

SCHOOL OF AGRICULTURE COURSE HANDBOOK

Head of School

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Senior Lecturers

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Lecturers

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Technical Team

Chief Technical Officer

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Scientific Officer

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Manager-Unitech Soil Analytic Laboratory.

Principal Technical Officer

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Senior Technical Officers

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Secretary

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Ms Joan Wokolon, BSc.Ag.

Janitor

Mr Aron Samson
Ms Ellis Komba

Undergraduate Degree Programs

The School of Agriculture offers a four-year course, which leads to the Degree of Bachelor of Science in Agriculture (B.Sc.Agric). The program is designed to prepare the students for a wide variety of agricultural and agriculturally related occupations in PNG and abroad. These include teaching, research, advisory and technical positions both in government and private industry as

well as in numerous other areas for which the offered courses in agriculture and related sciences are deemed essential. The school also offers a two-years course which leads to the Bachelor's Degree in Agriculture and Rural Development (BARD). This program is designed to give opportunity to the working or experienced agriculturalist have attained a Diploma or Post Certificate Diploma (PCD) in Agriculture to upgrade qualification to degree level. The first year of the B.Sc.Agric program is designed to form a common foundation upon which years 2, 3 and 4 of the separate professional options are based.

Entry requirements for undergraduate B.Sc.Agric & BARD programs:

B.Sc.Agric

- i) Grade 12 School Leavers: STAT-P Test Score, with a minimum 'B' in Maths B or 'C' in Maths A, 'B' in Biology, L&L or Applied English, 'C' in either Chemistry or Physics.
- ii) All non-school leavers entering into the B.Sc.Agric program should have Grade 12 (PNG Higher School Certificate) or equivalent level with a minimum 'B' in Maths B or 'C' in Maths A, 'B' in Biology, L&L or Applied English, 'C' in either Chemistry or Physics. Entry exams is compulsory.

BARD

Professionals or graduates having a Diploma or PCD in Agriculture with 2-5 or more work experience either in public and private agriculture sectors or any related field.

Post graduate Degree Programs

The School also offers postgraduate degrees in Masters of Science (MSc), Master of Philosophy (MPhil) and Doctor of Philosophy (PhD). The MSc programs comprises both coursework and research. The MPhil and PhD programs are research-based.

Entry requirements for post graduate:

- a) **Master of Philosophy & Masters of Science:** A merit degree or postgraduate diploma from a tertiary institution approved by the Postgraduate Studies, Research and Innovation Committee (PSR&IC), or a Bachelor degree of Honours standard (GPA 3.7 out of 5) from a tertiary institution approved by the PSR&IC. Relevant first degree with an industry experience of more than two years.
- b) **Doctor of Philosophy:** Must have a Master degree in a field of study related to the subject of the proposed research. Proven track record of research and more than 2 years' work experience.

COURSE STRUCTURE

BACHELOR OF SCIENCE IN AGRICULTURE

First Year	First Semester		
Code	Subject	Contact Hours	Credit
AG 111	Biochemistry	6	21
AG 112	Introduction to Agriculture Economics	6	20
AG 113	Professional Practice & Communication in Agriculture	6	20
AG 114	Physiology & Anatomy of Animals	6	21
First Year	Second Semester		
AG 121	Rural Sociology & Community Development	6	20
AG 122	Introduction to Soils	6	20
AG 123	Plant Physiology	6	18
AG 124	Agriculture Experimentation	6	20
Second Year	First Semester		
Code	Subject	Contact Hours	Credit
AG 211	Agronomy I	6	18
AG 212	Agriculture Mechanization	6	18
AG 213	Soil Fertility Management	6	18
AG 214	Agriculture Entomology	6	18
Second Year	Second Semester		
AG 221	Weed Science	6	18
AG 222	Agribusiness Management & Entrepreneurship	6	22
AG 223	Animal Nutrition	6	18
AG 224	Agronomy II	6	18
Third Year	First Semester		
Code	Subject	Contact Hours	Credit
AG 311	Animal Management I	6	16
AG 312	Research Method I	6	18
AG 313	Animal Health & Disease	6	16
AG 314	Crop Disease I	6	16
Third Year	Second Semester		
AG 321	Animal Management II	6	16
AG 322	Research Methods II	6	16
AG 323	Crop Disease II	6	16
AG 324	Horticultural Science	6	16

Fourth Year First Semester			
Code	Subject	Contact Hours	Credit
AG 411	Environment & Sustainable Agriculture	6	16
AG 412	Animal Breeding	6	16
AG 413	Field Engineering	6	13
AG 414	Agriculture Extension	6	16
Fourth Year Second Semester			
AG 421	Plant Breeding	6	16
AG 422	Agriculture Biotechnology	6	16
AG 423	Postharvest Technology	6	16
AG 424	Farm Management Economics	6	18
AG 425	Professional Work Experience	Not Applicable	0

Graduate Statement

The graduate will be equipped with scientific knowledge and skills in the broad area of agriculture to solve critical problems of stakeholders ethically, sustainably and efficiently. They would be aptly trained to be innovative, entrepreneurial and effective communicators.

Course Learning Outcomes (CLO)

CLO1	Possess in-depth knowledge and skills related to a range of concepts and principles that underpin agricultural production
CLO2	Apply scientific knowledge, skills and innovations to sustain and improve the crop/animal production
CLO3	Illustrate an understanding of the socio-economic and environmental benefits and values of natural resources in agriculture
CLO4	Evaluate and interpret policies of stake holders that support agricultural production at local, national and global levels
CLO5	Demonstrate and apply entrepreneurial skills and knowledge in agricultural projects
CLO6	Communicate agricultural information by conventional and digital dissemination methods
CLO7	Holistically assess profitability, sustainability and impact on the environment, health and society using new and established technologies in agriculture
CLO8	Engage in life-long, collaborative learning and research and integrate socio-cultural contexts and ethics in agriculture

Student Workload

The total workload for the subject for the 'average' student is a nominal 150 hours, based on a 15-week semester with 13 weeks of teaching as per the PNG National Qualification Framework.

Relevant Unitech Policies

It is important that all students familiarize themselves with the University of Technology Assessment Guidelines www.unitech.ac.pg/AssessmentGuide/ including those on plagiarism www.unitech.ac.pg/Plagiarism/

SUBJECT DETAILS:

AG111 BIOCHEMISTRY

Course(s)	Agriculture (NQF Level 7)
Subject Name	Biochemistry
Subject Code	AG111
Duration	13 teaching weeks
Contact hours	6 hours per week
Credit Points	21
Delivery Mode	On campus
Prerequisites	Nil
Co-requisites	Nil
Subject Coordinator	TBA

Synopsis

The subject provides students with an overarching introduction to the relationship between organisms and the chemical processes of life. The subject gives an outline of basic chemistry principles relevant to the macromolecular interactions and structure/functions of major macromolecules, metabolic and, bioenergetics pathways within cell and some practical experience in biochemical techniques. This subject will provide necessary foundation for further studies on cell biology, cytogenetics and biotechnology-related subjects.

Subject Topics

1. Fundamental principles of biochemistry including structure and roles of macromolecules.
2. Cell biology including cell cycle and cell division.
3. Enzyme catalysis and factors affecting the activity of enzymes.
4. Brief description of photosynthesis, respiration process and electron transport chain.
5. Protein synthesis, structure and chemical basis of heredity.
6. Principles and methodology involved in the common biochemical techniques.

Subject Outline

Topic	Content
1. Fundamental principles of biochemistry including structure and roles of macromolecules	Chemistry of water, significance of pH, acids, bases, salts, ions, buffer solutions and redox reactions in the biological systems- interactions between macromolecules; bonding, hydrogen bond, interactions and van der Waals interactions. Chemistry, importance and metabolism of important macromolecules- carbohydrates, lipids, vitamins, amino acids, nucleic acids and proteins. Definition of vitamins, role of vitamins as co-enzymes, classification of vitamins, dietary recommended intakes (DRI) and vitamin toxicity.

<p>2. Cell biology including cell cycle and cell division.</p>	<p>Structure of plant and animal cells, cell organelles and their functions. Comparison of prokaryotic and eukaryotic cells, cell cycle and cell division. Membrane structure and properties such as fluidity and asymmetry, diffusion vs. passive transport via pores and channels, active transport, G protein.</p>
<p>3. Enzyme catalysis and factors affecting the activity of enzymes.</p>	<p>Introduction to enzymes-nature of enzymes, classification of enzymes, enzyme catalysis process, active sites and mode of catalysis. Enzyme kinetics, mechanisms and enzyme regulation Factors affecting enzyme activity</p>
<p>4. Brief description of photosynthesis, respiration process and electron transport chain.</p>	<p>Introduction to light and dark reactions of photosynthesis, steps involved in anabolism and catabolism, energetics and energy generation. glycogen synthesis and breakdown. Hormones, fatty acid degradation, beta-oxidation pathway. Glycolysis in the cytosol, ATP and NADP production, glucose conversion to pyruvate, Energy investment and yielding, Glycolysis pathway and citric acid cycle link, acetyl-coenzyme A, dehydrogenase complex, glyoxylate cycle. Brief introduction to bioinformatics-scope and utility, sequence homology search, data basing and bioinformatics tools, sequence similarity search, sequence alignment and sequence patterns, structure comparisons and homology modelling.</p>
<p>5. Protein synthesis, structure and chemical basis of heredity.</p>	<p>From genes to proteins- introduction to genes, genetic code, RNA and DNA, replication, transcription, protein synthesis/ translation, tRNA, mRNA, codon and anticodon Mutation and gene duplication. Types and Structure of amino acids, DNA structure, sugar phosphate backbone, double helix, charged groups outwards, hydrophobic base inwards, difference between RNA and DNA. Nucleases, restriction enzymes and catalytic enzymes, glycosylation of proteins.</p>
<p>6. Principles and methodology involved in the common biochemical techniques.</p>	<p>Principles and applications of common biochemical techniques such as electrophoresis, dialysis and ammonium sulphate precipitation, chromatography, ion exchange chromatography, gel filtration chromatography, centrifugation and spectroscopic methods.</p>

Subject Learning Outcomes (SLOs)

On completion of this subject students will be able to:

1. Describe cell structure, cell division and cell chemistry;
2. Identify the structure of the major macromolecules and to narrate their role in the cellular metabolism;
3. Narrate the pathways and cycles involved in the cellular metabolism of the nutrient macromolecules;
4. Classify enzymes and explain roles of enzymes in cellular processes;
5. Describe photosynthetic process and relate respiration to photosynthesis;
6. Perform basic biochemical techniques

Assessment Tasks and Weightings

Students must attain at least 50% overall in the subject. There will be a final written examination weighing 50% and 50% formative assessment.

Formative assessments

Tests: There will be 2 tests each weighing 15%

AT 1: Test 1 in the first half of the semester

AT2: Test 2 in the second half of the semester

Lab reports: A group work-done report/s for practical sessions weighs 20%. There will be 4 lab reports each worth 5%. Students should submit individual reports.

AT3: Practical 1. Qualitative testing of carbohydrates

AT4: Practical 2. Biological cells - Bacteria a prokaryotic organism

AT5: Practical 3. Qualitative testing of proteins and amino acids

AT6: Practical 4. Determination of concentration and purity of DNA sample by spectroscopy

Final written examination: A 2 ½ hour written examination weighs 50%

Assessment Rubrics: Lab Reports

All lab reports should be word-processed and electronic copies submitted through google classroom. Individual reports will be assessed.

Laboratory Report Contents	1 Beginning or incomplete	2 Developing	3 Accomplished	4 Exemplary	Score
Introduction	Very little background information provided or information is incorrect	Some introductory information, but still missing some major points	Introduction is nearly complete, missing some minor points	Introduction complete and well-written; provides all necessary background principles for the experiment	
Procedure	Missing several important experimental details or not written in paragraph format	Written in paragraph format, still missing some important experimental details	Written in paragraph format, important experimental details are covered, some minor details missing	Well-written in paragraph format, all experimental details are covered	
Results/ Observations Data, figures, graphs, tables, etc.	Figures, graphs, tables contain errors or are poorly constructed, have missing titles, captions or numbers, units missing or incorrect, etc.	Most figures, graphs, tables OK, some still missing some important or required features	All figures, graphs, tables are correctly drawn, but some have minor problems or could still be improved	All figures, graphs, tables are correctly drawn, are numbered and contain titles/captions.	
Interpretation/ Conclusions	Conclusions missing or missing the important points	Conclusions regarding major points are drawn, but many are misstated, indicating a lack of understanding	All important conclusions have been drawn, could be better stated	All important conclusions have been clearly made, student shows good understanding	
Spelling, grammar, sentence structure	Frequent grammar and/or spelling errors, writing style is rough and immature	Occasional grammar/spelling errors, generally readable with some rough spots in writing style	Less than 3 grammar/spelling errors, mature, readable style	All grammar/spelling correct and very well-written	

Appearance and formatting	Sections out of order, too much handwritten copy, sloppy formatting	Sections in order, contains the minimum allowable amount of handwritten copy, formatting is rough but readable	All sections in order, formatting generally good but could still be improved	All sections in order, well-formatted, very readable	
TOTAL					
Comments for improvements					

Subject Textbook

Nelson, D.L. and Cox, M.M. 2017. Lehninger Principles of Biochemistry, 7th Edn., W.H. Freeman and Company, New York, USA.

References

Alberts, B., Bray, D., Hopkin, K., Johnson A.D., Lewis, J., Raff, M., Roberts, K. and Walter, P. 2014. Essential Cell Biology, 4th Edn. Garland Science, Taylor and Francis Group, LLC, New York, USA.

Berg, J.M., Tymoczko, J.L., Gatto, G.J. Jr. and Stryer, L. 2015. Biochemistry (8th Edn.), Palgrave Macmillan, UK.

Chesworth, J.M., Stuckbury, T. and Scaife, J.R. 1998. An Introduction to Agricultural Biochemistry. Chapman and Hall, London, UK.

Heldt, H.W. and Piechulla, B. 2011. Plant Biochemistry, 4th Edn. Academic Press (Elsevier) The Netherlands.

Niugini Agrisaiens Journal, Available at: www.unitech.ac.pg/node/756

Subject Textbook

Nelson, D.L. and Cox, M.M. 2017. Lehninger Principles of Biochemistry, 7th Edn., W.H. Freeman and Company, New York, USA.

References

Alberts, B., Bray, D., Hopkin, K., Johnson A.D., Lewis, J., Raff, M., Roberts, K. and Walter, P. 2014. Essential Cell Biology, 4th Edn. Garland Science, Taylor and Francis Group, LLC, New York, USA.

Berg, J.M., Tymoczko, J.L., Gatto, G.J. Jr. and Stryer, L. 2015. Biochemistry (8th Edn.), Palgrave Macmillan, UK.

Chesworth, J.M., Stuckbury, T. and Scaife, J.R. 1998. An Introduction to Agricultural Biochemistry. Chapman and Hall, London, UK.

Heldt, H.W. and Piechulla, B. 2011. Plant Biochemistry, 4th Edn. Academic Press (Elsevier) The Netherlands.

Niugini Agrisaiens Journal, Available at: www.unitech.ac.pg/node/756

Readings

Lecture notes and power point outlines will be uploaded to the google classroom.

AG112 INTRODUCTION TO AGRICULTURAL ECONOMICS

Course(s)	Agriculture (NQF Level 7)
Subject Name	Introduction to Agricultural Economics
Subject Code	AG112
Duration	13 teaching weeks
Contact hours	6 hours per week
Credit Points	20
Delivery Mode	On campus
Prerequisites	Nil
Co-requisites	Nil
Subject Coordinator	TBA

Synopsis

The subject introduces the students to the basic principles of economics and provides a distinction between the working dimensions of microeconomic and macroeconomic theory. In microeconomics, the subject provides an outline of basic theories of household demand and supply, supplier behaviour in production and consumption behaviour of consumers while in macroeconomics, the subject gives an outline of the circular flow of income, national income accounting, savings, investment and consumption, IS-LM framework, aggregate demand and supply, money and banking, inflation, employment and unemployment, international trade, balance of payments, exchange rate system, trade policies, economic growth and development.

Subject Topics

1. Basic principles of microeconomics
2. Theories of supply, consumer and markets
3. Macroeconomics and macro- variables in relation to macroeconomic policy
4. National income and economy

5. Fiscal policy and balance of payments
6. Banking system and money

Subject Outline

Topic	Content
Basic principles of microeconomics	Nature of economics, economic systems and how markets work, nature of economic theory and economic modelling; demand, supply, elasticities of supply and demand, and factors that influence demand and supply, market price determination, market efficiency and market failure and government intervention
Theories of supply and consumer and markets	Supply theory: production, costs of production and profit maximization and consumer theory: cardinal and ordinal approaches and consumer choice; and forms of markets: structure, conduct and performances of these markets
Macroeconomics and macro-variables in relation to macroeconomic policy	Key macro variables: employment and unemployment, total national product, the general price level, the interest rate, balance of payments and exchange rates and, goals of macroeconomic policy
National income and economy	Circular flow of income, national income accounting, the consumption function and factors that influence equilibrium national income of a two sector economy
Fiscal policy and balance of payments	Government and the circular flow on income, income fluctuations and fiscal policy, balance of payments and national income
Banking system and money	Money, price levels, banks and the supply of money; Exchange rate system, trade policies, economic growth and development

Subject Learning Outcomes (SLOs)

On completion of this subject students will be able to:

1. Explain the fundamental economic problem in society, choice, opportunity cost and economic growth;
2. Determine market price and the factors that influence market demand and supply;
3. Calculate the elasticity of demand and supply, optimum levels of input to use and output to produce, and the optimum consumer choice;
4. Describe the circular flow of income, national income accounting methods and be able to calculate the equilibrium interest rate, consumption level, national income and investment level in open and closed economies;
5. Estimate the level of government expenditure or taxation that are needed to increase the level of national income, and
6. Calculate the balance of payment deficit in PNG and identify appropriate strategies that are needed to recover deficits.

Assessment Tasks and Weightings

Students must attain at least 50% overall in the subject. There will be a final written examination weighing 50% and 50% formative assessment.

Formative assessments

Tests: There will be 2 tests (AT1 and AT2) each weighing 15%

Quizzes: There will be 2 quizzes (AT3 and AT4) each weighing 5%

Assignment: There will be an assignment (AT5) weighing 10%

Lab report: Nil

Final written examination: A 2 ½ hour written examination (AT6) weighs 50%

Assessment Rubrics

Assignments

Marks	Marking Criteria
9-10	The assignment is engaging, concise and polished. It has an introduction, a body and conclusion. The topic is discussed very well with a thoroughly. Excellent use of relevant literature is noticeable in the assignment. Factual details, visual elements and proper use of scientific terminology adds clarity and interest to the assignment. The assignment is well formatted and contains no spelling and grammatical errors.
7-8	The assignment is well written. It has an introduction, a body and conclusion. The topic is discussed fairly with an acceptable level of depth. Adequate and relevant literature citations are noticeable in the assignment. Factual details, visual elements and proper use of scientific terminology adds clarity and interest to the assignment. Sometimes the writing is slightly repetitive or unclear, but the writer does demonstrate a good understanding of the subject matter.
4-6	The assignment is fairly well written and clear, but several errors indicate that the author may not have a complete understanding of the subject. Factual details, visual elements and the proper use of scientific terminology are used reasonably well.
1-3	The assignment has several significant problems in style and content. The topic is never clearly stated, scientific terms are misused, and misspelled words are present. Inadequate or incorrect use of factual details, visual elements seem to indicate that the author does not have a solid understanding of the subject.
0	No work was completed.
Total Marks	
Comments for improvements	

Subject Textbook

Lipsey, R.G. and Harbury, C. 1992. First Principles of Economics (2nd Edn.). Oxford University Press, UK.

References

Mankiw, N.G. 2018. Principles of microeconomics (8th Edn.). Cengage Learning, Boston, USA.

Mankiw, N.G. 2018. Principles of macroeconomics (8th Edn.). Cengage Learning, Boston, USA.

Niugini Agrisaiens Journal, Available at: www.unitech.ac.pg/node/756

Readings

Lecture notes and power point outlines will be uploaded to the google classroom.

AG113 PROFESSIONAL PRACTICE AND COMMUNICATION IN AGRICULTURE

Course(s)	Agriculture (NQF Level 7)
Subject Name	Professional Practice and Communication in Agriculture
Subject Code	AG113
Duration	13 teaching weeks
Contact hours	6 hours per week
Credit Points	20
Delivery Mode	On campus
Prerequisites	Nil
Co-requisites	Nil
Subject Coordinator	TBA

Synopsis

This course introduces the various communication options available in a business context so that students can make appropriate choices in the workplace. This will develop key skills required for professional practice in Agriculture e.g. communication skills of both written and oral, facilitating meetings, networking, customer relations, presentation skills and dealing with the media. The course also introduces professionalism and ethical behavior in the workplace that can benefit the students' career and improve their working environment. It will also focus on leadership and management skills and will include the setting of personal goals for career progression and identifying relevant career opportunities.

