Mining and the Environment

The module covers the mining process, mineral exploration and mine design, mine construction and development, development, production, mine closure and post closure management, small scale mining, mining and sustainable development. The student is also introduced to mining environmental policies and legislation. To approach the topic in some practical way, case studies are used throughout the studies.

HGGES438 Geography of Zimbabwe

The module will focus on the physical and socio-economic aspects of Zimbabwe. The physical aspects will include the factors affecting the spatial variations of climate patterns of Zimbabwe, the physiographic regions of Zimbabwe

and the potential for agriculture. The socio-economic part deals with tourism, trade and agricultural development opportunities and constraints. The module will also look at the general opportunities and constraints to socio-economic development in the country. The module also looks at the contemporary biophysical and socio-economic environmental challenges facing the country and the solutions that can be used to address some of these challenges.

HGGES439 Geography of Central and Southern Africa

The focus of this module is to introduce the student to the geographical perspectives of this region. The main aspects to be studied include, but are not limited to; the biophysical, socio-economic and geopolitical characteristics of the countries of this region. It is upon successful completion of this module that the student would be equipped with ideas, concepts, experiences and skills to critique and propose development policy alternatives for the countries in this region.

HGGES440 Environmental Health and Safety

The module examines the nature and types of exposures of people to harmful substances and dangerous machinery in their workplaces and surrounding communities. It also assesses the impacts of environmental pollution to workers and local communities. Policies and statutory instruments are evaluated. The module assesses the operations and challenges encountered by the Environmental Management Agency in Zimbabwe in ensuring environmental safety.

HGGES441 Environmental Pollution

The module dissects the concept of pollution and analyses the types of environmental pollution (water, land, air, radiation and noise). The student is introduced to various forms, sources, effects of environmental pollutants and the way they affect environmental health. In a bid to approach the problems in a practical way, case studies of pollution monitoring and control will be studied. The module ends with strategies for pollution control.

HGGES442 Geography of Sub-Saharan Africa

The student of this module is exposed to a wide array of ideas, concepts and issues covering the past, contemporary and future prospects of this rapidly changing sub-continent. It is by taking a closer and keen look at this sub-region that one would appreciate the contributions of the biophysical environment and natural resources, the history, human resources, governance and human rights, and globalisation, towards the geography of this region. Case studies and appropriate examples would be cited to clearly demonstrate events, change processes and outcomes of human endeavours to attain modern civilisations, socio-economic prosperity and sustained growth in this region.

HGGES443 Agriculture and the Environment

Agriculture is an activity essential for humankind survival. However, most agricultural activities interfere with the ecological integrity of the environment. This module shall explore the impacts of various agricultural activities on the natural environment. It shall also look at various ways of attaining sustainable agriculture, that is, agriculture that manages to produce adequate food for humanity while at the same time maintaining the ecological integrity of the environment on which it depends.

HGGES444 Spatial Analysis

The main purpose of this module is to equip students with the skills of handling and processing spatial data. The major aspects covered in the module include spatial modelling, spatial interaction models, maps and map projections, introduction to remote sensing, introduction to geographical information systems, spatial statistics and transport network analysis.

HGGES445 Natural Hazards and Disaster Management

The introduction covers the concept of natural hazards and its anthropocentrism. This will be followed by a detailed discussion of the geographical distribution of natural hazards, including earthquakes, volcanoes, landslides, tropical storms, tsunamis, floods, drought and desertification. The module ends with an exposition of how disasters affect development and man's response prior to, during and after the occurrence of a disaster.

HGGES446 Urban Geography

The module aims to understand the processes that give rise to the spatial arrangement of urban towns and cities. This will involve focusing on analysing and examining the following elements: patterns, theory and techniques. The module also examines the characteristics of cities as well as historical and contemporary processes of urban growth. It also discusses the contemporary problems of urbanisation particularly in the developing world region.

HGGES447 Medical Geography

The nature and scope of medical geography introduces the module. The other major aspects of the module include collection and analysis of medical geography data, disease diffusion models, spatial patterns of health in selected regions, health promotion (planning and strategies) with emphasis on developing countries, AIDS and HIV in terms of causes, effects, distribution and efforts to control it and the application of the epidemiological transition model.

HGGES448 Water Resources Management

Water is increasingly becoming a scarce resource across the globe due to rapidly increasing demand, environmental degradation among various other resources. The module shall examine the various threats to water availability (quality and quantity) and the impacts to society and the environment. Measures to ensure adequate water availability including legislation, watershed management, Transboundary cooperation, demand management, among others shall also be discussed.