In this course students will further explore the health and safety issues of various types of work in context of agriculture including the enforcement of laws regulating occupational safety and health and role of workers, unions and the employers. This includes minimum wages for agricultural labour.

Subject Topics

1. Introducing work place communication skills of both written and oral.
2. Professionalism and ethical behaviour in workplace.
3. Leadership and management skills and its application.

4. Personal and professional development.
5. Introduction to occupational health and safety in context of agriculture.
6. Agriculture policies, labour laws, and role of workers' unions and employers.

Topic	Content
1. Introducing workplace communication skills of both written and oral.	Characteristics of communication according to various types of workplaces. Organisational structure: power, leadership and language. Format, content, purpose and style of various genres of written and spoken communication in the workplace: forms, memos, official letters, reports, minutes, advertisements, announcements/dealing with media, interviews, telephone conversations, meetings, oral addresses /presentations, facilitating meetings, and networking.
2. Professionalism and ethical behaviour in workplace	Define ethics and perspective of ethics at workplace, fundamental theories, principles and rules of workplace and professionalism. Ethical standards and codes and their relationship to the conduct of a professional. Personal effectiveness, promoting creatively in the workplace.
3. Leadership and management skills and its application	Introduction to leadership and working in team; leadership and management, leadership style, motivation and needs theory.
4. Personal and professional development	Setting of personal goals for career progression; identify and display appropriate attitudes, behaviors and values for their own situation. Interpersonal skills. Accountability, responsibility and authority. Human resource planning, career planning.
5. Introduction to occupational health and safety in context of agriculture	Personal health and safety; reaction to accidents, safety wear and protective equipment, stress and safety. Accident and their effect on industry/organization. Workplace hazards. Theories of accident, workers compensation.

6. Agriculture policies, labour laws, and role of workers unions and employers	PNG agriculture MTDP and policy and its importance. PNG Labour rights and law. Workers union and their role. Employers' responsibility to employees.
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Subject Learning Outcomes (SLOs)

On completion of this subject students will be able to:

1. Demonstrate effective professional communication through writing, designing, presentation and speaking in a variety of professional genres;
2. Conceptualise the general conduct of workplace professionalism and theories, principle, ethics, and practices of agricultural workplace and organizations;
3. Outline management and leadership styles and importance of team dynamics;
4. Identify personal and professional characteristics associated with job success;
5. Discuss the role of health and safety in the workplace pertaining to the responsibility of workers, supervisors, researchers, and managers.
6. Interpret the national agricultural policies, employment laws, and role of workers union and employers.

Assessment Tasks and Weightings

Students must attain at least 50% overall in the subject. There will be a final written examination weighing 50% and 50% formative assessment.

Formative assessments

Assignment: There will be two assignments (AA1, AA2) each weighing 10%

AT1: Assignment 1 – Assignment on communication at workplace

AT2: Assignment 2 – PNG agricultural policies, application and its impact to PNG economy

Tests: There will be 2 tests (AT1, AT2) each weighing 15%

AT3: Test 1 – Test covering topic 1, 2, and 3

AT4: Test 2 – Test covering topic 4, 5, and 6

Final written examination: A 2 ½ hour written examination weighs 50%

Subject Textbooks

Gutierrez, A. 2014. *Effective Communication in the Workplace: Learn How to Communicate Effectively and Avoid Common Barriers to Effective Communication*, Bookspace Publishing, UK.

Kehatsin, J. 2001. *Communication in the Workplace, A Guide for Papuan New Guineans*, PNG University of Technology, School of Language and Communication Studies, Lae. Papua New Guinea.

References

Alli, O.B. 2008. Fundamental Principles of Occupational Health and Safety (2nd Edn.). ILO publications, Geneva, Switzerland.

DAL 2007. Ministry of Agriculture and Livestock, National Agriculture Development Plan 2007-2016, Policies and Strategies, Vol 1, Department of Agriculture & Livestock, Port Moresby, Papua New Guinea

Niugini Agrisaiens Journal, Available at: www.unitech.ac.pg/node/756

Northouse, G. 2007. Leadership Theory and Practice (3rd Edn.). Thousand Oak: Sage Publications, USA.

Searles, J.G. 2017. Workplace Communications: The Basics (7th Edn.). Pearson, New York, USA.

Readings

Power point notes, lecture handouts

Communication at the Workplace:

www.intranet.ecu.edu.au/_data/assets/pdf_file/0019/501634/Communication-practices-for-managers-Jan15.pdf

Understanding leadership and Management Styles:

www.managers.org.uk/~media/Files/PDF/Checklists/CHK-256-Understanding-management-and-leadership-styles.pdf

AG114 ANATOMY AND PHYSIOLOGY OF FARM ANIMALS

Programs	Agriculture (NQF Level 7)
Subject Name	Anatomy and Physiology of Farm Animals
Subject Code	AG114
Duration	13 teaching weeks
Credit Points	21
Delivery Mode	On campus
Prerequisites	Nil
Co-requisites	Nil
Subject Coordinator	TBA

Synopsis

The subject deals with structure and gross anatomy of different farm animals including Poultry. The functions of different systems are dealt with. Special emphasis is given to digestive, endocrine and reproductive, growth and lactation physiology. Students will be made aware of recent

developments in reproductive physiology. Avian physiology will also be discussed. A number of lab exercises are included for proper understanding of the subject.

Subject Topics

1. Tissues and their classification
2. Musculoskeletal system
3. Gross Anatomy and physiology of different systems
4. Endocrinology, Reproduction and parturition
5. Growth, lactation and reproductive management
6. Avian physiology

Subject Outline

Topic	Content
Tissues and their classification	Microscopic structure of different tissues, (epithelial tissue, connective tissue, their role and modifications-glands) their classification and identification.
Musculoskeletal system	Skeletal system of farm animals, structure of bones and muscles. Classification of muscles, and their physiology.
Gross Anatomy and physiology of different systems.	Gross and microscopic structure of organs of different systems and their physiology. Experiments to demonstrate the few of the functions of systems.
Endocrinology, Reproduction and parturition	Classification of hormones and their function. Structure and physiology of reproductive organs, female reproductive cycle, pregnancy, parturition. Experiments to demonstrate few functions of systems.
Growth and Lactation and reproductive management.	Physiology of growth, milk production. Artificial insemination, synchronization, super ovulation, embryo transfer, cloning, etc.
Avian physiology.	Comparative study with emphasis on reproduction, respiration and excretory systems.

Subject Learning Outcomes

On completion of this subject the student will be able to:

1. Identify different organs from different farm animals;
2. Differentiate the physiological process of digestion, reproduction, nervous and other systems in different farm animals;
3. Design and perform simple tests for the functions of digestive and endocrine systems;
4. Outline the methods of reproductive management of farm animals;
5. Evaluate the quality of semen.

Assessment Tasks and Weightings

Students must attain at least 50% overall in the subject. There will be a final written examination weighing 50% and 50% formative assessment.

Formative assessments

AT. 1. Tests: There will be 2 tests each weighing 10%

AT. 2. Assignment: An assignment topic weighing 10% (TBA).

AT. 3. Lab report: A work-done report/s for practical sessions weighs 20%

AT. 4. Final Written examination: A 2 ½ hour written examination weighs 50%

Assessment Rubrics

Lab Reports

NOTE: It is assumed that all lab reports will be word-processed. Individual reports will be assessed while taking into account the overall teamwork.

Laboratory Report Contents	1 Beginning or incomplete	2 Developing	3 Accomplished	4 Exemplary	Score
Introduction	Very little background information provided or information is incorrect	Some introductory information, but still missing some major points	Introduction is nearly complete, missing some minor points	Introduction complete and well-written; provides all necessary background principles for the experiment	
Experimental procedure or methodology	Missing several important experimental details or not written in paragraph format	Written in paragraph format, still missing some important experimental details	Written in paragraph format, important experimental details are covered, some minor details missing	Well-written in paragraph format, all experimental details are covered	
Results: data, figures, graphs, tables, etc.	Figures, graphs, tables contain errors or are poorly constructed, have missing titles, captions or numbers, units missing or incorrect, etc.	Most figures, graphs, tables OK, some still missing some important or required features	All figures, graphs, tables are correctly drawn, but some have minor problems or could still be improved	All figures, graphs, tables are correctly drawn, are numbered and contain titles/captions.	
Discussion	Very incomplete or incorrect interpretation of trends and comparison of data indicating a lack of understanding of results	Some of the results have been correctly interpreted and discussed; partial but incomplete understanding of results is still evident	Almost all of the results have been correctly interpreted and discussed, only minor improvements are needed	All important trends and data comparisons have been interpreted correctly and discussed, good understanding of results is conveyed	

Conclusions	Conclusions missing or missing the important points	Conclusions regarding major points are drawn, but many are misstated, indicating a lack of understanding	All important conclusions have been drawn, could be better stated	All important conclusions have been clearly made, student shows good understanding	
Spelling, grammar, sentence structure	Frequent grammar and/or spelling errors, writing style is rough and immature	Occasional grammar/spelling errors, generally readable with some rough spots in writing style	Less than 3 grammar/spelling errors, mature, readable style	All grammar/spelling correct and very well-written	
Appearance and formatting	Sections out of order, too much handwritten copy, sloppy formatting	Sections in order, contains the minimum allowable amount of handwritten copy, formatting is rough but readable	All sections in order, formatting generally good but could still be improved	All sections in order, well-formatted, very readable	
Total					
Comments for improvements					

Assignments

Marks	Marking Criteria
15-20	The assignment is engaging, concise and polished. It has an introduction, a body and conclusion. The topic is discussed very well. Excellent use of relevant literature is noticeable in the assignment. Factual details, visual elements and proper use of scientific terminology adds clarity and interest to the assignment. The assignment is well formatted and contains no spelling and grammatical errors.
10-15	The assignment is well written. It has an introduction, a body and conclusion. The topic is discussed fairly with an acceptable level of depth. Adequate and relevant literature citations are noticeable in the assignment. Factual details, visual elements and proper use of scientific terminology adds clarity and interest to the assignment. Sometimes the writing is slightly repetitive or unclear, but the writer does demonstrate a good understanding of the subject matter.

5-10	The assignment is fairly well written and clear, but several errors indicate that the author may not have a complete understanding of the subject. Factual details, visual elements and the proper use of scientific terminology are used reasonably well.
1-5	The assignment has several significant problems in style and content. The topic is never clearly stated, scientific terms are misused, and misspelled words are present. Inadequate or incorrect use of factual details, visual elements seem to indicate that the author does not have a solid understanding of the subject.
0	No work was completed.
Total Marks	
Comments for improvements	

Text books

Fails, A.D. and Magee, C. 2018. Anatomy and Physiology of Farm Animals (8th Edn.). John Wiley & Sons Inc., New Jersey, USA.

Frandsen, R.D., Wilke, W.L. and Fails, A.D. 2009. Anatomy and Physiology of Farm Animals (7th Edn.). Wiley-Blackwell, Iowa, USA.

References

Aspinall, V. and Cappello, M. 2015. Introduction to Veterinary Anatomy and Physiology (3rd Edn.). Elsevier, The Netherlands.

Denbow, D.M. and Akers, R.M. 2013. Anatomy and Physiology of Domestic Animals (2nd Edn.). Wiley-Blackwell, Iowa, USA.

Klein, B. 2013. Cunningham's Textbook of Veterinary Physiology (5th Edn.). Elsevier Saunders, Missouri, USA.

Niugini Agrisaiens Journal, Available at: www.unitech.ac.pg/node/756

Reece, W.O., Erickson, H.H., Goff, J.P. and Uemura, E.E. 2015 Dukes' Physiology of

Domestic Animals (13th Edn.). Wiley-Blackwell, Iowa, USA.

Simpkins, J. and Williams, J.J. 1985. Advanced Biology. Bell and Hyman, London.

Svendsen, P. and Carter, A.M. 1984. An Introduction to Animal Physiology (2ndEdn.), MTP Press Ltd., The Hague.

Readings

Lecture notes and handouts as uploaded onto the google class room.

Topics for further reading will be informed in the class.

AG 121 RURAL SOCIOLOGY AND COMMUNITY DEVELOPMENT

Course(s)	Agriculture (NQF Level 7)
Subject Name	Rural Sociology and Community Development
Subject Code	AG121
Duration	13 teaching weeks
Contact hours	6 hours per week
Credit Points	20
Delivery Mode	On campus
Prerequisites	Nil
Co-requisites	Nil
Subject Coordinator	TBA

Synopsis

This subject has two components that focus on understanding the rural livelihood people and underlying principles that govern the rural societies in PNG context. First component of the

subject presents rural sociology by understanding the science of a society, the people and their behaviour, social interactions and relationships, leadership, and rural changes in communities. Additional information on social science data collecting tools and techniques are articulated as well.

The second half of the subject introduces contemporary rural community development and change management approaches from both international and Papua New Guinea perspective. It provides an understanding of the processes involved, their underlying assumptions, and how to use these processes in sustainable rural and community development endeavours. The aim is to introduce students to the variety of rural community development and change management approaches, theories and concepts, and tools and techniques in a way that will provide sufficient theory for informing rural development practice with confidence in a range of settings.

Subject Topics

1. Definition and Concept of Rural Sociology and needs and motivation theory.
2. Structure and function of a society, social stratification, culture values and beliefs.
3. Rural Social, Attitude Change and spread of ideas.
4. Definition, philosophy and nature of rural development and agriculture and rural community development in PNG.
5. Approaches, process and techniques to rural community development.

Topic	Content
1. Definition and Concept of Rural Sociology and needs and motivation theory	Define sociology and rural sociology, and articulate the concept of rural sociology. Definitions and components of family, community and village. Maslow's Need Theory Theory of Human Motivation.
2. Structure and function of a society, social stratification, culture values and beliefs	Social structure and social functions; Social structure of rural agrarian system, factors causing the division of people into groups and societies. Systems of succession and inheritance in agrarian society Types and forms of stratification, determinates of people's status, features of local stratification system. Define culture, values and beliefs, characteristics of culture.
3. Rural social, attitude change and spread of ideas.	General aspects of social and attitude change, source of social change, concept of attitude and attitude change. Diffusion of innovation theory and applications, adoption categories.
4. Definition, philosophy and nature of rural development and agriculture and rural community development in PNG.	Define rural and community development, philosophy and nature of rural development, concept of rural development and the rural outlook. Nation at cross roads; issues of development, Medium Term Development Strategy (MTDS): poverty reduction and rural development

	(2006-2016) integrated framework for agricultural development.
5. Approaches, process and techniques to rural community development	Principle and appropriateness, rethink/reframe. Basic community development approaches and models. Community development process, techniques for involvement and facilitation. Community organization for development action

Subject Learning Outcomes (SLOs)

On completion of this subject students will be able to:

1. Define and articulate the concept of rural sociology, as well as the needs and motivation theory in the context of rural sociology
2. Discuss structure and function of a society, social stratification, interaction, and cultures, and social changes
3. Discuss the social and attitude change, source of social change, and diffusion of innovation in rural society.
4. Investigate and gain greater knowledge and understanding of rural community development,
5. Identify the indices of development and steps to bring about development in rural areas in PNG context, and
6. Acquire more practical skills and ability to use community development tools and techniques with community.

Assessment Tasks and Weightings

Students must attain at least 50% overall in the subject. There will be a final written examination weighing 50% and 50% formative assessment.

Formative assessments

Assignment: There will be two assignments (AA1, AA2) each weighing 10%.

AT1: Assignment 1 – Culture and social change in PNG context.

AT2: Assignment 2 – Assignment on writing a project proposal for a community development project.

Tests: There will be 2 tests (AT1, AT2) each weighing 15%.

AT3: Test 1 – Test covering topic 1, 2, and 3.

AT4: Test 2 – Test covering topic 4, and 5.

Final written examination: A 2 ½ hour written examination weighs 50%.

**Assessment Rubrics
Assignments**

Marks %	Marking Criteria
9-10	The assignment is engaging, concise and polished. It has an introduction, a body and conclusion. The topic is discussed very well with a thoroughly. Excellent use of relevant literature is noticeable in the assignment. Factual details, visual elements and proper use of scientific terminology adds clarity and interest to the assignment. The assignment is well formatted and contains no spelling and grammatical errors.
7-8	The assignment is well written. It has an introduction, a body and conclusion. The topic is discussed fairly with an acceptable level of depth. Adequate and relevant literature citations are noticeable in the assignment. Factual details, visual elements and proper use of scientific terminology adds clarity and interest to the assignment. Sometimes the writing is slightly repetitive or unclear, but the writer does demonstrate a good understanding of the subject matter.
4-6	The assignment is fairly well written and clear, but several errors indicate that the author may not have a complete understanding of the subject. Factual details, visual elements and the proper use of scientific terminology are used reasonably well.
1-3	The assignment has several significant problems in style and content. The topic is never clearly stated, scientific terms are misused, and misspelled words are present. Inadequate or incorrect use of factual details, visual elements seem to indicate that the author does not have a solid understanding of the subject.
0	No work was completed.
Total Marks	
Comments for improvements	

Subject Textbooks

Chitamber, J. B. 2008. Introductory Rural Sociology: A Synopsis of Concepts and Principles, John Wiley and Sons Ltd, India.

Kerua, W. 2012. Rural Community Development Manual (ARD302), Unitech Printry, Lae, PNG.

References

Aspen Institute 1996. Measuring Community Capacity Building: A Workbook-in Progress for Rural Communities. The Aspen Institute, Washington D.C., USA.

Baba, D.M, 2015. Introduction to Rural Sociology, Lambert Academic Publishing, London

Frank, F. and Smith, A. 2000. The Community Development Handbook: A Tool to Build Community Capacity, Human Resources Development Canada, Ottawa, Canada

Hanson, L. W. 2001. Papua New Guinea Rural Development Handbook. The Australian National University, Canberra, Australia.

James, P., Nadarajah, Y., Haive K. and Stead, V. 2012. Sustainable Communities, Sustainable Development: Other parts of Papua New Guinea. University of Hawai'i Press, USA.

Niugini Agrisaiens Journal, Available at: www.unitech.ac.pg/node/756

Readings

Power point notes, lecture handouts:

<https://www.slideshare.net/MarinaHanna12/introduction-to-rural-sociology-101-1st-lecture>

AG122 INTRODUCTION TO SOILS

Course(s)	Agriculture (NQF Level 7)
Subject Name	Introduction to Soils
Subject Code	AG122
Duration	13 teaching weeks
Contact hours	6 hours per week
Credit Points	20
Delivery Mode	On campus
Prerequisites	Nil
Co-requisites	Nil
Subject Coordinator	TBA

Synopsis

The subject provides students with an insight into fundamental aspects of soil as a natural body, explores the relationship between soil properties and crop production. The subject topics offer an overview of important disciplines of soil science such as soil genesis, taxonomy, soil physics, soil chemistry and soil biology. Efficient and sustainable soil management needs the

managers to have in-depth knowledge on soils. Upon completion of this subject students would have developed sufficient insight into soil properties through a series of lab practicals and lectures. This subject will provide necessary foundation for understanding fertility aspects of soil.

Subject Topics

1. Concept of soil, role of soil in the environment and pedogenesis.
2. Elements of soil physics-densities, structure, texture, temperature, porosity and aeration, colour, soil water and movement of water in soils.
3. Principles of soil chemistry-soil minerals and colloidal system, soil reaction, cation and anion exchange reactions, buffering capacity and redox potentials.
4. Soil biology-importance and characters of soil organic matter, role and diversity of macro- and micro-organisms in soils.
5. Problematic soils-characterization of acid, calcareous, saline, saline-sodic and sodic soils.
6. Soil profile description, soil taxonomy, mapping, land use classification and soils of PNG.