HGGES449 Applied Geomorphology

The focus of the module is on the earth's lithospheric materials, landforms and their characteristics as well as landform history and origin. Major areas of interest being the relationship between landform formation and climate, plate tectonics, rocks and weathering. Slope form, process and evolution are covered in more detail. Fluvial processes are covered in terms of landforms with emphasis placed on arid and semi-arid regions.

HGGES450 Environmental Impact Assessment

This module deals with the Environmental Impact Assessment (EIA) policy and process as a means of encouraging environmentally responsible investment and development in an economy such as Zimbabwe. It gives the history,

rationale, principles and implementation of the EIA policy. The key elements for conducting EIA are discussed in the context of EIA policy in Zimbabwe. Issues discussed in detail also include EIA tools and techniques, screening, scoping, reporting, public participation and auditing. Throughout the module, the role of EIA in attaining sustainable development would be highlighted.

HGGES451 Regional Development Planning

Regions are one of the geographer's main analytical tools and the study of regions and the processes by which they change and develop plays a central role in geography. This module examines the concept of a region, different type of region, methods of analysing regional characteristics, the factors which affect regional development. Theories of regional development will also be discussed. The nature and scope of regional planning and the role of decentralisation in regional development.

HGGES452 Ecosystems

The interaction between the biotic and abiotic environment defines an ecosystem. The primary focus of ecosystem ecology is the exchange of energy and matter. In this course the components of an ecosystem are explored. Primary production in ecosystems is also discussed. Biogeochemical cycles are also discussed. Remote sensing indices of primary production in terrestrial ecosystems are also explored. The module also explores ecosystem responses to global environmental change.

HGGES453 Applied Geographic Information Systems

The module aims to give students hands-on understanding of GIS as tool for studying the environment and as input for a decision making process. This will include introducing students to the various software used in GIS; principles of GIS; GIS database management systems; coordinate systems; GIS Data input; global positioning systems (GPS) and global satellite navigation systems (GSNS); web GIS and open source GIS and spatial analysis. Students must by the end of the module be able to efficiently capture, store, update, manipulate, analyze, and display all forms of geographically referenced information in a GIS and also must be able to demonstrate applications of GIS to the study of environmental science.

HGGES454 Applied Remote Sensing

In Remote Sensing students will learn about various Remote sensing platforms and sensors. The electromagnetic spectrum will be studied in detail and various types of sensors identified. Image acquisition, processing and interpretation would be practically done in the GIS-RS laboratory to demonstrate the applications of RS in environmental monitoring and management.

HGGES455 Gender and Development

Mainstreaming gender into environmental management is significant because, historically, institutions and management structures perpetrate gender inequalities and inequities vis-à-vis men and women in environmental management and in accessing to strategic resources such as land yet most of women's livelihood strategies heavily depend on the natural environment. This module seeks to discuss the historical trends in mainstreaming gender issues into environmental management.

HGGES456 Rangeland Management

A rangeland describes land for which the major use is grazing by wild animals and livestock. The module explores ways in which range managers can balance grazing with the re-vegetative capacity of the rangeland. The concept of carrying capacity and the indicators of rangeland degradation shall also be covered. Rangeland resource inventory and monitoring shall also be discussed.

HGGES457 Climate Change

The module is focused around the science of climate change. Is the climate changing? What evidence suggest climate change? If it is changing, what is ahead? What role does living things play? Which policy responses are sustainable? It is by critically reviewing on such questions that students understand the concept of climate change. Students assess the scientific evidence of climate change and its impacts on natural resources and human livelihoods. Communities adaptations, mitigation and policy responses in different regions are examined.

HGGES459 Industrial Geography

Industrial productions impact on the environment in varied adverse ways, such that if not carefully planned, the benefits might be overshadowed. Environmental Management System – ISO 14001 and cleaner production techniques have central role to play in ensuring sustainability of industrial activities. Students of this module shall acquire knowledge and skills to be professional environmental managers in industry.

HGGES460 Energy and the Environment

Global energy use has increased greatly starting from the mid-1950s. Today's economies are powered largely by fossil fuels however, these fuels are contributing to the destruction of the stratospheric ozone layer leading to climate change and environmental degradation. There is thus, need to find renewable energy alternatives so that the world achieves sustainable energy use.