Subject Outline

Topic	Content
1. Concept of soil, role of soil in the environment and pedogenesis.	Concept and definition of soil, components of soil, functions of soil, soil forming rocks and minerals. Pedogenesis-Soil forming processes and weathering action on rocks and minerals, factors of soil formation-active and passive factors.
2. Elements of soil physics-densities, structure, texture, temperature, porosity and aeration, colour, soil water and movement of water in soils.	Definitions of bulk density and particle density, relationship between soil densities and porosity or aeration, their importance in plant growth, soil structure and plant growth; aggregate formation, types of structures. Soil texture, its evaluation and effects on other properties of soil. Soil tilth and tillage. Soil colour and temperature, factors affecting these properties, effects of soil temperature on plants. Soil water, classification of soil water based on soil water potentials, soil moisture constants, relationship between moisture content and soil water potentials, factors affecting soil moisture availability, hydrological cycle and soil-plant-water-atmospheric relationship, saturated and unsaturated flow of water in soil.
3. Principles of soil chemistry-soil minerals and colloidal system, soil reaction, cation and anion exchange	Chemical composition of soil, colloids and soil colloidal system, characters of colloids, chemical nature of minerals, classification of soil minerals, silicate and non-silicate clay minerals and their properties including specific surface area. Ion exchange- characters of cation

reactions, buffering capacity and redox potentials.	exchange reactions, cation exchange capacity (CEC) of soils and anion exchange capacity of soils and lyotropic series. Buffering capacity and base saturation%, their relation to general fertility of soils. Chemistry of flooded soils, oxidation-reduction reactions, redox potential of soil and its importance in nutrient availability.
4. Soil biology-importance and characters of soil organic matter, role and diversity of macro- and micro-organisms in soils.	Soil biota-bacteria, fungi, actinomycetes and protozoa, Factors affecting occurrence and distribution of microflora in soil, classification based on nutrition and physiology, their biochemical functions/importance. Soil organic matter-origin, nature of humus, components of humus, importance of organic matter in agriculture, decomposition of organic matter and C sequestration.
5. Problematic soils- characterization of acid, calcareous, saline, saline-sodic and sodic soils.	Soil reaction- soil acidity, types of acidity, reasons for development of the acid soils, controls of acidity on soil characters and plant growth. Soil alkalinity and salinity-factors responsible for development of problem soils, characterization of these soils, plant nutritional constraints. Calcareous soils- distribution and properties, plant nutritional constraints.
6. Soil profile description, soil classification, mapping, land use classification and soils of PNG.	Differences between soil profile and soil horizon, master horizons in a hypothetical soil profile, soil monoliths. Soil classification systems, purpose of classification, diagnostic horizons, structure and salient features of Soil Taxonomy and Australian Soil Classification Systems. Types of soil survey. Base map and its significance in soil survey; soil mapping units; soil survey report, its interpretation and application. Principles and types of land evaluation: soil versus land; land capability classification, physical rating of soils and linkage for crop suitability classification, soil site suitability evaluation for land use planning. Benchmark soils of PNG and soil related constraints for crop and animal production, soil databases-PNGRIS.

Subject Learning Outcomes (SLOs)

On completion of this subject students will be able to:

1. Define basic terminologies of soil science;
2. Discuss the importance of soil as a medium for plant growth and soils role in the environment;
3. Describe the basic processes and factors of soil formation;
4. Identify the physical, chemical, and biological processes in the soil;
5. Relate soil profile description to the soil taxonomy and land use, and
6. Analyze basic physico-chemical properties of soils.

Assessment Tasks and Weightings

Students must attain at least 50% overall in the subject. There will be a final written examination weighing 50% and 50% formative assessment.

Formative assessments

Tests: There will be 2 tests each weighing 10%

AT1: Test 1 in the first half of the semester

AT2: Test 2 in the second half of the semester

Lab reports: A group work-done reports for practical sessions weighs 30%. There will be 6 lab reports each worth 5%. Students should submit individual reports.

AT3: Practical 1. Determination of bulk density and soil moisture content by core method

AT4: Practical 2. Determination of particle density of soil by pycnometer method

AT5: Practical 3. Determination of soil texture by hydrometer method

AT6: Practical 4. Determination of soil colour

AT7: Practical 5. Determination of cation exchange capacity of soils by ammonium saturation method

AT8: Practical 6. Determination of organic matter content of soil by loss-on-ignition method

Final written examination: A 2 ½ hour written examination weighs 50%

Assessment Rubrics

Lab Reports

All lab reports should be word-processed and electronic copies submitted through google classroom. Individual reports will be assessed.

Laboratory Report Contents	1 Beginning or incomplete	2 Developing	3 Accomplished	4 Exemplary	Score
Introduction	Very little background information provided or information is incorrect	Some introductory information, but still missing some major points	Introduction is nearly complete, missing some minor points	Introduction complete and well-written; provides all necessary background principles for the experiment	
Procedure	Missing several important experimental details or not written in paragraph format	Written in paragraph format, still missing some important experimental details	Written in paragraph format, important experimental details are covered, some minor details missing	Well-written in paragraph format, all experimental details are covered	
Results/ Observations Data, figures, graphs, tables, etc.	Figures, graphs, tables contain errors or are poorly constructed, have missing titles, captions or numbers, units missing or incorrect, etc.	Most figures, graphs, tables OK, some still missing some important or required features	All figures, graphs, tables are correctly drawn, but some have minor problems or could still be improved	All figures, graphs, tables are correctly drawn, are numbered and contain titles/captions.	
Interpretation / Conclusions	Conclusions missing or missing the important points	Conclusions regarding major points are drawn, but many are misstated, indicating a lack of understanding	All important conclusions have been drawn, could be better stated	All important conclusions have been clearly made, student shows good understanding	
Spelling, grammar,	Frequent grammar	Occasional grammar/spellin	Less than 3 grammar/spellin	All grammar/spellin	

sentence structure	and/or spelling errors, writing style is rough and immature	g errors, generally readable with some rough spots in writing style	g errors, mature, readable style	g correct and very well-written	
Appearance and formatting	Sections out of order, too much handwritten copy, sloppy formatting	Sections in order, contains the minimum allowable amount of handwritten copy, formatting is rough but readable	All sections in order, formatting generally good but could still be improved	All sections in order, well-formatted, very readable	
Total					
Comments for improvements					

Subject Textbook

Weil, R.R. and Brady, N.C. 2017. The Nature and Properties of Soils (15th Edn.), Pearson Education Ltd, Essex, UK.

References

Bleeker, P. 1983. Soils of Papua New Guinea. ANU Press. Canberra

Buol, S.W., Southard, R.J., Graham, R.C. and McDaniel, P.A. 2011. Soil Genesis and Classification, (6th Edn.), John-Wiley and Sons Inc., Sussex, UK.

Huang, P.M., Li, Y. and Sumner, M.E. 2011. Handbook of Soil Sciences: Properties and Processes (2nd Edn.). CRC Press, Boca Raton, USA.

Niugini Agrisaiens Journal, Available at: www.unitech.ac.pg/node/756

White, R.E. 2006. Principles and Practice of Soil Science: The Soil as a Natural Resource (4th Edn.). Balckwell Science, Oxford, UK.

Readings

Lecture notes and power point outlines will be uploaded to the google classroom.

AG123 PLANT PHYSIOLOGY

Programs	Agriculture (NQF Level 7)
Subject Name	Plant Physiology
Subject Code	AG123
Contact hours	6 hours per week
Duration	13 teaching weeks
Credit Points	18

Delivery Mode	On campus
Prerequisites	AG111
Co-requisites	Nil
Subject Coordinator	TBA

Synopsis

Plant Physiology is the subject that covers the fundamental aspects of how plant systems function. To capture an overview of knowledge and skills areas of this subject, we adopt questions that have been asked by plant physiologists, e.g. Salisbury and Ross (1992): What are the major cellular components involved in important physiological functions? How do water and dissolved ions move in and out of plants? What happens to the ions that have entered the plants? How do cells reproduce, grow, and specialize to form organisms, such as plants? How do plants (and cells) interact with their environments? These questions map out the major knowledge and skills areas that are taught to establish a comfortable foundation for students to learn and apply the same, for instance, in areas of crop production, crop improvement, and crop protection.

Subject Topics (ST)

Major areas to be covered in this subject are:

1. Principles of plant physiology, and Cellular functions and communication.
2. Plant-water relations and mineral absorption.
3. Photosynthesis, elemental fixation and assimilation, and respiration processes.
4. Seed germination, plant growth, and development processes.
5. The effects of environmental stress on crop physiological functions and survival.

Topic	Content
1. Introduction to Crop Physiology and Review of Cells	Plants in atmosphere matrix; soil-plant-atmosphere continuum; definitions and principles. Application of physiological principles in agriculture. Review of cellular 'communication' and functions, particularly major organelles involved in physiological processes.
2. Plant Water Relations and Mineral Absorption	Water and its role in physiological functions; components of water potential; factors affecting water potential. Water and nutrient absorption and movement. Stomata, xylem and phloem mechanisms.
3. Photosynthesis and Respiration	Role of biomolecules e.g. enzymes (review). Photosynthesis (I, II, III) covering inorganic fixation, synthesis and assimilation. Respiration and photorespiration processes.
4. Plant Growth and Development	Roles of hormones and growth regulators. Seed germination and emergence mechanisms. Photo-periodism and photo-morphogenesis. Growth processes on yield parameters and crop yield. Reproductive physiology.
5. Environmental Physiology	Principles of plant and environment interaction (GxE). Mechanisms of plant

	responses to abiotic (e.g. salinity and drought) and biotic stresses (i.e. pests, diseases and weeds).
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Subject Learning Outcomes (SLOs)

After completing this subject, students will possess the skills and knowledge to:

1. Explain the importance of plant physiological processes to crop productivity.
2. Discuss the effects of water on plant growth and development.
3. Relate crop photosynthetic capacity to crop yield parameters and actual crop yield.
4. Discuss seed germination mechanisms as a basis for successful crop establishment.
5. Investigate the effects of environmental stress on crop physiological processes.

Assessment Tasks and Weightings

Students must attain at least 50% overall in the subject. The assessment types and weightings for formative assessment and a final written examination are:

Tests: There will be 3 tests (AT1-Test1, AT2-Test2, AT3-Test3) each weighing 10%

Sequence of test administration: AT1 given after ST1 and ST2; AT2 given after ST3; and AT3 given after ST4 and mid ST5.

Lab report: Written report(s) for all practical sessions weighs 20%

There are five (5) laboratory practicals (LP) to be given, each weighing 4%. The LPs will be delivered in the following sequence: ST1-LP1; ST2-LP2; ST3-LP3; ST4-LP4, and ST5-LP5.

Areas of investigation for LPs are:

AT4-LP1: Osmotic potential and density gradient of cell sap.

AT5-LP2: Water potential and stomata infiltration capacity.

AT6-LP3: Identification of chloroplast pigments by thin layer chromatography (TLC).

AT7-LP4: Effects of growth regulators on adventitious root formation and development.

AT8-LP5: Effects of water and salt regimes on growth of bean and maize.

For written reports of LPs (marked out of 20 points), it is emphasized that a standard format of scientific experimental reporting is followed.

Assessment Rubric and Marking Criteria

Division of written report	Information required	Allocation of marks
Title	<i>What was the title of the laboratory practical?</i> The title should be descriptive, positive, brief and specific. For uniformity, lecturer gives this, but is checked for consistency. This section is assessed together with 'Introduction'.	5
Introduction	<i>What was the laboratory practical about?</i> A comprehensive background is logically presented, ending with objective(s) of the practical session. Review of some literature is necessary, and when done, correct format of citation is followed.	
Materials and Methods	<i>What was done?</i> Scientific procedures followed with materials used to address the objective(s) are	3

	systematically presented. Reasons are provided for any variations made to original procedures.	
Results	<i>What did you find?</i> Outcomes of experiments (descriptive or empirical) are clearly presented. Appropriate format(s) of results presentation are used e.g. Tables, Figures (graphs, illustrations, plates, etc.), and these are correctly captioned.	3
Discussion	<i>What do the outcomes mean?</i> Outcomes of experiments are logically and coherently discussed and explained. Appropriate inferences are made with correct citations. This section is where students are expected to ‘empty their minds’ because respective student’s comprehension of the entire practical process is judged here.	7
References	<i>Where any information sources accessed?</i> A bibliography of all literature sourced to assist successfully complete a laboratory practical report, is presented. For uniformity, an “APA Referencing System” is recommended. Details of literature cited in the text must be presented here.	2

Final written examination (FE): A 2½ hour written examination weighs 50%.

Subject Textbook

Taiz, L., Zeiger, E., Møller, I.M. and Murphy, A. 2018. Fundamentals of Plant Physiology (1st Edn.). Oxford University Press, UK.

References

Hopkins, W.G. and Hüner, N.P.A. 2009. Introduction to Plant Physiology (4th Edn.). John Wiley & Sons, Inc., London.

Niugini Agrisaiens Journal, Available at: www.unitech.ac.pg/node/756

Salisbury, F.B. and Ross, C.W. 1992. Plant Physiology (4th Edn.). Wadsworth Publishing Company, Belmont, California.

Readings

Lecture Notes and power-point presentations (supplementary notes). The Google search engine (www.google.com) is amassed with educational material. Students are encouraged to exploit this internationally popular website. Almost every topic pertaining to crop physiology can be accessed, in images or texts, at this information search engine.

Additional websites specific to the subject that can also be accessed are: www.plantphysiol.org; www.nature.com/subjects/plant-physiology, and www.plantcell.org.

AG124 AGRICULTURAL EXPERIMENTATION

Course(s)	Agriculture (NQF Level 7)
Subject Name	Agricultural Experimentation
Subject Code	AG 124
Duration	13 teaching weeks
Contact hours	6 hours per week
Credit Points	20
Delivery Mode	On campus
Prerequisites	Nil
Co-requisites	Nil
Subject Coordinator	TBA

Synopsis

The subject provides students with basic planning and implementation of experiments in agriculture, analyses of the data, describing the results and drawing valid conclusions and recommendations. It involves knowledge of the basic ideas of experimentation, probability, testing of hypothesis, statistical inference and hands-on use of software for analyses and computing.

Subject Topics

1. Data sampling and distributions
2. Descriptive statistics
3. Models and Transformation
4. Probability
5. Introduction to Inferential statistics
6. Introduction to Experimental Designs and Analysis

Subject Outline

Topic	Content
1. Data sampling and distributions	Ability to construct and interpret tables and graphs of univariate and bivariate data; detect outliers Construct and discuss distributions of univariate and bivariate data and describe simple random sampling and other types of sampling
2. Descriptive statistics	Univariate descriptive statistics, sigma notation and formulae for mean and standard deviation, bivariate and multivariate descriptive statistics
3. Models and Transformation	Linear regression, linear transformation, the z-score transformation and the 67-95-99.7 percent rule.
4. Probability	Three ways of measuring probability, p-values, probabilities, proportions and percentages, three events, random variables and special events and 3 rules for these probability distributions.

	Probabilities associated with normal distributions, the Central Limit Theorem, Standard Error
5. Introduction to Inferential statistics	Population parameter estimates and their accuracy, Tests of hypothesis and probability, testing a hypothesis using p-values, Type I and Type II errors, Two-population hypothesis test Analysis of variance
6. Introduction to Experimental Designs and Analysis	Outline the concept of experiments in the context of agriculture and define related terminologies Set out the various procedures of experimentation in crop and livestock systems of agriculture Discuss the importance of good experimental design Single factor ANOVA Completely Randomized Design (CRD), One-way ANOVA – Randomized Complete Block Design (RCBD): Description and field layout of single factor experiments with CRD & RCBD; Set out the null hypothesis and statistical model of single factor experiments with CRD & RCBD; Use at least one available software to analyse and interpret data from single factor experiments with CRD & RCBD including multiple comparisons. Describe the results of analyses, draw conclusions and appropriate recommendation. Factorial Experiments: Outline the main characteristics of factorial experiments and differentiate between main effect, interaction effect and row factor, column factor. Describe layout of two-factor model for full factorial experiments. Set out hypotheses to test various effects. Use statistical software to analyse two factor experiments, draw valid conclusions. Interpret results of analysis variance of two-factor and make recommendations. Correlation and Simple Regression

Subject Learning Outcomes (SLOs)

On completion of this subject students will be able to:

1. Construct and apply frequency tables, histograms, and calculate descriptive statistics for centre and spread of data
2. Calculate probabilities associated with simple experiments
3. Detail the steps involved in planning and executing basic agricultural experiments
4. Identify and implement the method of analysis and tests of significance for each design
5. Demonstrate use of statistical programs for entering, exploring, and analyzing data obtained from experiments.

Assessment Tasks and Weightings

Students must attain at least 50% overall in the subject. There will be a final written examination weighing 50% and 50% formative assessment.

Formative assessments

AT 1 - Tests: There will be 2 tests each weighing 10%

AT 2 - Assignments: There will be 2 assignments weighing 15%

AT 3 - Lab reports: There will be 2 work-done report/s for practical sessions weighing 15%

The laboratory practicals are summarized below:

Lab 1: Collection of data from CRD and RCBD single factor experiments, analyse using statistical package, draw conclusions and make appropriate recommendation.

Lab 2: Collection of data from two factor experiments, analyse using statistical package, draw conclusions and make recommendations.

AT 4 - Final written examination: A 2½ hour written examination weighs 50%.

Assessment Rubrics

Lab Reports

NOTE: It is assumed that all lab reports will be word-processed. Individual reports will be assessed while taking into account the overall teamwork.

	Good	Fair	Could be better	Poor	Specific comments	Your mark
Introduction	Clearly states background, aims and objectives; relates lab exercise to the theory; mentions knowledge to be gained; written in past tense, zero spelling and grammatical errors. (3pts)	One of the "Good" conditions (in previous column) is not met. (2pts)	2-3 of the "Good" conditions is not met. (1.5pts)	More than 3 of the "Good" conditions is not met. (1 pts)	On your work	
Materials and Methods	Comprehensively describe how work was done using own words; logical or step by step description of procedure; description can be easily followed by any interested person to conduct the lab elsewhere; mentions all materials used and how they were used; mentions any new discoveries made (if any); written in past tense, zero spelling and grammatical errors. (3pts)	One of the "Good" conditions is not met. (2pts)	2-3 of the "Good" conditions is not met. (1.5pts)	More than 3 of the "Good" conditions is not met. (1 pts)		
Results	All data are presented and analysed where necessary; drawings are made according to drawing rules discussed in class; other results are clearly stated either in words or in Table format, correct units of measurement and decimal points are used; trends in the results are pointed out but not discussed. (5pts)	One of the "Good" conditions is not met. (4 pts)	2-3 of the "Good" conditions is not met. (3 pts)	More than 3 of the "Good" conditions is not met. (2 pts)		
Discussion	Reflects on what happened (the results) and provides insightful explanation and meaning of the results; where possible, compares results with expected results and explains differences and/or similarities. (5pts)	One of the "Good" conditions is not met. (4pts)	2-3 of the "Good" conditions is not met. (3 pts)	More than 3 of the "Good" conditions is not met. (2 pts)		

Conclusions	Summarizes data collected or observed in the experiment; Comments regarding lesson learned during the experiment; Discussed possible application of lesson to real life where necessary. (4pts)	One of the "Good" conditions is not met. (3pts)	2-3 of the "Good" conditions is not met. (2pts)	More than 3 of the "Good" conditions is not met. (1pts)		
Presentation	Plagiarism not evident; No spelling or grammatical errors; all conventions for writing lab reports followed; logical presentation; neatness; good use of space; minimum number of repetitions. (5pts)	One of the "Good" conditions is not met. (4pts)	2-3 of the "Good" conditions is not met. (3pts)	More than 3 of the "Good" conditions is not met. (2pts)		
Total	25	19	14	9		

Subject Text Book

Dean, A., Voss, D. and Draguljik, D. 2017. Design and Analysis of Experiments (2nd Edn.). Springer International Publishing, Switzerland.

Easterling, R.G. 2015. Fundamentals of Statistical Experimental Design and Analysis. John Wiley & Sons, UK.

References

Clarke, G.M. 1981. Statistics and Experimental designs (2nd Edn.). Arnold, London.

Gomez, K.A. and Gomez, A.A. 1984. Statistical Procedures for Agricultural Research (2nd Edn.). John Wiley & Sons, UK.

Niugini Agrisaiens Journal, Available at: www.unitech.ac.pg/node/756

Sokal, R.R. and Rohlf, F.J. 1995. Biometry: The Principles and Practice of Statistics in Biological Research (3rd Edn.) WH Freeman Co., USA.

Steel, R.G.D. and Torrie, G.H. 1980. Principles and Procedures of Statistics (2nd Edn.) McGraw-Hill Education, New York, USA.

Zar, J.H. 1984. Biostatistical Analysis. Prentice Hall International. New Jersey, USA.

Readings

Lecture notes and power point outlines will be uploaded to the google classroom.

Study Notes on Experimental design and analyses in Agriculture prepared by G Danbaro 2013.

AG211 AGRONOMY I

Programs	Agriculture (NQF Level 7)
Subject Name	Agronomy I
Subject Code	AG211
Contact hours	6 hours per week (3 Lecture+1 Tutorial+2 Lab)
Duration	13 teaching weeks
Credit Points	18
Delivery Mode	On campus
Prerequisites	AG122, AG123
Co-requisites	Nil

Synopsis

Agronomy is a subject that deals with the art and science of production management of crop and pasture plants important to the agriculture sector. Like agriculture, agronomy is an integrated and applied aspect of different disciplines of pure sciences, and covers a synthesis of crop and pasture sciences, soil science, and environmental sciences (plant- environmental relationships). Therefore, major characteristics of field crops and pasture plants, approaches in land preparation, planting, fertilizer use and production management (pests and diseases) are explored. The impacts of cropping and pasture development on environmental health are detailed.

Subject Outline

Topic	Content
1. Principles of agronomy.	Land use planning, choice of crop and pasture, field management, production systems, choice of propagules, water management, technology adaptation, post-harvest.
2. Plant production characteristics.	Vegetative and reproductive morphology of crop and pasture plants. Photosynthesis, respiration, water and nutrient uptake, transpiration and translocation, dormancy, seed germination, juvenility, maturity.
3. Plant taxonomy and classification.	Definitions, Linnaeus and plant kingdom- classification, identification, nomenclature, description, and taxonomic characteristics.
4. Ecology of crop and pasture plants.	Ecology, sub-divisions, level and types of plants, interactions, ecosystem and ecological pyramid, important cyclic features of the environment.
5. Production and management.	Principles of crop and pasture production. Nursery establishment, transplanting, pests and diseases management, plantation and density estimation, yield estimation, harvesting and post-harvest loss management.

Subject Topics

1. Principles of crop and pasture agronomy.
2. Plant production characteristics of crop and pasture plants.
3. Taxonomy and classification of crop and pasture plants.
4. Biochemistry of crop and pasture plants.
5. Production and management of crop and pasture plants.

Subject Learning Outcomes (SLOs)

On completion of this subject students will be able to:

1. Explain the basic principles of field crop and pasture agronomy;
2. Describe the basic developmental processes that give rise to field crop and pasture yield;
3. Differentiate a field crop or a pasture plant based on its morphological and taxonomical characteristics;
4. Establish the plant-environmental interrelationships that affect productivity and strategize approaches to manage them;
5. Apply the general principles of field crops and pasture production and management systems.

Assessment Tasks and Weightings

Students must attain at least 50% overall in the subject. The assessment types and weightings for formative assessment and a final written examination are:

Formative Assessments

Tests: There will be 3 tests (AT1, AT2, AT3) each weighing 10%.

AT1: Weighing 10%

AT2: Weighing 10%

AT3: Weighing 10%

Sequence of test administration: AT1 given after ST1 and ST2; AT2 given after ST3; and AT3 given after ST4 and mid ST5.

Lab report: Written report(s) for all practical sessions weighs 20%.

There are five (5) laboratories practical (LP) to be given, each weighing 4%. The LPs will be delivered in the following sequence: ST1-LP1; ST2-LP2; ST3-LP3; ST4-LP4, and ST5-LP5.

Areas of investigation for LPs are:

AT4: Seed quality and germination tests
4%

AT5: Plant nutrition and deficiency 4%.

AT6: Plant identification 4%.

AT7: Seed and asexual propagules 4%.

AT8: Transplanting and management 4%.

AT9: A 2½ hour final written examination weighs 50%.

Subject Textbook

A Text Book of Agronomy. Chandrasekara, B., Annadurai, K. and Somasundaram, S. (2010). Age International Publishers. New Delhi, India.

References

Principles of Agronomy. Yelamanda, R. T. and Sankara, R. G. H. (1995). Kalyani Publishers, Ludhiana.

Introduction to Agronomy and Soil Water Management. Vaidya, V. G. and Shasrabudde, K. R. (1979). Continental Prakashnam, Pune.

Principles of Agronomy. Mudaliar, V.T. S. (1991). Bangalore Printing and Publishing Company, Bangalore.

Principles of Agronomy. Reddy, S. R. (1999). Kalyani Publishers, Ludhiana.

Readings

Lecture Notes and power-point presentations (supplementary notes). The recommended textbook including other key ebooks are available on Google to help you study this subject.

AG212 AGRICULTURAL MECHANIZATION

Programs	Agriculture (NQF Level 7)
Subject Name	Agricultural Mechanization
Subject Code	AG212
Contact hours	6 hours per week (3 Lecture+0 Tutorial+3 Lab)
Duration	13 teaching weeks
Credit Points	18
Delivery Mode	On campus

Prerequisites Nil

Co-requisites Nil

Synopsis

Agricultural mechanization is the process of improving farm labour productivity through the use of agricultural machineries, implements and tools. The subject covers basic engineering principles and the operation and management of agricultural machineries and equipment.

Subject Topics (ST)

1. Concepts, principles and objectives of agricultural mechanization.
2. Concept application in simple tools and machinery to complex mechanical engineering systems.
3. Farm power sources, Tractor and Mechanical Power transmission.
4. Operation and efficiency of farm machineries and equipment.
5. Machinery selection and management.
6. Post-harvest techniques, irrigation methods and equipment, and Energy management systems.

Topic	Content
1. Concepts, principles and objectives of Agricultural Mechanization.	Definition and objectives of agricultural mechanization. Explanation of engineering concepts. Outlining of engineering principles. Six simple machines and mechanisms. Hand tools. Introduction to engineering drawing and materials.
2. Operating principles of mechanical engineering systems.	a. Fluid power control systems – hydraulics and pneumatics systems. b. Fire and water-tube boilers. c. IC engines d. Turbines e. Pumps f. Compressors
3. Farm power sources, tractor and mechanical power transmission.	a. Identify the different farm power sources and their uses. b. Differentiate the different types of tractors, tractor parts and tests. c. Study how mechanical power is transmitted especially in a tractor.
4. Operation and efficiency of farm machineries and equipment.	a. Land preparation & soil tillage equipment. b. Crop planting equipment. c. Fertilizer and pest control equipment. d. Harvesting equipment. e. Conveying of agricultural materials.
5. Machinery selection and management.	a. Field capacity and efficiency. b. Draft and power requirements. c. Machinery costs. d. Machinery selection and replacement.

6. An introduction to post-harvest techniques, irrigation methods and equipment, and energy management systems.	<ul style="list-style-type: none"> a. Post-harvest processing techniques and equipment. b. Irrigation methods and equipment. c. Energy management systems.
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Subject Learning Outcomes (SLOs)

On completion of this subject students will be able to:

1. Explain the concepts, and outline the principles and objectives of agricultural mechanization;
2. Apply basic engineering concepts, operate and maintain machineries and equipment relevant to agricultural operations;
3. Identify different farm power sources, and able to use farm tractors;
4. Efficiently operate and maintain farm machineries and equipment;
5. Precisely select and manage machineries and equipment;
6. Describe proper post-harvest and irrigation techniques and equipment, and energy systems.

Assessment Tasks and Weightings

Students must attain at least 50% overall in the subject. The assessment types and weightings for formative assessment and a final written examination are:

Formative assessments

Quiz: There will be 2 quizzes (AT1 & AT2)

AT1: Weighing 5%

AT2: Weighing 5%

Sequence of quiz administration: AT1 given after ST1; AT2 given after ST5.

Tests: There will be 2 tests (AT3 & AT4) each weighing 10%

AT3: Weighing 10%

AT4: Weighing 10%

Sequence of test administration: AT3 given after ST1 & ST2; AT4 given after ST3, ST4 and ST5;

Practical report: Written report(s) for all practical sessions weighs 20%

There are four (4) field practicals (FP) to be given, each weighing 4%. The FPs will be delivered in the following sequence: ST1-FP1; ST2-FP2; ST3-FP3; and ST4 & ST5-FP4. Areas of investigation for FPs are:

AT5: Calculation of mechanical advantage of simple machines and their applications 4%

AT6: A factory-setup and the role of mechanical engineering systems in the set-up visited weighs 4%

AT7: Measurements and observations on important tractor terminology, hitching and hitching terms, traction and testing weigh 4%

AT8: Field capacity and efficiency of selected machinery, and draft and power requirements weigh 4%.

AT9: A 3-hour final written examination weighs 50%

Subject Textbook

Kaul, R.N. and Egbo, C.O. 1985. Introduction to Agricultural Mechanization, Macmillan, 1985, London, UK.

Srivastava, A.K., Carroll E. and Goering C.E. 2006. Engineering Principles of Agricultural Machines (2nd Edn.), American Society of Agricultural Engineers, USA.

References

French, T.E. and Vierck, C.J. 1966. An Introduction to Technical Drawing, Metric Edition, Delmar Publishers, Albany, New York, USA.

Kepner, E.L., Bainer, R., and Barger, E.L. 2005. Principles of Farm Machinery (2nd Edn.), AVI Publishers, Connecticut, USA.

Kalpakjan, S.1995. Manufacturing Engineering and Technology (3rd Edn.), Addison–Wesley Publishing Co., Boston, USA.

Readings

Lecture Notes and power-point presentations (supplementary notes). The Google search engine (www.google.com) is amassed with educational material. Students are encouraged to exploit this internationally popular website. Almost every topic pertaining to agriculture mechanization can be accessed, in images or texts, at this information search engine.

AG213 SOIL FERTILITY MANAGEMENT

Course(s)	Agriculture (NQF Level 7)
Subject Name	Soil Fertility Management
Subject Code	AG 213
Duration	13 teaching weeks
Contact hours	6 hours per week [3 Lecture+ 0 Tutorial+ 3 Lab]
Credit Points	18
Delivery Mode	On campus
Prerequisites	AG122
Co-requisites	Nil
Subject Coordinator	TBA

Synopsis

Students will be familiar with all aspects of soil nutrients as a vital plant growth and yield determinant. The subject provides an in-depth knowledge of chemical and fertility aspects of soils for efficient and sustainable soil management. The topics offer an overview of important concepts of soil fertility including the chemical basis of soil fertility and nutrient availability. Students will develop sufficient insight into forms of soil nutrients, transformation of major nutrients, nutrient availability in soil, techniques for evaluating soil fertility including soil testing and plant analysis, and estimating fertilizer requirement based on recommended dosage. An overview of possible soil constraints, their appraisal methods and corrective measures will also be studied.

Subject Topics

1. Soil as a nutrient source to crops and pasture plants
2. Nutrient acquisition by crops and translocation

3. Transformation of major nutrients in soils
4. Soil fertility evaluation techniques
5. Soil testing and fertilizer recommendation
6. Soil constraints and their management with emphasis on tropical soils

Subject Outline

Topic	Content
1. Soil as a nutrient source to crops and pasture plants	Concepts of soil fertility and productivity, Liebig's law of minimum, criteria of essentiality, classification of nutrients, biochemical functions of major nutrients in plants.
2. Nutrient acquisition by crops and translocation	Nutrient availability in soil, mechanics of nutrients movement in soil. Review of nutrient movement within plants and across cell membrane, passive and active uptake theories, primary and secondary active uptake of nutrients.
3. Transformation of major nutrients in soils	Transformation of nitrogen, phosphorous and potassium in soils- natural inputs/sources, losses, transfers, mobilization, immobilization, and fixation. Sources of major nutrients. Relationship between nutrient use efficiency, transformations and soil chemical properties.
4. Soil fertility evaluation techniques	Foliar diagnosis, plant tests, biological tests – their advantages and disadvantages.
5. Soil testing and fertilizer recommendation	Definitions, philosophies and procedures of soil testing, fertilizer recommendations, hands-on experience in soil sampling, analyses and interpretation of results: soil pH, electrical conductivity, organic carbon content, available N content, lime requirement. Fertilizers, types of fertilizers and classification, fertilizer analysis and basic calculations of fertilizer dosages
6. Soil constraints and their management with emphasis on tropical soils	Soil problems such as soil acidity, compaction, salinity and solidity, anion fixation, potassium fixation, poor water retention, soil erosion, soil fertility decline and the relevant soil management options. Soil management under different cropping systems.

Subject Learning Outcomes (SLOs)

On completion of this subject students will be able to:

1. List ionic formula of essential plant nutrients;
2. Differentiate between primary and secondary active uptake of nutrients
3. Discuss the transformation steps of major nutrients;
4. Enlist and describe soil fertility evaluation techniques;
5. Define and outline the principles of soil testing as well as interpretation of soil test results;
6. Enlist soil management practices to alleviate key soil problems.

Assessment Tasks and Weightings

Students must attain at least 50% overall in the subject. There will be a final written examination weighing 50% and 50% formative assessment.

Formative assessments

Tests: There will be 2 tests each weighing 10%

AT1: Test 1 in the first half of the semester

AT2: Test 2 in the second half of the semester

Lab reports: A group work-done reports for practical sessions weighs 30%. There will be 6 lab reports each worth 5%. Students should submit individual reports.

AT3: Practical 1. Sampling for soil testing

AT4: Practical 2. Determination of soil pH by potentiometric method

AT5: Practical 3. Determination of electrical conductivity of soil by conductivity bridge method

AT6: Practical 4. Determination of organic carbon content of soils by wet digestion method

AT7: Practical 5. Determination of available nitrogen content of soil-alkaline permanganate method

AT8: Practical 6. Determination of lime requirement of an acid soil-Adam and Evan's buffer method

Final written examination: A 2 hour written examination weighs 50%

Subject Text

Havlin, J.L., Tisdale, S.L., Nelson, W.L. and Beaton, J.D. 2004. Soil fertility and fertilizers: An introduction to nutrient management, (7th Edn.), Prentice Hall, New Jersey, USA

References

Foth, H.D. 1990. Fundamentals of Soil Science, (8th Edn.), John Wiley and Sons, UK.

Niugini Agrisaiens Journal, Available at: www.unitech.ac.pg/node/756

Weil, R.R. and Brady, N.C. 2017. The Nature and Properties of Soils, (15th Edn.) Pearson Education Ltd, Essex, UK.

White, R.E. 2009. Principles and Practices of Soil Science, The Soil as a natural resource, (4th Edn.), Blackwell Science, Oxford, UK.

Wild, A. 1988. Russell's Soil Conditions and Plant Growth, (11th Edn.), Longmans Scientific and Technical, Harlow, Essex, UK.

Readings

Lecture notes and power point outlines will be uploaded to the google classroom.

AG214 AGRICULTURAL ENTOMOLOGY

Course(s)	Agriculture (NQF Level 7)
Subject Name	Agricultural Entomology
Subject Code	AG 214
Duration	13 teaching weeks
Contact Hours	6 hours per week [3 Lecture+ 0 Tutorial + 3 Lab]
Credit Points	18
Delivery Mode	On campus
Prerequisites	AG111
Co-requisites	Nil
Subject Coordinator	TBA

Synopsis

The subject principally delivers the relationship between arthropods and crop plants, and factors that influence this relationship. It covers the importance of arthropods in agro-ecosystems, characteristics and factors that affect spread and invasion, taxonomy and identification of important insects and allies; general biology and ecology of these arthropods; infestations and crop yield relations; insects and mites in PNG and their economic importance; concepts and principles of arthropod pest control; insecticides, acaricides and resistance management; implementing Integrated Pest Management [IPM] and current trends in pest control.

Subject Topics

Major areas to be covered in this subject are:

1. Arthropods, man, agro-ecosystem
2. Biology and ecology of arthropods
3. Arthropod taxonomy
4. Crop injury vs. damage
5. Arthropod pest management including IPM in PNG and Pacific
6. Non-arthropod pests

Topic	Content
Arthropod, man, agro-ecosystem	Arthropod biodiversity, roles arthropods play in terrestrial & agro-ecosystems, benefits to man; Man vs. insects: Anthropogenic factors and invasive species, characteristics that make arthropods successful colonizers.
Biology and ecology of arthropods	Structures and life processes: morphology, anatomy and physiology; Life cycle and development, arthropod-pathogen vector associations; Ecology: multi-trophic interactions, abiotic interactions, distribution.
Arthropod taxonomy	Definitions of terms in taxonomy, taxonomic tools; Classification and description: Classes Insecta & Arachnida, Orders Blattodea, Thysanoptera, Odonata, Hemiptera, Hymenoptera, Isoptera, Coleoptera, Lepidoptera, Diptera, Orthoptera, Superorder Acariformes: Tetranychidae, Eriophyidae; Superorder Parasitiformes; Varroidae. Advanced tools for insect identification and classification.
Crop injury vs. damage	Theory of sampling, methods of insect infestation sampling, pest monitoring and surveillance; Crop loss assessment: Tools for estimating crop yield loss.
	Arthropod pests of horticultural and plantation crops
	Grain storage insect pests
	Introduction to beneficial insects including apiculture
Arthropod pest management including IPM in PNG and Pacific	Definitions, history of IPM, Pest management theory; biological control agents, strategies of biological control, biology of natural enemies; ecological management; chemistry and classification of conventional insecticides, resistance management, effects of insecticides/acaricides on non-target organisms; microbial insecticides/acaricides; emerging techniques of insect pest control. Current economically important insects, climate change and biosecurity, IPM programs in Papua New Guinea and the Pacific, drawbacks in IPM implementation and adoption, future of IPM in PNG
Non-arthropod pests	Types, significance, and control methods of important non-arthropod pests

Subject Learning Outcomes (SLOs)

On completion of this subject students will be able to:

1. Explain the importance of arthropods and non-arthropod pests in different agro-ecosystems;
2. Identify and describe the factors that trigger arthropod/non-arthropod spread/invasion as agricultural crop pests;
3. Describe major and minor insect pests of Papua New Guinea;
4. Assess crop yield losses;
5. Formulate management strategies based on bio-ecological knowledge of insect and mite pests;

6. Test and evaluate management strategy from available tools for insect and mite pests.

Assessment Tasks and Weightings

Students must attain at least 50% overall in the subject. There will be a final written examination weighing 50% and 50% formative assessment.

Formative assessments

Tests: There will be 2 tests (AT3, AT5, AT8) each weighing 10%. AT8 will be treated as a field practical test.

Lab report: A work-done report/s for practical sessions and field trips weigh 20%.

AT1: Lab practical 1: Insect identification and spatial distribution

AT2: Lab practical 2: Structure, anatomy and life cycle of insects/mites

AT4: Lab practical 3: multi-trophic interactions

AT6: Lab practical 4: Arthropod sampling and Crop loss assessment

AT7: Lab practical 5: Monitoring and control of insects

Final written examination: A 2 ½ hour written examination (AT9) weighs 50%.

Subject Text

van Endem, H.F. 2013. Handbook of Agricultural Entomology. Wiley-Blackwell, USA.

References

Hoy, M.A. 2011. Agricultural Acarology: Introduction to Integrated Mite Management. CRC Press, Boca Raton, USA.

Muniappan, R., Shepard, B.M, Carner, G., Ooi, P. 2012. Arthropod Pests of Horticultural Crops in Tropical Asia. Cabi Publishers, UK.

Niugini Agrisaiens Journal, Available at: www.unitech.ac.pg/node/756

Readings

International Journal of Acarology; <https://www.tandfonline.com/loi/taca20>

Schneider M.F. 1997. Entomology: A Textbook for Students, Agriculturalists and Foresters in Papua New Guinea. Bulolo University College, PNG.

www.iobc-global.org/publications_iobc_internet_book_of_biological_control.html

www.nature.com/subjects/entomology,

AG221 WEED SCIENCE

Course(s)	Agriculture (NQF Level 7)
Subject Name	Weed Science
Subject Code	AG221
Duration	13 teaching weeks
Contact hours	6 hours per week [3 Lectures + 0 Tutorial + 3 Lab]
Credit Points	18
Delivery Mode	On campus
Prerequisites	AG 111, AG 127
Co-requisites	Nil
Subject Coordinator	TBA

Synopsis

Weed science covers the basic aspects of how weeds outcompete crop species for scarce growth resources. The subject begins with “the making of a weed”, weeds and man, and evolution of weed species. The characteristics of weed species; ecology of weeds; effects of climate change on invasion; noxious global weed species; weeds of Papua New Guinea and the Pacific; yield loss assessments; management tools – prevention, interference, natural enemies and biological control; herbicides and resistance management; integrated weed management; weeds in IPM, current trends in weed management.

Subject Topics (ST)

1. Plants as weeds, role of humans
2. Biology and ecology of weeds
3. Weed control
4. Weeds and herbicides
5. Integrated weed management
6. Future prospects of weed science

Topic	Content
Plants as weeds, role of humans.	Why plants become weed species? Overview of impacts of weed on man and ecosystems; noxious weeds of global and economic importance.
Biology and ecology of weeds.	Classification and nomenclature of weeds; major weeds of PNG and Pacific crops. Biology of weed invasion, factors governing establishment-survival-dispersal, weed-crop interactions, weed allelopathy, tripartite interactions.
Weed control	History and principles of weed control; prevention, quarantine, environmental manipulation and agronomic practices. Weed control with natural enemies (biological control agents and bio-herbicides, herbivores) with special reference to PNG and Pacific.
Weeds and herbicides	Herbicide history, classification, chemistry, modes of action, and formulation. Herbicide registration and legislation. Herbicide use and injury; effects on non-targets and environment. Herbicide resistance and management.
Integrated Weed Management (IWM)	Historical development of IWM. Principles of IWM. Developing IWM program and implementation. Weed scouting/monitoring.
Future prospects of weed science	Basic principles and future directions in weed research; search for novel pathogens; genetically modified crops and weeds.

Subject Learning Outcomes (SLOs)

On completion of this subject students will be able to:

1. Identify weeds and explain their importance in PNG and the Pacific;
2. Describe the biology and ecology of weeds;
3. Assess the economic impacts of weeds and decision-making in agricultural production;
4. Apply the biological knowledge in managing weed populations in varying agro-ecosystems;
5. Design a management strategy and use available management tools to control weedy species;
6. Evaluate an integrated weed management program.

Assessment Tasks and Weightings

Students must attain at least 50% overall in the subject. There will be a final written examination weighing 50% and 50% formative assessment.

Formative assessments

Tests: There will be 3 tests (AT3, AT5, AT8) each weighing 10%. AT3 will be given after subject topic 2 (ST2), AT5 after ST4 and AT8 after ST6. AT8 will be a field-oriented or practical test.