HGGES461 Geographic Information Systems and Remote Sensing

The module aims to give students hands-on understanding of GIS as tool for studying the environment and as input for a decision making process. This will include introducing students to the various software used in GIS; principles of GIS; GIS database management systems; coordinate systems; GIS Data input; global positioning systems (GPS) and global satellite navigation systems (GSNS); web GIS and open source GIS and spatial analysis. Students must by the end of the module be able to efficiently capture, store, update, manipulate, analyze, and display all forms of geographically referenced information in a GIS and also must be able to demonstrate applications of GIS to the study of environmental science. It also gives the students a practical understanding of the remote sensing system and its principles. This includes an understanding of the principles of remote sensing; digital image acquisition, image visualisation and interpretation; image enhancement and image classification. Students at the end must be able to apply remote sensing in practical environmental problems and be able to source remote sensing data.

HGGES470 Research Project

Research is one of the major components of undergraduate studies. An undergraduate research project should show originality, rigour and clarity of issues. It is critical that the research problem must be well defined and developed because without a theoretical grounding of the research the whole process would be flawed. Therefore, students are

expected to show a high level of understanding of the theoretical body of knowledge upon which they develop their research topics. A research project must not be confused with showing how one is well versed with the literature about the area under study but it gives the researcher the opportunity to communicate new ideas in a scientific way.

BACHELOR OF SCIENCE HONOURS DEGREE IN PHYSICS

HPH101 Mechanics

An introduction to classical mechanics, space and time, straight line kinematics, motion in a plane; forces and equilibrium particle dynamics, collisions and conservation laws, work and potential energy; inertia forces and non-inertia frames; central focus motions; rigid bodies and rotational dynamics.

HPH103 Thermodynamics

Heat energy conduction, convection, radiation, Zeroth Law of thermodynamics and temperature definition: the first law–work, heat internal energy. Carnot cycles and the second law; entropy and irreversibility. Thermodynamic potential. Quantitative discussion of phase transitions. Elementary kinetic theory of gases; Boltzman counting, Maxwell-Boltzman law of distribution of velocities. Simple applications.

HPH104 Waves and Optics

The harmonic oscillator. Aquatic waves, waves on a string. Superposition, energy in wave motion; progressive and standing waves; longitudinal and transverse waves; group and phase velocity. Doppler effect. Physical Optics; interference, diffraction, thin films, crystal diffraction, holography, dispersion and scattering. Geometrical optics; waves and rays; reflection and refraction at a spherical surface; thin lenses, optical lenses, mirror and prisms. Ultrasound.

HPH105 Modern Physics

This module covers special and general relativity, the quantum description of light and matter, and quantum and statistical mechanics. Also covered are topics on atoms, molecules, solids, and nuclear and particle physics, and a concluding online section on modern cosmology.

HPH106 Electrical Circuits

The module covers the following topics: Voltage, current, power. Resistance and Ohm's Law. DC, AC and RMS values; Series and parallel circuits. The potential divider. Networks and Kirchhoff laws. Mesh currents, node voltages, superposition. Thevenin and Norton's Theorem; Thevenin and Norton theorems and AC circuit theory.

HPH201 Solid State Physics I

Crystal structure, crystal binding and elastic properties. Lattice vibrations and thermal properties. Free electron theory. Energy band structures in metals, semiconductors and insulators. Superconductors and insulators. Superconductivity.

HPH202 Electromagnetism

This module introduces the fundamental concepts and principles of electrostatics, magnetostatics, electromagnetism and Maxwell's equations, and electromagnetic waves. It also covers differential vector analysis in the context of electromagnetism. It will enable students to formulate Maxwell's equations in the presence of dielectric and magnetic materials; to apply Maxwell's equations to simple problems involving dielectric and magnetic materials.

HPH204 Quantum Mechanics

The formulation of quantum mechanics in terms of state vectors and near operators. Three dimensional spherically symmetric potentials. The theory of angular momentum and spin. Identical particles and the exclusion principles. Methods of approximation. Multielectron atoms.

HPH205 Analogue Electronics

Basic electronic concepts. Simple electronic circuits. Transistor applications. Charging circuits, regulation, transformers. Wave form generators and oscillators. Inverters and rectifiers.

HPH206 Nuclear Physics

Liquid drop model, shell model, collective model. Alpha decay, nuclear reactions, Neutron physics, Fission and fusion. Thermonuclear reactions, Accelerators, Nuclear energy sources, Elementary particles and their classification.

HPH208 Atomic Physics and Relativity

This module covers the basic principles of atomic physics. Atomic structure, energy levels and nuclear reactions and radioactivity shall be dealt with. Energy calculations from nuclear fission and fusion reactions shall be considered. Basic reactor design consideration will be included. Inertial frames, space-time geometry, Lorentz transformations, space-time diagrams, length contraction and time dilation, Minkowski line element, particle world lines and proper time, Doppler effect, addition of velocities, acceleration and event horizons in special relativity.