Lab report: A work-done report/s for practical sessions and field trips weighing 20%.

AT1: Lab practical 1: Weed sampling, identification & distribution

AT2: Lab practical 2: Tri trophic interactions

AT4: Lab practical 3: Weed control: cultural practices

AT6: Lab practical 4: Herbicide classification and effects on targets and non-targets

AT7: Lab practical 5: Weed control: conventional practices

Final written examination: AT9 is 2 ½ hour written examination weighs 50%.

Subject Text

Zimdahl, R. L. 2018. Fundamentals of Weed Science. (5th Edn.). Academic Press, USA.

References

Monaco, T.J., Weller, S.C. and Ashton, F.M. 2002. Weed Science: Principles and Practices. (4th Edn.), Wiley-Blackwell, New York, USA.

Niugini Agrisaiens Journal, Available at: www.unitech.ac.pg/node/756

www.weedscience.org

Readings

Hajek, A.E. 2004. Natural Enemies: An Introduction to Biological Control. (1st Edn.), University Press, Cambridge, UK.

AG 222 AGRIBUSINESS MANAGEMENT AND ENTREPRENEURSHIP

Course(s)	Agriculture (NQF Level 7)
Subject Name	Agribusiness Management and Entrepreneurship
Subject Code	AG 222
Duration	13 teaching weeks
Contact Hours	6 hours per week [4 Lecture+ 2 Tutorials + 0 Lab]
Credit Points	22
Delivery Mode	On campus
Prerequisites	Nil
Co-requisites	Nil
Subject Coordinator	TBA

Synopsis

The subject provides students with an overarching introduction to the transition of agribusiness from traditional agriculture and differentiates between agribusiness, commerce and entrepreneurship and understanding their relationships for managing profitable business enterprises. The subject gives an outline of basic agribusiness principles relevant to material and income flows in the product supply chain, the role and functions of marketing to create

value additions, information keeping systems for planning, financial analysis and risk management to enhance growth and profitability. This subject will provide necessary foundation for further studies on supply chain analysis, marketing and forecasting, financial and risk management related to capital and enterprise management.

Subject Topics

1. Definitions and issues in agribusiness and entrepreneurship
2. Supply chain analysis
3. Target Market analysis
4. Managing information & planning methods
5. Managing risk and uncertainty
6. Agribusiness/entrepreneurship environment

Subject Outline

Topic	Content
1. Definitions and issues in agribusiness and entrepreneurship	<p>The rise of agribusiness: traditional agriculture, transition to agribusiness, commerce and entrepreneurship, and the factors that gave rise to the transition.</p> <p>Definitions: agribusiness, commerce, entrepreneur, entrepreneurship and agribusiness management.</p> <p>Goals and decisions: setting goals and the decision-making process; characteristics of a good manager and entrepreneur</p> <p>Influences of agribusiness environment: Internal: (i) Production: climatic conditions, pests and diseases, and land, (ii) People: managers, co-workers. External: input suppliers, service providers, credit providers, markets, government policy</p>
2. Supply (value) chain analysis	<p>Definition of supply (value) chain, supply (value) chain management</p> <p>The nodes of the supply chain: Input supply, production, processing, logistics, wholesale, retail, final consumer; functions of the nodes of the supply chain.</p> <p>The management of physical and money flow in the supply chain</p>
3. Target market analysis	<p>Definitions: target market and target market analysis.</p> <p>Marketing functions: exchange, physical and facilitating functions</p> <p>Methods for identifying the market to be targeted: gross margin analysis (product selection), comparative advantage (location, product), competitors, logistics (SWOT)</p> <p>Promotion: market research, branding, pricing strategies</p>
4. Managing information and planning	<p>Records: physical and financial records</p> <p>Farm assets: valuation of agribusiness assets and depreciation methods,</p>

	<p>Financial statements: Balance statement, profit and loss statement, sources and uses of cash flow and performance ratio analysis</p> <p>Appraisal of investments: time value of money, net present value, benefit-cost ratio, payback period and internal rate of return</p> <p>Credit analysis: types and functions of credit, credit institutions and equal and unequal repayment methods.</p>
5. Differentiate risk and uncertainty and apply risk mitigating approaches in agribusiness enterprises	<p>Risk and uncertainty: distinction between risk and uncertainty, types of risk and causes of business and financial risks: production uncertainty, price uncertainty, casualty risk and technological uncertainty variation in prices of product and types of and acquisition of capital</p> <p>Methods for risk analysis: mean, variance and standard deviations</p> <p>Risk reducing strategies:</p> <p>Financial strategies: carry cash reserves, and borrowing</p> <p>Marketing strategies: Hedging, forward contracting, spreading sales</p> <p>Production strategies: diversification and flexibility</p>
6. Agribusiness environments conducive for agribusiness to develop and thrive	<p>Business environment: Definition and types</p> <p>Useful enablers: business linkages, business development services, ease of doing business</p> <p>Important enablers: Financial services, research and development, standards and regulations</p> <p>Essential enablers: Trade policy, Infrastructure, land tenure, property rights, tax and labour deregulation</p>

Subject Learning Outcomes (SLOs)

On completion of this subject students will be able to:

1. Understand the background of agribusiness, identify and conduct supply (value) chain analysis
2. Conduct target market analysis and determine product, price, place and promotion strategies to reduce cost and improve profitability.
3. Construct financial statements, investment analysis and develop farm planning methods as processes for establishing and growing agribusiness enterprises.
4. Differentiate risk and uncertainty and apply risk mitigating approaches in agribusiness enterprises
5. Understand the external and external business environments conducive for agribusiness to develop and thrive.

Assessment Tasks and Weightings

Students must attain at least 50% overall in the subject. There will be a final written examination weighing 50% and 50% formative assessment.

Formative assessments

Tests: There will be 2 tests each weighing 15%

AT 1: Test 1 in the first half of the semester

AT2: Test 2 in the second half of the semester

Business Plan: Group work-done reports for business plans (BP) weighs 20%. There will be 4 practical sessions of the business plan, each worth 5%. Each practical session will be conducted over a 3-week period. Students should submit group reports.

AT3: Practical 1. Background: vision, mission, objectives, and SWOT analysis

AT4: Practical 2. Market analysis and production strategy

AT5: Practical 3. Financials: Financial, profit and loss, and sources and uses of cash flow statements

AT6: Practical 4. Final report

Final written examination: A 2 hour written examination weighs 50%.

Subject Text

Barnard, C.S. and Nix, J. S. 1979. Farm Planning and Control, Cambridge University Press, Cambridge, UK.

Dillon, D.L. and Hardaker, J.B. 1980. Farm Management Research for Small Farmer Development, FAO, Rome, Italy

Lee, W.F., Boehlje, M.D., Nelson, A. G., and Murray, W.G.1980. Agricultural Finance. The Iowa State University Press, Ames, USA.

Sadoulet, E. and de Janvry, A. 1995. Quantitative Development Policy Analysis, Johns Hopkins University Press, Baltimore, USA.

References

Nil

Readings

Lecture notes and power point outlines will be uploaded to the google classroom.

AG 223 ANIMAL NUTRITION

Programs	Agriculture (NQF Level 7)
Subject Name	Animal Nutrition
Subject Code	AG 223
Duration	13 weeks
Contact Hours	6 hours per week [3 Lectures+ 0 Tutorials+ 3 Lab]
Credit Points	18
Delivery Mode	On campus
Prerequisites	AG111, AG114
Co-requisites	Nil
Subject Coordinator	TBA

Synopsis

The subject deals with chemistry, digestion and metabolism of carbohydrate, proteins, lipids, minerals and vitamins and their requirements, deficiency symptoms of nutrients in farm animals. Topics on energy metabolism; anti-nutritional factors and feed additives will be

covered. Students will have the opportunity to learn estimation of pasture yield, management of animals on pasture, methods of conservation of feeds and fodder and feed budgeting. Certain elements of feed technology including *in vitro* and *in vivo* evaluation of feed, feed formulation for different animals and production types including use of local feed resources will be emphasized. Finally, students will learn to prepare mineral mixtures.

Subject Topics

1. Chemistry, digestion and metabolism of nutrients
2. Nutrient requirements, feeding standards and feeding management of farm animals
3. Feed evaluation
4. Feed budgeting and management of animals on pasture
5. Conservation of feeds and fodder
6. Feed formulation

Subject Outline

Topics	Contents
Chemistry, digestion and metabolism of nutrients	Review of chemistry of carbohydrates, proteins, lipids, digestion and metabolism of nutrients.
Nutrient requirements, feeding standards and feeding management of farm animals	Energy metabolism. Nutrient requirements of animals as per ARC/NRC for different classes and production types of animals, feeding management. Optimization of feed utilization
Feed evaluation	<i>In vitro</i> and <i>in vivo</i> evaluation of feeds, digestibility trials.
Feed budgeting and management of animals on pasture	Review of forage crops. Estimation of pasture yield, grazing management.
Conservation of feed and fodder.	Silage making, hay making, enhancing the quality of roughages, important aspects of feed technology.
Feed formulation	Feed formulation, preparation of mineral mixtures. Use of local feed resources

Subject Learning Outcomes

On completion of the subject the student will be able to:

1. Compare nutrient content of different feeds;
2. Outline digestion and metabolism of nutrients;
3. Assess nutrient requirements of different classes of animals;
4. Apply pasture management practices;
5. Demonstrate various methods of feed conservation and feed technology;
6. Formulate and prepare compound feed and mineral mixtures.

Assessment Tasks and Weightings

Students must attain at least 50% overall in the subject. There will be a final written examination weighing 50% and 50% formative assessments

Formative assessments

AT1 Tests: There will be 3 tests weighing 20%

AT2 Assignments: weighing 10%

AT3 Lab reports: A work-done report/s for practical sessions weighs 20%

AT4 Final written examination: A 2½ hour written examination weighs 50%

Text books

McDonald, P., Greenhalgh, J.F.D., Morgan, C.A., Edwards, R. and Sinclair, L. 2011. Animal Nutrition (7th Edn.), Pearson Education Ltd, UK

Strickler, D. 2019. Managing Pasture: A Complete Guide to Building Healthy Pasture for Grass-Based Meat & Dairy Animals, Storey Publishing, LLC, Massachusetts, USA

References

Chiba, L.I. 2014. Animal Nutrition Hand book (Edn.), USA.

Reddy, D.V. 2001. Principles of Animal Nutrition and Feed Technology. Oxford and IBH Publishing Co. Pvt. Ltd. India.

Reddy, D.V. 2006. Applied Animal Nutrition. Oxford and IBH Publishing Co. Pvt. Ltd. India

Readings

Materials posted on the class room.

As informed in the class from time to time.

AG 224 AGRONOMY II

Programs	Agriculture (NQF Level 7)
Subject Name	Agronomy II
Subject Code	AG224
Contact hours	6 hours per week (3 Lecture + 1 Tutorial + 2 Lab)
Duration	13-week semester
Credit Points	18
Delivery Mode	On campus
Prerequisites	AG211
Co-requisites	Nil
Subject Coordinator	TBA

Synopsis

Agronomy II is the subject that covers annual and perennial crops of socio-economic importance grown in Papua New Guinea (PNG) as well as other countries. This subject teaches knowledge and skills sets of respective annual and perennial crops and touches on the origin, distribution and the importance of the crops; the botanical features of the crops covered; requirements for growth, development and production e.g., soils and climatic conditions; and cultivation and management practices. These study areas should essentially provide sufficient foundational knowledge and skills to students taking up this subject, and apply the same in any annual and perennial crop production systems.

Subject Topics (ST)

1. Introduction and general background of crops.
2. General morphological characteristics of crops.
3. Suitable agro-ecological environment.
4. Cultivation systems.
5. Management systems.

Subject Outline

Topic	Content
1. Introduction and general background of crops	Origin, botanical names & family, distribution, common cultivars & varieties, and importance & uses of annual and perennial crops.
2. Morphological characteristics of crops	General characteristics of below and above-ground organs including, root system, stem type, leaf morphology, flowers, fruits, and seeds.
3. Agro-ecological environment	Suitable agro-ecological conditions for crop growth: characteristics of soil; climatic conditions (rainfall, temperature, day-length, humidity, altitude, and etc.).
4. Cultivation systems	Cultivation practices beginning from site selection, nursery preparation, land

	preparation, selection of propagules, crop establishment (planting) and harvesting.
5. Management systems	Nursery and field management practices including control of insect pests, diseases and weeds; fertilizer application, pruning & thinning, and irrigation.

Subject Learning Outcomes (SLOs)

After completing this subject student will possess the skills and knowledge to:

1. Discuss the origin, distribution and the importance of annual and perennial crops.
2. Illustrate and explain the common morphological features of annual and perennial crops.
3. Explain the agro-ecological conditions suitable for crop growth.
4. Discuss the cultivation practices and crop establishment for the annual and perennial crops.
5. Relate the effects of management practices applied to crop production.

Assessment Tasks and Weightings

Students must attain at least 50% overall in the subject. The assessment types and weightings for formative assessment and a final written examination are:

Tests: There will be 3 tests (AT1-Test1, AT2-Test2, AT3-Test3) each weighing 10%.

Sequence of test administration: AT1 given after ST1 and ST2; AT2 given after ST3; and AT3 given after ST4 and mid ST5.

Lab report: Written report(s) for all practical sessions weighs 20%

There are five (5) laboratory practicals (LP) to be given, each weighing 4%. The LPs will be delivered in the following sequence: ST1-LP1; ST2-LP2; ST3-LP3; ST4-LP4, and ST5-LP5.

Areas of investigation for LPs are:

AT4-LP1: Impacts of annual and perennial crops on livelihood of farming communities.

AT5-LP2: Comparison of morphological features of dicot and monocot crops.

AT6-LP3: Distribution of annual and perennial crops in PNG.

AT7-LP4: Preparation of nursery and seed establishment.

AT8-LP5: Bud-grafting and pruning of cocoa.

For written reports of LPs (marked out of 20 points), it is emphasized that a standard format of scientific experimental reporting is followed.

Final written examination (FE): A 2½ hour written examination weighs 50%

Subject Textbook

Jenkins, A. 2016. Agricultural Crop Production. Callisto Reference, New South Wales, Australia

Jenkins, A. 2016. Agronomy and Crop Production. Syrawood Publishing House, New South Wales, Australia.

References

Michael, R. and Harwood, T. 2009. Food and Agriculture in Papua New Guinea. ANU E Press, Canberra, Australia.

Purseglove, J.W. 1972. Tropical Crops: Monocotyledons Vols. 1 and 2. Longman: London, England.

Purseglove, J.W. 1972. Tropical Crops: Dicotyledons Vols. 1 and 2. Longman: London, England.

Readings

Lecture Notes and power-point presentations (supplementary notes). The Google search engine (www.google.com) is amassed with educational material. Students are encouraged to exploit this internationally popular website. Almost every topic pertaining to Agronomy II can be accessed, in images or texts, at this information search engine.

AG311 ANIMAL MANAGEMENT I

Course(s)	Agriculture (NQF Level 7)
Subject Name	Animal Management I
Subject Code	AG311
Duration	13 teaching weeks
Contact hours	6 hours per week (3 Lecture+ 3 Lab.)
Credit Points	16
Delivery Mode	On campus
Prerequisites	Nil
Co-requisites	Nil
Subject Coordinator	TBA

Synopsis

This subject deals with the husbandry and management of monogastric farm animals. It aims at elucidating the components of animal production systems and their influence on productivity and efficiency. It deals with production systems, welfare, ethics, principles of animal production, and certain aspects of physiology and anatomy of farm animals with special reference to adaptation to the environment. It discusses the genetic resources, feeding, housing, current husbandry practices, mating, dam-offspring relationships and the care of the neonates, product harvesting and quality aspects of chickens and pigs. Emphasis is given to the role of livestock in the present and future development of PNG and to the sustainability and integration of animals into mixed farming systems. The material covered is largely introductory with the aim of giving the student general knowledge in animal production so he/she can recognize and access the knowledge and skills of specialists such as veterinarians, nutritionists and breeders for help where necessary.

Subject Topics

1. Definitions and concept of animal production.
2. Animal welfare, ethics and behaviour.
3. Animal farming systems.
4. Review of basic animal physiology.
5. Management of poultry.
6. Management of pigs.
7. Principles of aquaculture.

Subject Outline

Topic	Content
1. Definitions and concept of animal production	Farm animal species of PNG and their uses, concept and definitions of animal management, sociological aspects of animal production in PNG, issues of animal production in PNG. Principles of farm animal production, domestication and classification of farm animals.

2. Animal welfare, ethics and behaviour	Concepts of animal welfare, ethics and behavior. Assessment of animal behaviour and welfare.
3. Animal farming systems	Components of global animal production systems, advantages and limitations of different animal farming systems including exploitation, extensive; transitional; intensive as well as mixed crop and animal systems.
4. Review of basic animal physiology	Basic principles of animal reproduction, growth, nutrition, health, and adaptation and their relationship to efficiency of animal production.
5. Management of poultry	Genetic resources, terminologies and body parts, production systems, intensive systems of managing broilers (brooding, grow-out, feeding, health, housing processing and equipment). Village chicken production systems and their improvement. Intensive systems of layer production, reproduction in chickens and physiology of egg laying. Hatchery practices.
6. Management of pigs	Intensive systems of pig production – genetic resources, terminologies, housing, equipment, feeding, reproduction and care of young, maintenance of health and disposal of effluent. Village and extensive pig production systems.
7. Principles of aquaculture	Significance, history, status and trends in PNG and in the world; concepts of aquaculture; principles of fish production; characteristics of different cultivable species (fresh, brackish and marine waters), rearing media for aquaculture systems (e.g., ponds, cages, pens and tanks), types, operations and management of culture systems; water parameters; feeds and feeding; harvesting, processing and marketing techniques.

Subject Learning Outcomes (SLOs)

On completion of this subject students will be able to:

1. Explain the processes and factors involved in producing good quality products and by-products from animals.
2. Discuss farm animal welfare, ethics and behavior necessary for managing farm animals and designing production facilities.
3. Discuss the elementary physiology, the environmental and sustainability issues associated with farm animal production.
4. Analyze the factors that affect productivity and efficiency of farm animals.
5. Design a schedule of husbandry programs for managing the major farm animal species of PNG.
6. Discuss the role of animals in agriculture; and describe how animals can be integrated into a sustainable system involving crops and other land use practices.

Assessment Tasks and Weightings

Students must attain at least 50% overall in the subject. There will be a final written examination weighing 50% and 50% formative assessment.

Formative assessments

Quizzes: there will be three quizzes, based on the reading materials. These quizzes will contribute total of 15% to continuous assessment.

AT 1: Quiz 1 in the first half of the semester weighing 5%.

AT 2: Quiz 2 in the first half of the semester weighing 5%.

AT 3: Quiz 3 in the second half of the semester weighing 5%.

AT 4: Test 1 in the first half of the semester weighing 10%.

AT 5: Test 2 in the second half of the semester weighing 10%.

Lab reports: Based on a practical work done on brooding and grow-out of broiler chickens. Students will work in groups and each group will produce a single report. Members of each group will also produce a peer assessment of each other. Group report and peer assessment will contribute 10% and 5% respectively to continuous assessment.

AT 6: Practical 1a. Report on broiler brooding and grow out practical project.

AT 7: Practical 1b. Students peer assessment of each other in groups.

AT8: Final written examination: A 2-3 hour written examination weighs 50%.

Assessment Rubrics

Lab Reports

All lab reports should be word-processed and electronic copies submitted through Google classroom. Individual reports will be assessed.

Laboratory Report Contents	1 Beginning or incomplete	2 Developing	3 Accomplished	4 Exemplary	Score
Introduction (4)	Very little background information provided or information is incorrect (1)	Some introductory information, but still missing some major points (2)	Introduction is nearly complete, missing some minor points (3)	Introduction complete and well-written; provides all necessary background principles for the experiment (4)	
Procedure (4)	Missing several important experimental details or not written in paragraph format (1)	Written in paragraph format, still missing some important experimental details (2)	Written in paragraph format, important experimental details are covered, some minor details missing (3)	Well-written in paragraph format, all experimental details are covered (4)	
Results/ Observations Data, figures, graphs, tables, etc. (8)	Figures, graphs, tables contain errors or are poorly constructed, have missing titles, captions or numbers, units missing or incorrect, etc. (2)	Most figures, graphs, tables OK, some still missing some important or required features (4)	All figures, graphs, tables are correctly drawn, but some have minor problems or could still be improved (7)	All figures, graphs, tables are correctly drawn, are numbered and contain titles/captions. (8)	
Interpretation/ Conclusions (6)	Conclusions missing or missing the important points (2)	Conclusions regarding major points are drawn, but many are misstated, indicating a lack of understanding (4)	All-important conclusions have been drawn, could be better stated (5)	All-important conclusions have been clearly made; student shows good understanding (6)	
Spelling, grammar, sentence structure (4)	Frequent grammar and/or spelling errors, writing style is rough and immature (1)	Occasional grammar/spelling errors, generally readable with some rough spots in writing style (2)	Less than 3 grammar/spelling errors, mature, readable style (3)	All grammar/spelling correct and very well-written (4)	

Appearance and formatting (4)	Sections out of order, too much handwritten copy, sloppy formatting (1)	Sections in order, contains the minimum allowable amount of handwritten copy, formatting is rough but readable (2)	All sections in order, formatting generally good but could still be improved (3)	All sections in order, well-formatted, very readable (4)	
TOTAL (30)	8	16	24	30	
Comments for improvements					

Subject Textbook

1. Mack O. North, 1990. Commercial chicken production. Kluwer Academic Publishers
2. Payne, W.J.A. 1990. An Introduction to Animal Husbandry in the Tropics (4th Edn). Longman Scientific & Technical, New York, USA

References

Avault, J.W. Jr. 1996. Fundamentals of Aquaculture: A Step-By-Step Guide to Commercial Aquaculture. Ava Publishing Co, West Sussex, UK

Hide, R. 2003. Pig Husbandry in New Guinea: A literature review and bibliography. ACIAR Monograph No. 108. Xvi+291p, Canberra, Australia

Niugini Agrisaiens Journal, Available at: www.unitech.ac.pg/node/756

Papua New Guinea Journal of Agriculture, Forestry and Fisheries

Stickney, R.R. 1994. Principles of Aquaculture. John Wiley, New York, USA

Zade, S.B., Khune, C.J., Sitre, S.R., Tijare, R.V. 2011. Principles of Aquaculture. Himalaya Publishing House, New Delhi, India.

Readings

Lecture notes and power point outlines will be uploaded to the Google classroom.

AG312 RESEARCH METHODS I

Course(s)	Agriculture (NQF Level 7)
Subject Name	Research Methods 1
Subject Code	AG312
Duration	13 teaching weeks
Contact hours	6 hours per week (3 Lecture+ 3 Tutorial)
Credit Points	18
Delivery Mode	On campus
Prerequisites	AG124 Agricultural Experimentation
Co-requisites	Nil
Subject Coordinator	TBA

Synopsis

This subject deals with the application of the scientific method to finding acceptable solutions to problems in agriculture. Content is based mainly on the theory and procedures of scientific research and their applications to crop and livestock production systems as well as socio-economic aspects of research. The objective is to impart knowledge and skills necessary for carrying out independent research in agriculture so that the results obtained are valid and acceptable to stakeholders.

Subject Topics

1. Concept and characteristics of scientific research
2. Research ethics
3. Research proposal
4. Introduction to experiments in agriculture
5. Introduction to surveys and qualitative research in agriculture

Subject Outline

Topic	Content
1. Concept and characteristics of scientific research	Definition, concept and characteristics of research, the logical framework for research projects, quantitative and qualitative research
2. Research ethics	Definition and explanation of ethics, background of the development of research ethics, the guiding principles of ethics in research
3. Research proposal	Outline the main sections of a research proposal, research topics, problems, questions, aims/goal/purpose and objectives, scope, hypothesis, expected outcomes, materials and methods/methodology, audience. Literature review and sources Citing and referencing scientific literature Sources of literature and their evaluation
4. Introduction to agricultural experimentation.	Experiments versus observational studies, types and principles of experimentation, experimental error Review of experimental designs in agriculture and their importance Stages of experimentation
5. Surveys and qualitative research in agriculture	Selection of a survey study design, identification of study variables and measurements. Methods of data collection. Ethical issues concerning the research participants, researchers and funding organizations. Coding the information collected for data analysis Understand the methods used in survey data analysis and the role of computers. Presentation skills (oral and written).

Subject Learning Outcomes (SLOs)

On completion of this subject students will be able to:

1. Define and/or explain terminologies used in agricultural research
2. Discuss the basic principles and components of research and the scientific method
3. Differentiate between observational studies and experiments in agriculture
4. Produce a research proposal
5. List and explain the various steps involved in agricultural experimentation and surveys
6. Debate and assess the ethics of research.

Assessment Tasks and Weightings

Students must attain at least 50% overall in the subject. There will be a final written examination weighing 50% and 50% formative assessment.

Formative assessments

Quizzes: there will be two quizzes, one in each half of the semester, based on the reading materials. Each quiz will contribute 5% to continuous assessment.

AT 1: Quiz 1 in the first half of the semester

AT 2: Quiz 2 in the second half of the semester

Tests: There will be 2 tests weighing 15%

AT 3: Test 1 in the first half of the semester weighs 5%

AT 4: Test 2 in the second half of the semester weighs 10%

Assignment on proposal writing: Each student will work with a lecturer in the School to select a research topic and produce a complete proposal. The proposal should include the following: 1) Title and names of researcher and supervisor; 2) An introduction clearly stating the research problem, research questions, research aims/goal/purpose and justification, scope, objectives, hypothesis, expected outcomes, audience (those who will benefit) of the research; 3) logical framework; 4) Literature review; 5) Materials and methods/methodology; 6) Time schedule or Gantt Chart; 7) Budget. 8) Acknowledgements, 9) References

Students should submit individual reports. Reports should be submitted before the end of the semester. This assignment will contribute 10% to continuous assessment

AT5: Assignment 1. Writing of research proposal

Seminar presentation of research proposal: Each student will present his/her research in a School seminar which will be organized towards the end of the semester by the School Seminar Coordinator. **This presentation is compulsory and students who do not make a presentation will fail the subject.** This presentation will contribute 15% to continuous assessment.

AT 6: Presentation of research proposal at School Seminar

AT 7: Final written examination: A 2-3 hour written examination which will contribute 50% to overall assessment.

Assessment Rubrics

Writing of research proposal

All written reports should be word-processed and electronic copies submitted through Google classroom or other learning management system. Individual reports will be assessed.

Writing of research proposal Contents (Total = 20 marks)	1 Beginning or incomplete	2 Developing	3 Accomplished	4 Exemplary	Score
Title (1)	Missing or poorly crafted, does not reflect objectives and aims of the study, vague, too long or too short. (0.5)	Some major aspects of a good title are missing (0.5)	The title nearly reflects the objectives of the proposal; but misses out a bit on other aspects of a good proposal (1)	The title reflects the objectives of the proposal; It is neither misleading, nor vague; it is of appropriate length and gives a hint of the main aims of the study. (1)	
Introduction (4)	Very little background information provided or information is incorrect; poorly articulated research problem and questions. Little or no citation of current literature. The hypothesis, aim and objectives of the study are unclear and difficult to understand. The project objectives are not measurable and cannot be achieved within the timeframe of approximately 9 months (1)	Some introductory information given, but still missing some major points in relation to objectives, aims, research problem, question, hypothesis etc. (3)	Introduction is mostly complete but missing some minor points. (4)	Introduction complete, background of the proposal is clearly stated and described in a compelling manner. The problem, research question and significance of the study are well articulated. Proposal well supported by current literature. The hypothesis, aim and study objectives are clear, concise and easy to understand. The study objectives are	

				measurable and can be achieved within the timeframe of approximately 9 months. (4)	
The Logical Framework for Research Projects (2)	Many aspects are poorly written or missing (0.5)	Some aspects are well written but many other aspects poorly written or missing (1)	Logical framework is nearly complete, missing some minor points (1.5)	All aspects are well written. (2)	
Literature review (4)	Generally poor review, not current (>10yrs), not well related to the study and previous work done in the School or similar environment, Literature source is not authentic, Number of citations is too many or too few (2.5)	Review is average and few are current (within last 10yrs), somewhat related to study and previous work done in the School or similar environment, Literature source is authentic. Only few of citations appropriate (3)	Generally good review but missing a few areas of the study; Review is current (within last 10yrs), original, relevant to the study and related to previous work done in the School or similar environment where possible, Literature source is mostly authentic Number and of citations is mostly appropriate (3.5)	Review is current (within last 10yrs), original, relevant to the study and related to previous work done in the School or similar environment where possible, Literature source is authentic Number and quality of citations is appropriate (4)	
Materials and methods/methodology (4)	Most materials to be used are not mentioned, methods are poorly written not in logical order excludes units of measurement. Poorly described study location, study design,	Missing some important details of materials and methods (3)	Nearly well written, most materials mentioned, important aspects of methods are covered, some minor details missing (4)	All materials to be used are mentioned, methods are well written in logical order including units of measurement. Clearly described study location, study design, experimental or	

	experimental or sampling procedures, data collection, and data analysis. The approach to be used is not appropriate for the project (1)			sampling procedures, data collection, and data analysis. The approach to be used is appropriate for the project. (4)	
Time schedule or Gantt Chart; Budget. Acknowledgements, and References (2)	Most aspects missing or poorly described including citations and referencing of the literature (0.5)	Written yet still missing some important details, major mistakes with citations and referencing of literature source (1)	Nearly well written, most important aspects are covered, some minor details missing, minor mistakes with citations and referencing of literature sources (1.5)	All aspects well described. All in-text citations and other sighted literatures are clearly written on the reference list. APA referencing style is preferable. (2)	
Spelling, grammar, sentence structure and presentation of report (3)	Frequent grammar and/or spelling errors, writing style is rough and immature. Sections out of order, too much handwritten copy, sloppy formatting (0.5)	Occasional grammar/spelling errors, generally readable with some rough spots in writing style. Sections in order, contains the minimum allowable amount of handwritten copy, formatting is rough but readable (1)	Less than 3 grammar/spelling errors, mature, readable style. All sections in order, formatting generally good but could still be improved (2.5)	All grammar/spelling correct and very well-written. All sections in order, well-formatted, very readable (3)	
TOTAL 20	6.5	12.5	18	20	
Comments for improvements					

Seminar presentation of research proposal

Electronic copies of all presentations should be submitted through Google classroom or other learning management system. Individual submissions will be assessed.

Seminar presentation of research proposal Contents (Total = 20 marks)	1 Beginning or incomplete	2 Developing	3 Accomplished	4 Exemplary	Score
Presentation (6)	Speaker does not maintain good eye contact with the audience; voice is hardly audible and unclear; Delivery is uncontrolled, and rough; Poor language skills and pronunciation are used; Visual aids are poorly prepared, uninformative and ineffective; Length of presentation is outside the assigned time limits. Information - poorly communicated. (1)	A few basic aspects of a good presentation are evident, but still missing some major points (3)	Most aspects of a good presentation are evident, but still missing some minor points. (5)	Speaker maintains good eye contact with the audience; Uses a clear, audible voice; Delivery is poised, controlled, and smooth. Good language skills and pronunciation are used; Visual aids are well prepared, informative and effective; Length of presentation is within the assigned time limits. Information - well communicated. (6)	
Knowledge (6)	Introduction, problem statement, review of the problem, research question and hypothesis are poorly presented in a logical sequence; knowledge gap not articulated, research method not appropriate, study design and	A few basic aspects of a good knowledge of the research area are evident, but still missing some major points (3)	A most aspects of a good knowledge of the research area are evident, but still missing some few points (5)	Introduction, problem statement, review of the problem, research question and hypothesis are presented in a logical sequence; Identifies knowledge gap, uses appropriate research methods, study design and statistical	

	statistical analysis not mentioned; Poor use of appropriate technical terms, citations and references (1)			analysis; Uses appropriate technical terms, citations and references (6)	
Quality of slides (2)	Poor quality of slides; font size out of range, poor contrast and visibility, too many sentences/slides; too many slides, poor colour schemes (1)	A few basic aspects of slide quality have been met but major parts are missing or poor (1)	Almost all aspects of slide quality have been met but few parts are missing (1.5)	Good quality of slides; good font size, good contrast and visibility, appropriate number of sentences/slides; good number slides for time allocated, good use of colour schemes (2)	
Questions and answers (3)	Unable to understand questions; answers are incorrect or unclear (0.5)	Some effort is made to understand questions and give correct answers (1)	Most questions well understood and answers were correct but missed a few (1.5)	Able to understand questions thoroughly and gives correct and clear answers (3)	
Attendance and performance throughout the semester (3)	Present only 10% or less of the time allocated to consult with the supervisor; poor understanding of the project, little or no effort towards completion of project. (1)	Consults with supervisor up to 50% of the time, fair understanding of the project and average effort towards completion of project (1.5)	Consults with supervisor more than 50% of the time, more than average understanding of project and good effort towards completion of project. (2.5)	Consults with supervisor all of the time allocated, very good understanding of project and extra effort input towards completion of project. (3)	
TOTAL 20	4.5	9.5	15.5	20	
Comments for improvements					

Subject Textbook

1. Kumar, R. 2018. Research Methodology: A Step-by-Step Guide for Beginners. (5th Edn.). SAGE Publications, California, USA, 528p.

References

1. Bailey, K. D. 1978. Methods of Social Research (3rd ed.) New York, The Free Press.
2. Kelley. K, Clark, B. and Sitzia, J. 2003. Good Practice in the Conduct and Reporting of Survey Research. Research Department, Worthing & Southlands Hospitals, NHS Trust, Worthing, West Sussex, UK.
3. Niugini Agrisaiens Journal, Available at: www.unitech.ac.pg/node/756
4. Rangaswamy, R. 1995. A Textbook of Agricultural Statistics. (1st Edn.) New Age International Publishers. New Delhi, India, 496p.

Readings

Lecture notes and power point outlines will be uploaded to the google classroom.

AG313 ANIMAL HEALTH AND DISEASES

Course(s)	Agriculture (NQF Level 7)
Subject Name	Animal Health and Diseases
Subject Code	AG313
Duration	13 teaching weeks
Contact hours	6 hours per week (3 Lecture+ 3 Lab)
Credit Points	16
Delivery Mode	On campus
Prerequisites	AG114 Physiology and Anatomy of Animals
Co-requisites	Nil
Subject Coordinator	TBA

Synopsis

The subject deals with study of epidemiology and immunology of animals. Students study identification of healthy and diseased animals, diseases caused by microorganisms, protozoa and parasites in farm animals including poultry, their symptoms, treatment and control. Some aspects of biosecurity are also covered. Emphasis will be given to integrated parasite management, metabolic diseases in productive animals, procedure of clinical examination, and methods of administration of drugs. Basic information of exotic diseases, post mortem techniques, collection and dispatch of specimen for diagnoses will also be taught.

Subject Topics

1. Epidemiology and clinical examination
2. Diseases caused by bacteria and viruses in farm animals
3. Diseases caused by internal and external parasites in farm animals
4. Drugs and their dosages used in treating farm animals
5. Vaccination schedule and biosecurity
6. Post mortem techniques

Subject Outline

Topic	Content
1. Epidemiology and clinical examination	Definitions of various terms used in epidemiology, measures of health, association, study design and diagnostic tests.
2. Diseases caused by bacteria and viruses in farm animals	Immunology, bacterial diseases, lameness in sheep, edema disease, coryza, etc., Viral diseases: Foot and mouth, Blue tongue, Scrapie, ASF, CSF, ND, Marek's IBD, etc. Treatment and control measures
3. Diseases caused by internal and external parasites in farm animals	Nematodes: Ascaris, haemonchus, verminous pneumonia, Trematodes: Fascioliasis, Protozoa: Babesia, arthropods: Flies, fleas, ticks and mites infestation. Treatment and control measures
4. Drugs and their dosages used in treating farm animals	Antiseptics and disinfectants and their uses; Various drugs and preparations used for treatment, and prophylaxis. Their dosage, route of administration.
5. Vaccination schedule and biosecurity	Vaccination methods and schedule for farm animals. Biosecurity principles and procedures.
6. Post mortem techniques	Post mortem procedures, collection and dispatch of specimen for diagnostic purposes. Abattoir practices, ante-mortem and post mortem examination of food animals.

Subject Learning Outcomes (SLOs)

On completion of this subject students will be able to:

1. Carry out clinical examination of the animals and identify diseases
2. Adapt suitable treatment and recommend control measures
3. Calculate and administer required quantity of drugs through proper route
4. Apply proper measures for sanitation of animal houses and equipment
5. Choose and implement proper prophylactic and biosecurity measures
6. Adapt suitable post mortem techniques, collect samples properly and dispatch them

Assessment Tasks and Weightings

Students must attain at least 50% overall in the subject. There will be a final written examination weighing 50% and 50% formative assessment.

Formative assessments

Tests: There will be 3 tests each weighing 10%

AT 1: Test 1 during 3rd week weighing 10%

AT 2: Test 2 during 7th week weighing 10%

AT 3: Test 3 during 10th week weighing 10%

AT4: Field trip report including assignment weighing 10%

AT5: Lab reports weighing 10%

AT6: Final written examination: A 2 hour written examination which will contribute 50% to overall assessment.

Assessment Rubrics

Lab reports

NOTE: it is assumed that all lab reports will be word-processed. Individual reports will be assessed while taking into account the overall teamwork.

Laboratory Report Contents	1 Beginning or incomplete	2 Developing	3 Accomplished	4 Exemplary	Score
Introduction	Very little background information provided or information is incorrect (1)	Some introductory information, but still missing some major points (2)	Introduction is nearly complete, missing some minor points (3.5))	Introduction complete and well-written; provides all necessary background principles for the experiment (5)	
Experimental procedure or methodology	Missing several important experimental details or not written in paragraph format (1)	Written in paragraph format, still missing some important experimental details (2)	Written in paragraph format, important experimental details are covered, some minor details missing (3.5))	Well-written in paragraph format, all experimental details are covered (5)	
Results: data, figures, graphs, tables, etc.	Figures, graphs, tables contain errors or are poorly constructed, have missing titles, captions or numbers, units missing or incorrect, etc.	Most figures, graphs, tables OK, some still missing some important or required features (2)	All figures, graphs, tables are correctly drawn, but some have minor problems or could still be improved (3.5))	All figures, graphs, tables are correctly drawn, are numbered and contain titles/captions. (5)	

	(1).				
Discussion	Very incomplete or incorrect interpretation of trends and comparison of data indicating a lack of understanding of results (1)	Some of the results have been correctly interpreted and discussed; partial but incomplete understanding of results is still evident (2)	Almost all of the results have been correctly interpreted and discussed, only minor improvements are needed (3.5))	All-important trends and data comparisons have been interpreted correctly and discussed; good understanding of results is conveyed (5)	
Conclusions	Conclusions missing or missing the important points (1)	Conclusions regarding major points are drawn, but many are misstated, indicating a lack of understanding (2)	All-important conclusions have been drawn, could be better stated (3.5))	All-important conclusions have been clearly made; student shows good understanding (5)	
Spelling, grammar, sentence structure	Frequent grammar and/or spelling errors, writing style is rough and immature (1)	Occasional grammar/spelling errors, generally readable with some rough spots in writing style (2)	Less than 3 grammar/spelling errors, mature, readable style (3.5))	All grammar/spelling correct and very well-written (5)	
Appearance and formatting	Sections out of order, too much handwritten copy, sloppy formatting (1)	Sections in order, contains the minimum allowable amount of handwritten copy, formatting is rough but readable (2)	All sections in order, formatting generally good but could still be improved (3.5))	All sections in order, well-formatted, very readable (5)	
TOTAL					
Comments for improvements					

Assignments/Field Trip reports

Marks	MARKING CRITERIA
9-10	The assignment is engaging, concise and polished. It has an introduction, a body and conclusion. The topic is discussed very well and thoroughly. Excellent use of relevant literature is noticeable in the assignment. Factual details, visual elements and proper use of scientific

	terminology. The assignment is well formatted and contains no spelling and grammatical errors.
6-8	The assignment is well written. It has an introduction, a body and conclusion. The topic is discussed fairly well with an acceptable level of depth. Adequate and relevant literature citations are noticeable in the assignment. Factual details, visual elements and proper use of scientific terminology. Sometimes the writing is slightly repetitive or unclear, but the writer does demonstrate a good understanding of the subject matter.
3-5	The assignment is fairly well written and clear, but several errors indicate that the author may not have a complete understanding of the subject. Factual details, visual elements and the proper use of scientific terminology are used reasonably well.
1-2	The assignment has several significant problems in style and content. The topic is never clearly stated, scientific terms are misused, and misspelled words are present. Inadequate or incorrect use of factual details, visual elements seem to indicate that the author does not have a solid understanding of the subject.
0	No work was completed.
Total Marks	
Comments for improvements	

Subject Textbook

Constable, P., Hinchcliff, K.W., Done, S. and Gruenberg, W. 2016. Veterinary Medicine (11th Edn) Elsevier, The Netherlands.

References

1. Niugini Agrisaiens Journal, Available at: www.unitech.ac.pg/node/756
2. Radostits, O.M., Gay, C.C., Blood D.C. and Hinchcliff, K.W. 2006. Veterinary Medicine: A Textbook of the Diseases of Cattle, Horses, Sheep, Pigs and Goats (10th Edn.) W.B. Saunders Ltd, London, UK. 2065 p.
3. Radostits, O.M., Mayhew, I.G.J. and Houston, D.M. 2000. Veterinary Clinical Examination and Diagnosis (1st Edn.), W. B. Saunders Ltd, London, UK, 800 p.
4. Sirois, M. 2014. Laboratory Manual for Laboratory Procedures for Veterinary Technicians (6th Edn.) Mosby Inc., St. Louis, USA. 152 p.