HPH209 Atmospheric Physics

Introduction to the structure of the atmosphere, different layers of the atmosphere and their characteristics. Composition of the atmosphere. The atmosphere as a thermodynamic system. Basic principles of weather forecasting.

HPH210 Digital Electronics

The module introduces the basics, theories and common practical applications of Digital Electronics under the following topics: Comparison between analogue & digital signals; Logic states and gates and truth tables; Boolean Algebra and De Morgan's Theorems; Logic minimization and Karnaugh maps; Combinational logic and Applications; Sequential Logic and Applications; Introduction to Digital Signal Processing.

HPH401 Solid State Physics II

Dielectric properties. Magnetism, dia-para, ferro and antiferro-magnetism. Imperfections in solids (general idea).

HPH402 Quantum Mechanics II

Time-dependent and time-independent perturbation theory. Scattering theory, elastic potential scattering. Green's function and partial wave methods. Selected phenomena from each of atomic physics, molecular physics, solid state physics and nuclear physics are described and interpreted using quantum mechanical models.

HPH403 Particle Physics

Overview of particle physics; Relativistic Quantum Mechanics –Antimatter; Quantum Electrodynamics; Particle Accelerators & Detectors; Symmetries in Particle Physics; The weak interaction; The Standard Model; Symmetry Violation and Neutrinos.

HPH404 Electromagnetic Theory

This module covers the basic principles of electromagnetism: experimental basis, electrostatics, magnetic fields of steady currents, motional e.m.f. and electromagnetic induction, Maxwell's equations, propagation and radiation of electromagnetic waves, electric and magnetic properties of matter, and conservation laws.

HPH405 Instrumentation Physics

Introduction to measurement systems; Static characteristics of measurements, error calculations and compensation; noise and interference in measurement circuits. Students shall acquire knowledge on transducers, signal conditioners, and types of measurements.

HPH406 Statistical Mechanics

The module covers the following topics: Microscopic dynamics of a physical system; Micro canonical Ensemble and the Entropy; Canonical Ensemble and the Free Energy; Grand Canonical Ensemble (Open systems); Partition function; Phase Transitions and their classifications. Maxwell-Boltzmann Statistics; Real Gases; Lattice Gas and Ising Model; Fermi-Dirac statistics and Bose-Einstein statistics

HPH408 Material Science

Atomic and molecular structure, crystals, metallic states, defects in crystals, conductors, semi-conductors and insulator. Alloy theory – application to industrial alloys-steel in particular. Engineering properties – their control. Hot and cold working, heat treatment, etc. Creep fatigue and fracture, Corrosion and corrosion control. Non-metallic materials – glass, rubber, concrete, plastics, wood and ceramics. Elastic and plastic deformation. Effects in metals.

HPH402 Quantum Mechanics II

Time-dependent and time-independent perturbation theory. Scattering theory, elastic potential scattering. Green's function and partial wave methods. Selected phenomena from each of atomic physics, molecular physics, solid state physics and nuclear physics are described and interpreted using quantum mechanical models.

HPH414 Geophysics

This module provides an introduction to geophysics and a context for various geophysical field techniques such as electromagnetics, gravity, DC resistivity and induced polarization, magnetics, and ground penetrating radar surveys. The module will first introduce students to traditional physics topics fundamental to an understanding of geophysics as applied to earth systems. These topics include force, electricity, heat, magnetism, electromagnetism, and thermodynamics. Students will develop competencies using basic geophysical equations to address real-life geoscience problems and predicting the geophysical response to different rock types and structures. An emphasis

will be placed on operating geophysical equipment and analysing data collected using a wide array of geophysical techniques.

HPH412Energy Physics

This module covers energy resources and the production, transmission, inter-conversion, consumption and waste of energy in the industrial society. Emphasis is placed on environmental impact and human safety. Topics include fossil fuels, nuclear fission and fusion, wind and solar power, the hydrogen economy, and conservation strategies.

HPH410Applied Thermodynamics

This module covers topics that include: simulating heat and energy flow and Applications of thermodynamics in heat engines and thermodynamic cycles. The key elements of room heat transfer processes are examined. Building thermal performance shall also be included with a focus on the relationship between building design parameters - such as fabric thermal mass - and the building's response, in terms of internal conditions and energy consumption.

UNIVERSITY OF CHOICE



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