Readings

Lecture notes and power point outlines will be uploaded to the google classroom.

AG314 CROP DISEASES I

Course(s)	Agriculture (NQF Level 7)
Subject Name	Crop Diseases I
Subject Code	AG314
Duration	13 teaching weeks
Contact hours	6 hours per week (3 Lecture +3 Lab)
Credit Points	16
Delivery Mode	On campus
Prerequisites	Nil
Co-requisites	Nil
Subject Coordinator	TBA

Synopsis

This subject covers fundamental aspects of diseases that affect agricultural crops with special reference to PNG. Students will learn about the relationship between the pathogenic microorganisms, their host and environment. Emphasis will be placed on isolation and identification of pathogenic microorganisms; and application of appropriate crop disease management and control practices.

Subject Topics

1. History of plant pathology and significance of crop diseases.
2. Fundamentals of microbiology.
3. Classification of crop diseases and disease development.
4. Biotic diseases and their sustainable management practices.
5. Pathogenesis and host defence mechanisms.
6. Genetics of plant diseases.

Topic	Content
1. History of plant pathology and significance of crop diseases	Historical development of plant pathology, terms and concepts, definitions and the significance of plant diseases. Options to increase crop production, the changes in agricultural production systems, human society and the impact on disease development. General classification of plant diseases.
2. Fundamentals of microbiology	Germ theory and introduction to microbiology. Types of microorganisms and their cellular organization.
3. Parasitism and plant disease development	The concepts of disease diagnosis including molecular techniques, Koch's Postulate, parasitism and pathogenicity, the host range of the pathogens, disease triangle, disease cycle and the stages in disease development.
4. Biotic diseases and their sustainable management practices	Crop diseases caused by fungi; parasitic higher plants; bacteria and mollicutes; plant parasitic nematodes; and viruses and viroids. Taxonomy of plant pathogens. Disease cycles; reproduction, dissemination and seasonal carryover. Diagnosis (isolation and identification) of important crop diseases and their cultural, chemical, biological and varietal resistance control practices.
5. Pathogenesis and host defense mechanisms	Direct penetration of pathogens into the host and role of enzymes, toxins, and growth regulators in disease development. Effects of pathogens on physiological functions of plants and the pre-existing structural and chemical defences of the host Including their induced structural and biochemical defences.
6. Genetics of plant diseases	Genes and disease (gene-for-gene concept), genetic variability in pathogens, types of plant resistance (vertical and horizontal), and breeding for resistant varieties.

Subject Learning Outcomes (SLOs)

On completion of this subject students will be able to:

1. Isolate and identify various plant pathogens
2. Identify various diseases based on signs, symptoms, and etiology
3. Choose appropriate methods of inoculation for diagnosing plant diseases
4. Explain the interrelationships of pathogens, hosts and their environment in disease development
5. Describe the conducive environment for disease development and identify the vulnerable stages of pathogen life cycle

6. Choose appropriate disease management strategies suitable for farmers in PNG.

Assessment Tasks and Weightings

Students must attain at least 50% overall marks in the subject. There will be a final written examination weighing 50% and 50% formative assessment.

Formative assessments

Tests: There will be 2 tests each weighing 10%

AT1: Test 1 in the first half of the semester

AT2: Test 2 in the second half of the semester

Lab reports: A group work-done reports for practical sessions weighs 30%. There will be 6 practical reports each worth 5%. Students should submit individual reports.

AT 3: Practical 1. Microbiological Laboratory Practices

AT4: Practical 2. Plant Disease Symptomatology

AT5: Practical 3: Isolation and Identification of Plant Pathogenic Fungi

AT6: Practical 4: Isolation and Identification of Plant Pathogenic Bacteria

AT7: Practical 5: Isolation and Identification of Plant Parasitic Nematode

AT8: Practical 6: Detection and Identification of Plant Viruses

AT9: Final written examination: A 3 hour written examination weighs 50%.

Assessment Rubrics

Lab reports

NOTE: It is assumed that all lab reports will be word-processed. Individual reports will be assessed while taking into account the overall teamwork.

	Good	Fair	Could be better	Poor	Specific comments	Your mark
Introduction	Clearly states background, aims and objectives; relates lab exercise to the theory; mentions knowledge to be gained; written in past tense, zero spelling and grammatical errors. (3pts)	One of the "Good" conditions (in previous column) is not met. . (2pts)	2-3 of the "Good" conditions is not met. (1.5pts)	More than 3 of the "Good" conditions is not met. (1 pts)	On your work	
Materials and Methods	Comprehensively describe how work was done using own words; logical or step by step description of procedure; description can be easily followed by any interested person to conduct the lab elsewhere; mentions all materials used and how they were used; mentions any new discoveries made (if any); written in past tense, zero spelling and grammatical errors. . (3pts)	One of the "Good" conditions is not met. . (2pts)	2-3 of the "Good" conditions is not met. (1.5pts)	More than 3 of the "Good" conditions is not met. (1 pts)		
Results	All data are presented and	One of the	2-3 of the "Good"	More than 3 of the		

	analyzed where necessary; drawings are made according to drawing rules discussed in class; other results are clearly stated either in words or in Table format, correct units of measurement and decimal points are used; trends in the results are pointed out but not discussed. (5pts)	"Good" conditions is not met. (4 pts)	conditions is not met. (3 pts)	"Good" conditions is not met. (2 pts)		
Discussion	Reflects on what happened (the results) and provides insightful explanation and meaning of the results; where possible, compares results with expected results and explains differences and/or similarities. (5pts)	One of the "Good" conditions is not met. (4pts)	2-3 of the "Good" conditions is not met. (3 pts)	More than 3 of the "Good" conditions is not met. (2 pts)		
Conclusions	Summarizes data collected or observed in the experiment; Comments regarding lesson learned during the experiment; Discussed possible application of lesson to real life where necessary. (4pts)	One of the "Good" conditions is not met. (3pts)	2-3 of the "Good" conditions is not met. (2pts)	More than 3 of the "Good" conditions is not met. (1pts)		

Presentation	Plagiarism not evident; No spelling or grammatical errors; all conventions for writing lab reports followed; logical presentation; neatness; good use of space; minimum number of repetitions. (5pts)	One of the "Good" conditions is not met. (4pts)	2-3 of the "Good" conditions is not met. (3pts)	More than 3 of the "Good" conditions is not met. (2pts)		
Total	25	19	14	9		

Subject Text Book

1. Agrios, G.N. 2005. Plant Pathology (5th Edn.). Academic Press, New York, USA.

References

Brown, J.F. and Ogle, H.J. 1997. Plant Pathogens and Plant Diseases (Eds). Rockvale Publications, Armidale, Australia. 556p.

Fry, W.E. 2012. Principles of Plant Disease Management. Elsevier, USA.

Niugini Agrisaiens Journal, Available at: www.unitech.ac.pg/node/756

Papua New Guinea Journal of Agriculture, Forestry and Fisheries

Readings

1. Lecture notes and power point outlines will be uploaded to the google classroom/moodle.
2. Practical reading material will be given during laboratory sessions.

AG321 ANIMAL MANAGEMENT II

Course(s)	Agriculture (NQF Level 7)
Subject Name	Animal Management II
Subject Code	AG321
Duration	13 teaching weeks
Contact hours	6 hours per week (3 Lecture+ 3 labs)
Credit Points	16
Delivery Mode	On campus
Prerequisites	AG311 Animal Management I
Co-requisites	Nil
Subject Coordinator	TBA

Synopsis

This subject deals with the husbandry and management of ruminant farm animals as well as some general topics related to animal production. Contents include ruminant animal production systems, welfare, ethics, and certain aspects of physiology and anatomy with special reference to adaptation to the environment. It discusses the genetic resources, feeding, housing, current husbandry practices, mating, dam-offspring relationships and the care of the neonates, product harvesting and quality aspects of beef cattle, dairy cattle, goats and sheep. Emphasis is given to the role of livestock in the present and future development of PNG and to the sustainability and integration of animals into mixed farming systems. The material covered is largely introductory with the aim of giving the student general knowledge in animal production so he/she can recognize and access the knowledge and skills of specialists such as veterinarians, nutritionists and breeders for help where necessary.

Subject Topics

1. Beef cattle management
2. Dairy cattle management
3. Goat management
4. Sheep management
5. Biosecurity and sustainability of livestock production systems

Subject Outline

Topic	Content
1. Beef cattle management.	Terminologies, genetic resources, production systems, production cycle, reproduction management, husbandry practices (castration, branding, dehorning, ear notching & tagging, vaccination), facilities (stockyard, equipment), feeding, body condition scoring, health management, paddock fencing.
2. Dairy cattle management.	Terminologies, genetic resources, production systems, production cycle, reproduction management, husbandry practices (ear notching & tagging, vaccination), physiology of lactation, facilities (milk parlour,

	equipment), milk harvesting, milk processing, feeding, health management.
3. Goat management.	Terminologies, genetic resources, production systems, production cycle, reproduction management, husbandry practices (ear notching & tagging, vaccination), housing, equipment, feeding, health management. Village goat production.
4 Sheep management	Terminologies, genetic resources, production systems, production cycle, reproduction management, husbandry practices (ear notching & tagging, tail docking, shearing), housing, equipment, feeding, health management.
5. Biosecurity and sustainability of livestock production systems.	Concept, definition and importance of biosecurity and biocontainment on animal farms, sources of biosecurity risk, Preventive health practices for the different species; Livestock and environment.

Subject Learning Outcomes (SLOs)

On completion of this subject students will be able to:

1. Explain the production systems and cycles of the major ruminant farm animal species of PNG.
2. Analyze the factors that affect productivity and efficiency of farm animals.
3. Design a schedule of management activities for the major ruminant animal species of PNG.
4. Discuss the role of animals in agriculture; and describe how animals can be integrated into a sustainable system involving crops and other land use practices.
5. Identify biosecurity risks and mitigation measures on animal farms and appreciate the role of livestock in sustainable development.

Assessment Tasks and Weightings

Students must attain at least 50% overall in the subject. There will be a final written examination weighing 50% and 50% formative assessment.

Formative assessments

Quizzes: there will be four quizzes, based on the reading materials. These quizzes will contribute total of 15% to continuous assessment.

AT 1: Quiz 1 in the first half of the semester.

AT 2: Quiz 2 in the first half of the semester.

AT 3: Quiz 3 in the second half of the semester.

Tests: There will be 2 tests each weighing 10%.

AT 4: Test 1 in the first half of the semester.

AT 5: Test 2 in the second half of the semester.

Field trip report: Based on a field trip to one major ruminant animal farm near Lae e.g., Trukai beef cattle farm. Individual reports will be assessed. This report will contribute 10% to continuous assessment. Attendance and participation in activities will contribute a further 5% to continuous assessment.

AT 6: Field trip report: Report on a field trip to one major ruminant animal farm near Lae.

AT 7: Final written examination: A 2-3 hour written examination weighs 50%.

Assessment Rubrics

Field trip report

All reports should be word-processed and electronic copies submitted through google classroom. Individual reports will be assessed.

Laboratory Report Contents	1 Beginning or incomplete	2 Developing	3 Accomplished	4 Exemplary	Score
Introduction (4)	Very little background information provided or information is incorrect (1)	Some introductory information, but still missing some major points (2)	Introduction is nearly complete, missing some minor points (3)	Introduction complete and well-written; provides all necessary background information (4)	
Procedure (4)	Missing several important details or not written in proper format (1)	Written in proper format, still missing some important details (2)	Written in proper format, important details are covered, some minor details missing (3)	Well-written in proper format, all details are covered (4)	
Results and discussion. Data, figures, graphs, tables, etc. (8)	Poor discussion not related to the objectives of the field trip. Lessons learnt and student's own perspectives are missing. Figures, graphs, tables contain errors or are poorly constructed, have missing titles, captions or numbers, units missing or incorrect, etc. (2) .	Average level of discussion in relation to these objectives. Most figures, graphs, tables OK, some still missing some important or required features (4)	Good discussion in relation to objectives of the trip. All figures, graphs, tables are correctly drawn, but some have minor problems or could still be improved (6)	Excellent discussion based on the objectives of the field trip. Lessons learnt and student's own perspectives are discussed. All figures, graphs, tables are correctly drawn, are numbered and contain titles/captions. (8)	
Interpretation/ Conclusions (6)	Conclusions missing or missing the important points (2)	Conclusions regarding major points are drawn, but many are misstated, indicating a lack of understanding (4)	All-important conclusions have been drawn, could be better stated (5)	All-important conclusions have been clearly made; student shows good understanding (6)	
Spelling, grammar, sentence structure (4)	Frequent grammar and/or spelling errors, writing	Occasional grammar/spelling errors, generally readable with	Less than 3 grammar/spelling errors, mature, readable style (3)	All grammar/spelling correct and very well-written (4)	

	style is rough and immature (1)	some rough spots in writing style (2)			
Appearance and formatting (4)	Sections out of order, too much handwritten copy, sloppy formatting (1)	Sections in order, contains the minimum allowable amount of handwritten copy, formatting is rough but readable (2)	All sections in order, formatting generally good but could still be improved (3)	All sections in order, well-formatted, very readable (4)	
TOTAL (30)	8	16	23	30	
Comments for improvements					

Subject Textbook

1. Payne, W.J.A. 1990. An Introduction to Animal Husbandry in the Tropics (4th Edn). Longman Scientific & Technical, New York, USA

References

Niugini Agrisaiens Journal, Available at: www.unitech.ac.pg/node/756

Papua New Guinea Journal of Agriculture, Forestry and Fisheries

Readings

Lecture notes and power point outlines will be uploaded to the Google classroom.

AG322 RESEARCH METHODS II

Course(s)	Agriculture (NQF Level 7)
Subject Name	Research Methods II
Subject Code	AG322
Duration	13 teaching weeks
Contact hours	6 hours per week (3 Lectures+ 3 Project/Lab.)
Credit Points	16
Delivery Mode	On campus
Prerequisites	AG312 Research Methods I
Co-requisites	Nil
Subject Coordinator	TBA

Synopsis

This subject builds on the contents of AG 312 (Research Methods I) which is taught in the first semester. It is aimed at providing the opportunity for the student to complete and present a practical research project based on the proposal which was produced in AG312. Content is rooted in the principles and procedures of scientific research as well as writing and presentation of a research report. The practical application of statistics to the analysis and interpretation of research data is emphasized. The objective is to impart knowledge and skills necessary for carrying out research in agriculture and to communicate the outcomes to stakeholders.

Subject Topics

1. Writing a research report
2. Research data exploration
3. Statistical analysis of experimental designs used in agriculture
4. Introduction to non-parametric statistics

Subject Outline

Topic	Content
1. Writing a research report	Outline and discussion of the main sections of a research report. Research report writing aids
2. Research data exploration	Importance of data exploration; measurement scales; construction and interpretation of scatterplots, frequency distributions; measures of centre and spread; linear correlation and linear regression using statistical software.
3 Statistical analyses of experimental designs used in agriculture	Review of experimental designs; Layout and implementation of various experimental designs including completely randomized, randomized complete and incomplete blocks, split pot and latin-square designs Factorial experiments; Use of statistical software to analyse and interpret data from single factor and two-factor experiments.
4. Introduction to non-parametric statistics	Concept and definition of non-parametric statistics Nonparametric tests of differences between groups Nonparametric tests of differences between variables Nonparametric tests of relationships between variables

Subject Learning Outcomes (SLOs)

On completion of this subject students will be able to:

1. Produce a research report
2. Use computer programs for exploring data obtained from experiments and surveys
3. Identify and implement appropriate methods of analysis and tests of significance for each experimental and survey design
4. Differentiate between parametric and nonparametric methods of data analyses
5. Implement non-parametric methods of data analysis as they apply to agricultural experiments

Assessment Tasks and Weightings

Students must attain at least 50% overall in the subject. There will be a final written examination weighing 50% and 50% formative assessment.

Formative assessments

Quizzes: there will be one quiz, in the second half of the semester, based on the reading materials. This quiz will contribute 10% to continuous assessment

AT 1: Quiz 1 in the first half of the semester

AT 2: Quiz 2 in the second half of the semester

Tests: There will be 2 tests weighing 15%

AT 3: Test 1 in the first half of the semester weighs 5%

AT 4: Test 2 in the second half of the semester weighs 10%

Assignment on writing research report: Each student will work with a lecturer in the School to complete a research project based on the proposal produced in AG 312, and write a report based on the results of the study. The report should include the following: 1) Title and names of researcher and supervisor; 2) An introduction which clearly states the research problem, research questions, research aims/goal/purpose and justification, scope, research objectives, research hypothesis, expected outcomes, audience (those who will benefit); 3) logical

framework; 4) Location or site where research project was carried out; 5) Materials and methods; 6) Results and discussion; 7) Conclusion; 8) Acknowledgements; 9) References
Students should submit individual reports. Reports should be submitted before end of the semester. This assignment will contribute 10% to continuous assessment.

AT 5: Assignment 1. Writing of research report

Seminar presentation of research report: Each student will present his/her research report in a School seminar which will be organized towards the end of the semester by the School Seminar Coordinator. This presentation is compulsory and students who do not make a presentation will fail the subject. This presentation will contribute 15% to continuous assessment.

AT 6: Presentation of research proposal at School Seminar

AT 7: Final written examination: A 2-3 hour written examination which will contribute 50% to overall assessment.

Assessment Rubrics

Writing of research report

All written reports should be word-processed and electronic copies submitted through Google classroom or other learning management system. Individual reports will be assessed.

Writing of research report Contents (Total = 20 marks)	1 Beginning or incomplete	2 Developing	3 Accomplished	4 Exemplary	Score
Quality and completeness of the report (5)	Most sections of the report are absent or poorly written; most sections lack appropriate depth and scope; report is either too short or too long; (1)	A few sections of the report are absent or poorly written; some sections lack appropriate depth and scope; report is of appropriate length (3)	Most sections of the report are present and well written to standard specifications with appropriate depth and scope, report is of appropriate length but still has minor quality problems. (4.5)	All sections of the report are present; each section was with appropriate depth and scope; length of report is appropriate (5)	
Knowledge	Poor knowledge of the subject area of research is evident; most not written to standard specifications; poor use of technical terms; inappropriate citing and referencing of authorities; report is substandard; student does not show any promise for further studies in the research area (1)	Some knowledge of the subject area of research is evident; a few sections not well written to standard specifications; below average use of technical terms as well as citing and referencing of authorities; report is hardly publishable; student cannot benefit from further studies (3)	Good knowledge of the subject area of research is evident; most sections are well written to standard specifications; above average use of technical terms as well as citing and referencing of authorities; report is publishable with few modifications; student can benefit from further studies (4.5)	Excellent knowledge of the subject area of research is evident; all sections well written to standard specifications; good use of technical terms; excellent citing and referencing of authorities; report is publishable; student can benefit from further studies (5)	
Spelling, grammar, sentence structure	Frequent grammar and/or spelling errors, writing style is rough and	Occasional grammar/spelling errors, generally readable with some rough	Less than 3 grammar/spelling errors, mature, readable style.	All grammar/spelling correct and very well-written. All sections in	

and presentation of report (5)	immature. Sections out of order, too much handwritten copy, sloppy formatting (2)	spots in writing style. Sections in order, contains the minimum allowable amount of handwritten copy, formatting is rough but readable (3)	All sections in order, formatting generally good but could still be improved (4.5)	order, well-formatted, very readable (5)	
Attendance and performance throughout the semester (3)	Present only 10% or less of the time allocated to consult with the supervisor; poor understanding of the project, little or no effort towards completion of project. (2)	Consults with supervisor up to 50% of the time, fair understanding of the project and average effort towards completion of project (3)	Consults with supervisor more than 50% of the time, more than average understanding of project and good effort towards completion of project. (4.5)	Consults with supervisor all of the time allocated, very good understanding of project and extra effort input towards completion of project. (5)	
Total 20	6	12	18	20	
Comments for improvements					

Seminar presentation of research report

Electronic copies of presentations should be submitted through Google classroom or other learning management system. Individual submissions will be assessed.

Seminar presentation of research proposal Contents (Total = 20 marks)	1 Beginning or incomplete	2 Developing	3 Accomplished	4 Exemplary	Score
Presentation skills (6)	Speaker does not maintain good eye contact with the audience; vice is hardly audible and unclear; Delivery is uncontrolled, and rough; Poor language skills and pronunciation are used; Visual aids are poorly prepared, uninformative and ineffective; Length of presentation is outside the assigned time limits. Information - poorly communicated. (1)	A few basic aspects of a good presentation are evident, but still missing some major points (3)	Most aspects of a good presentation are evident, but still missing some minor points. (5)	Speaker maintains good eye contact with the audience; Uses a clear, audible voice; Delivery is poised, controlled, and smooth. Good language skills and pronunciation are used; Visual aids are well prepared, informative and effective; Length of presentation is within the assigned time limits. Information - well communicated. (6)	
Knowledge (6)	Introduction, problem statement, review of the problem, research question and hypothesis are poorly presented in a logical sequence; knowledge gap not	A few basic aspects of a good knowledge of the research area are evident, but still missing some major points (3)	A most aspects of a good knowledge of the research area are evident, but still missing some few points (5)	Introduction, problem statement, review of the problem, research question and hypothesis are presented in a logical sequence; Identifies knowledge	

	articulated, research method not appropriate, study design and statistical analysis not mentioned; Poor use of appropriate technical terms, citations and references (1)			gap, uses appropriate research methods, study design and statistical analysis; Uses appropriate technical terms, citations and references (6)	
Quality of slides (4)	Poor quality of slides; font size out of range, poor contrast and visibility, too many sentences/slides; too many slides, poor colour schemes (1.5)	A few basic aspects of slide quality have been met but major parts are missing or poor (2.5)	Almost all aspects of slide quality have been met but few parts are missing (3.5)	Good quality of slides; good font size, good contrast and visibility, appropriate number of sentences/slides; good number slides for time allocated, good use of colour schemes (4)	
Questions and answers (4)	Unable to understand questions; answers are incorrect or unclear (1.5)	Some effort is made to understand questions and give correct answers (2.5)	Most questions well understood and answers were correct but missed a few (3.5)	Able to understand questions thoroughly and gives correct and clear answers (4)	
Total 20	5	11	17	20	
Comments for improvements					

Subject Textbook

1. Kumar, R. 2010. Research Methodology: A Step-by-Step Guide for Beginners (3rd Edn.). SAGE Publications, California, USA, 528p

References

- Bailey, K. D. 1978. Methods of Social Research (3rd Edn.) The Free Press, New York, USA.
- ILRI 2006. Biometrics and Research Methods Teaching Resource Version 1. (Edn Rowlands, J.). ILRI (International Livestock Research Institute), Nairobi, Kenya.
- Kelley, K., Clark, B. and Sitzia, J. 2003. Good Practice in the Conduct and Reporting of Survey Research. Research Department, Worthing & Southlands Hospitals NHS Trust, Worthing, West Sussex, UK.
- Niugini Agrisaiens Journal, Available at: www.unitech.ac.pg/node/756
- Rangaswamy R. 1995. A textbook of agricultural statistics. 1st Ed. New Age International Publishers, New Delhi, India. 496p.
- Steel, R.G.D., and Torrie, J.H. 1980. Principles and Procedures of Statistics: A Biometrical Approach (2nd Edn.). McGraw Hill International, Toronto, Canada. 633p.

Readings

Lecture notes and power point outlines will be uploaded to the google classroom.

AG323 CROP DISEASES II

Course(s)	Agriculture (NQF Level 7)
Subject Name	Crop Diseases II
Subject Code	AG323
Duration	13 teaching weeks
Contact hours	6 hours per week (3 Lecture +3 Lab.)
Credit Points	16
Delivery Mode	On campus
Prerequisites	AG 314 Crop Diseases I
Co-requisites	Nil
Subject Coordinator	TBA

Synopsis

This subject covers knowledge and skills in plant disease epidemiology, epidemiological experiments, crop loss assessment, disease forecasting, seed and soil borne diseases, and the management strategies including quarantine.

Subject Topics

1. Plant disease epidemiology

2. Crop loss assessment and forecasting
3. Soil-borne diseases
4. Seed-borne diseases
5. Disease management
6. Principles of crop biosecurity

Subject Outline

Topic	Content
Plant disease epidemiology	Importance and development of plant disease epidemics, and their components. Monocyclic & polycyclic diseases. Epidemiological experiments and sampling (sampling unit, frequency, design and size). Dispersal gradients, Inter-plot interference and remedies.
Crop loss assessment and forecasting	Application of mathematical models in disease forecasting. The use of GIS in disease identification, assessment and monitoring. Methods and procedures employed in assessing crop loss (e.g., incidences & severity)
Soil-borne diseases	Soil microbial populations, isolation, distribution, interactions, and dispersal of soil borne pathogens. Epidemiology, experimentation and management of soil borne diseases.
Seed-borne diseases	Significance of seed-borne diseases and their transmission. Testing of seed health, seed storage, mycotoxins. Deterioration of seed during storage by fungi and management including hot water treatment.
Disease management	Principles of crop disease management. The use of epidemiological knowledge in plant disease management. Applications of different control techniques. Varietal deployment strategies. Integrated disease management (IDM), features of IDM, advantages and disadvantages of IDM, stages in IDM, economic injury level (EIL), economic threshold (ET), characteristics of ET and calculation of EIL.
Principles of crop biosecurity	Significance of quarantine and biocontainment facilities, pest risk analysis (PRA) and plant disease clinic.

Subject Learning Outcomes (SLOs)

On completion of this subject students will be able to:

1. Explain the principles of plant disease epidemiology.
2. Apply appropriate models in forecasting plant disease epidemics.
3. Discuss the biology and ecology of soil-borne pathogens to formulate sustainable disease management strategies.
4. Explain the principles of seed health and production of pathogen-free seeds.
5. Apply quarantine procedures to formulate preventative measures for seed-borne diseases.

Assessment Tasks and Weightings

Students must attain at least 50% overall marks in the subject. There will be a final written examination weighing 50% and 50% formative assessment.

Formative assessments

Tests: There will be 2 tests each weighing 10%.

AT1: Test 1 in the end of the first half of the semester.

AT2: Test 2 in the end of the second half of the semester.

Quizzes: There will be 2 quizzes each weighing 5%.

AT3: Quiz 1 in the middle of the first half of the semester.

AT4: Quiz 2 in the middle of the second half of the semester.

AT5 - Writing a Research Report (Topic will be decided every semester by lecturer) weighing 10%.

Lab reports: A group work-done reports for practical sessions weighs 10%. There will be 2 practical reports each worth 5%. Students should submit individual reports.

AT6: Practical 1. Isolation of soil-borne pathogens.

AT7: Practical 2. Testing seeds for seed-borne organisms.

AT8: Final written examination: A 3 hour written examination weighs 50%.

Assessment Rubrics

Research report

NOTE: It is assumed that all research reports will be word-processed. Individual reports will be assessed while taking into account the overall teamwork.

Content and Details	Content is very informative and accurate. Report has many supporting details and interesting to read. (10)	Content is informative and mostly accurate. Report has adequate details. (7)	Content is not always related to the topic. Many inaccuracies. Few supporting details. (3)	Content is not relevant or accurate. No details. (1)
Organization	Report is well organized with a strong beginning, middle and ending. (10)	Report shows adequate organization. It has a beginning, middle and ending. (7)	Report is poorly organized and confusing at times. (3)	Report has no organization. (1)
Writing Mechanics and Readability	Report has few or no errors in spelling, punctuation, and/or grammar. Report is easy to read. (10)	Report has few to several errors in spelling, punctuation, and/or grammar. Report is readable. (7)	Report has many errors in spelling, punctuation, and/or grammar. Report is difficult to read. (3)	Report is unreadable. (1)
Notecards	Notecards are completed and labelled correctly. (10)	Most notecards are completed and labelled correctly. (7)	Some notecards are completed and labelled correctly. (3)	No notecards. (1)
Bibliography	Bibliography is completed and written in correct form. (10)	Bibliography is done but incomplete in parts. Some errors in form. (7)	Bibliography is incomplete. Many errors in form. (3)	No bibliography (1)
(Other)				
Total	50			

Lab reports

NOTE: It is assumed that all lab reports will be word-processed. Individual reports will be assessed while taking into account the overall teamwork.

	Good	Fair	Could be better	Poor	Specific comment	Your
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					s	mark
Introduction	Clearly states background, aims and objectives; relates lab exercise to the theory; mentions knowledge to be gained; written in past tense, zero spelling and grammatical errors. (3 pts)	One of the "Good" conditions (in previous column) is not met. (2 pts)	2-3 of the "Good" conditions is not met. (1.5 pts)	More than 3 of the "Good" conditions is not met. (1 pts)	On your work	
Materials and Methods	Comprehensively describe how work was done using own words; logical or step by step description of procedure; description can be easily followed by any interested person to conduct the lab elsewhere; mentions all materials used and how they were used; mentions any new discoveries made (if any); written in past tense, zero spelling and grammatical errors. (3 pts)	One of the "Good" conditions is not met. (2 pts)	2-3 of the "Good" conditions is not met. (1.5 pts)	More than 3 of the "Good" conditions is not met. (1 pts)		
Results	All data are presented and analyzed where necessary; drawings are made according to drawing rules discussed in class; other results are clearly	One of the "Good" conditions is not met. (4 pts)	2-3 of the "Good" conditions is not met. (3 pts)	More than 3 of the "Good" conditions is not met. (2 pts)		

	stated either in words or in Table format, correct units of measurement and decimal points are used; trends in the results are pointed out but not discussed. (5 pts)					
Discussion	Reflects on what happened (the results) and provides insightful explanation and meaning of the results; where possible, compares results with expected results and explains differences and/or similarities. (5 pts)	One of the "Good" conditions is not met. (4 pts)	2-3 of the "Good" conditions is not met. (3 pts)	More than 3 of the "Good" conditions is not met. (2 pts)		
Conclusions	Summarizes data collected or observed in the experiment; Comments regarding lesson learned during the experiment; Discussed possible application of lesson to real life where necessary. (4 pts)	One of the "Good" conditions is not met. (3 pts)	2-3 of the "Good" conditions is not met. (2 pts)	More than 3 of the "Good" conditions is not met. (1 pts)		
Presentation	Plagiarism not evident; No spelling or grammatical errors; all conventions for writing lab reports followed;	One of the "Good" conditions is not met. (4 pts)	2-3 of the "Good" conditions is not met. (3 pts)	More than 3 of the "Good" conditions is not met. (2 pts)		

	logical presentation; neatness; good use of space; minimum number of repetitions. (5 pts)					
Total	25	19	14	9		

Subject Text Book

Agrios, G. N. 2005. Plant Pathology (5th Edn.). Academic Press, New York, USA.

References

Agarwal, V.K. and Sinclair, J. B. 1996. Principles of Seed Pathology (2nd Edn). CRC Press.

Brown, J.F. and Ogle, H.J. (Edn.). 1997. Plant Pathogens and Plant Diseases. Rockvale Publications, Armidale, Australia.

Campbell, C.L. and Madden, L.V. 1990. Introduction to Plant Disease Epidemiology. John Wiley & Sons, New York, USA.

Naik, M. K. and Rani, D. 2008. Advances in Soil Borne Plant Diseases. New India Publishing Agency, New Delhi, India

Niugini Agrisaiens Journal, Available at: www.unitech.ac.pg/node/756

Papua New Guinea Journal of Agriculture, Forestry and Fisheries

Readings

Lecture notes and power point outlines will be uploaded to the google classroom/moodle
Practical reading material will be given during laboratory sessions

AG324 HORTICULTURAL SCIENCES

Programs	Agriculture (NQF Level 7)
Subject Name	Horticultural Sciences
Subject Code	AG324
Contact hours	6 hours per week (3 Lecture + 3 Lab)
Duration	13-week semester
Credit Points	16
Delivery Mode	On campus
Prerequisites	AG211 Agronomy I
Co-requisites	Nil
Subject Coordinator	TBA

Synopsis

In this subject, horticultural crops commonly cultivated in Papua New Guinea that come under pomology (fruits), olericulture (vegetables), spices, floriculture and arboriculture will be covered. Knowledge and skills areas covered for each crop will include: origin, distribution, types and importance; botany; climatic and soil requirements; cultivation and management practices, and postharvest processes. Other groups such as plantation crops, pastures, legumes, medicinal plants and aromatic crops are covered under different subjects.

Subject Topics (ST)

Major areas to be covered in this subject are:

1. Scope and significance of horticultural crops
2. Pomology
3. Olericulture
4. Spices, floriculture, and arboriculture
5. Postharvest processes

Topic	Content
1. Scope and significance of horticultural crops	Branches of horticulture, branches common in PNG, significance in the economy and welfare of nations/people, future prospects.
2. Pomology	Botany, distribution, types, varieties and cultivars of banana, citrus, papaya, mangoes, pineapples. Propagation, cultivation and management of these crops.
3. Olericulture	Botany, distribution, types, varieties and cultivars of introduced leafy vegetables (round cabbage, Chinese cabbage), introduced fruit vegetables (tomato, capsicum), introduced flower vegetables (broccoli), introduced bulb and root vegetables (bulb onion, carrot), traditional leafy vegetable (aibika). Propagation, cultivation and management of these crops.
4. Spices, floriculture, and arboriculture	Botany, distribution, types, varieties and cultivars of spices (zinger), floricultural crops (heliconia, roses), arboriculture plants and principles of landscaping. Propagation, cultivation and management of these crops
5. Postharvest processes	Processes involved after harvest; handling, drying, grading, quality control standards, certification, packaging, transportation and storage.

Subject Learning Outcomes (SLOs)

After completing this subject student will possess the skills and knowledge to:

1. Discuss the origin, distribution, types and the importance of horticultural crops
2. Illustrate and explain the common botanical features of horticultural crops studied

3. Explain the agro-ecological conditions suitable for the growth of horticultural crops studied
4. Discuss the cultivation and management practices involved in ensuring successful production of horticultural crops
5. Explain the production and postharvest processes of horticultural crops.

Assessment Tasks and Weightings

Students must attain at least 50% overall in the subject. The assessment types and weightings for formative assessment and a final written examination are:

Tests: There will be 3 tests (AT 1-Test 1-wk3, AT 2-Test 2-wk7, AT 3-Test 3-wk 11) with Test 1 weighing 5% and Tests 2 and 3 weighing 10% each. Sequence of test administration: AT1 given after ST1 and ST2; AT2 given after ST3; and AT3 given after ST4 and mid ST5.

AT 1: Test 1 weighing 5% on week 3.

AT 2: Test 2 weighing 10% on week 7.

AT 3: Test 3 weighing 10% on week 11.

Lab report: Written report(s) for all practical sessions weighs 25%.

There are five (5) laboratory practicals (LP) to be given, each weighing 5%. The LPs will be delivered in the following sequence: ST1-LP1; ST2-LP2; ST3-LP3; ST4-LP4, and ST5-LP5.

Areas of investigation for LPs are:

AT4-LP1: Impacts of horticultural crops on the livelihood of farming communities.

AT5-LP2: Comparison of botanical features of horticultural crops.

AT6-LP3: Distribution of horticultural crops in PNG.

AT7-LP4: Greenhouse observation on seed germination and growth of selected crops.

AT8-LP5: Effects of salinity on germination and early growth of selected vegetables.

For written reports of LPs (marked out of 20 points), it is emphasized that a standard format for writing scientific reports is followed.

AT9: Final written examination: A 2½ hour written examination weighs 50%.

Assessment of Rubrics

Lab reports

NOTE: It is assumed that all research reports will be word-processed. Individual reports will be assessed while taking into account the overall teamwork.

Division of written report	Information required	Allocation of marks
Title	What was the title of the laboratory practical? The title should be descriptive, positive, brief and specific. For uniformity, lecturer gives this, but is checked for consistency. This section is assessed together with 'Introduction'.	5
Introduction	What was the laboratory practical about? A comprehensive background is logically presented, ending with objective(s) of the practical session. Review of some literature is necessary, and when done, correct format of citation is followed.	
Materials and Methods	What was done? Scientific procedures followed with materials used to address the objective(s) are systematically presented. Reasons are provided for any variations made to original procedures.	3
Results	What did you find? Outcomes of experiments (descriptive or empirical) are clearly presented. Appropriate format(s) of results presentation are used e.g., Tables, Figures (graphs, illustrations, plates, etc.), and these are correctly captioned.	3
Discussion	What do the outcomes mean? Outcomes of experiments are logically and coherently discussed and explained. Appropriate inferences are made with correct citations. This section is where students are expected to 'empty their minds' because respective student's comprehension of the entire practical process is judged here.	7
References	Where any information sources accessed? A bibliography of all literature sourced to assist successfully complete a laboratory practical report, is presented. For uniformity, an "APA Referencing System" is recommended. Details of literature cited in the text must be presented here.	2

Subject Textbook

Acquaah, G. 2008. Horticulture: Principles and Practices (4th Edition). Prentice Hall, New Jersey, USA

Preece, J.E. and Read, P.E. 2005. Biology of Horticulture: An Introductory Textbook. John Wiley & Sons Inc., USA

References

- Michael, R. and Harwood, T. 2009. Food and Agriculture in Papua New Guinea. ANU E Press, Canberra, Australia.
- Purseglove, J.W. 1972. Tropical Crops: Monocotyledons Vols. 1 and 2. Longman: London, England.
- Purseglove, J.W. 1972. Tropical Crops: Dicotyledons Vols. 1 and 2. Longman: London, England.

Readings

Lecture notes and power-point presentations (supplementary notes).

The Google search engine (www.google.com) is amassed with educational material. Students are encouraged to exploit this internationally popular website. Almost every topic pertaining to Horticultural crops can be accessed, in images or texts, from this information search engine. Research information on different aspects of crop production can also be sourced from national Journals, such as Niugini Agrisaiens Journal (NAJ) and Papua New Guinea Journal of Agriculture, Forestry and Fisheries (PNGJAFF).

AG411 ENVIRONMENT AND SUSTAINABLE AGRICULTURE

Programs	Agriculture (NQF Level 7)
Subject Name	Environment and Sustainable Agriculture
Subject Code	AG411
Contact hours	6 hours per week (3-hour lecture + 3-hours lab)
Duration	13 teaching weeks
Credit Points	16
Delivery Mode	On campus
Prerequisites	Nil
Co-requisites	Nil

Synopsis

This subject deals with establishing the understanding of the concept of agricultural sustainability by initially addressing issues that are affecting the major components (soil, water and climatic factors) of an agricultural environment. The content in general, is sustainable use and management of the agricultural environment, taking into consideration the various aspects of environmental factors responsible for environmental sustainability and sustainable agriculture. The major local and global issues affecting environmental sustainability and sustainable agriculture covered include pollution of the components of the atmospheric; terrestrial and aquatic environments and the causes; the impacts on climate, soil and water quality; and biodiversity. The impacts of agricultural activities (production of livestock and crops and farming practices) on the agricultural environment and how to manage them are further discussed.

Subject Topics (ST)

Major areas to be covered in this subject are:

1. The concepts of environmental and agricultural sustainability.
2. Major environmental and climatic issues affecting environmental sustainability.
3. Major environmental and climatic issues affecting agricultural sustainability.
4. Management of issues affecting the natural environment
5. Management of issues affecting the agricultural environment.

Topic	Content
1. Environmental and Agricultural Sustainability	The concepts of environmental and agricultural sustainability. The components of agro-ecosystems, and indicators of environmental and agricultural sustainability, and importance of sustainability.
2. Major issues affecting environmental sustainability	Pollution and contamination of atmospheric, aquatic and terrestrial environments, loss of biodiversity and causes (logging and the extractive industries), and climate change.
3. Major issues affecting sustainable agriculture	soil degradation, pollution of water sources, and contamination of farm environment. Agrochemicals uses and their fates, and agricultural wastes.
4. Management of issues affecting environmental sustainability	The principles of environmental management, environmental quality assessment and rehabilitation, integrated disease and pest management.
5. Management of issues affecting sustainable agriculture	The principles of farm environment (soil and water) management; crop and livestock production and waste management systems; and agrochemicals (including fertilizers) management.

Subject Learning Outcomes (SLOs)

Upon completing this subject, students should be able to:

6. Define the concept of environmental and agricultural sustainability.
7. Compare and discuss the major environmental issues and the causes responsible.
8. Demonstrate the importance of sustainable agriculture on the environment.
9. Examine the impacts of natural and anthropogenic activities on the environment.
10. Assess the importance of the management of issues affecting sustainable agriculture.

Assessment Tasks and Weightings

Students must attain at least 50% overall in the subject. The assessment types and weightings for formative assessment and a final written examination are:

Tests: There will be 3 tests (AT1, AT2 and AT3) each weighing 10%.

AT1: Weighing 10%

AT2: Weighing 10%

AT3: Weighing 10%

Sequence of test administration: AT1 given after ST2, AT2 given after ST4 and AT3 given mid ST5.

Assignments: Two assignments, each weighing 5%, will be given. The sequence of assignment administration is: AT4 given after ST1 and AT5 given after ST3, respectively.

AT4: Assignment 1 weighs 5% (title and description to be given from time to time).

AT5: Assignment 2 weighs 5% (title and description to be given from time to time).

Laboratory report: Written report(s) for all practical sessions weigh 10%.

There are five (5) laboratory practicals (LP) to be given, each weighing 2%. The LPs will be delivered in the following sequence: ST1-LP1; ST2-LP2; ST3-LP3; ST4-LP4, and ST5-LP5.

Areas of investigation for LPs are:

AT6: Assessment of the major components of an agro-ecosystem (2%).

AT7: Analysis of indicators of a sustainable environment (2%).

AT8: Environmental impact assessment and sampling techniques (2%).

AT9: Rehabilitation of a degraded terrestrial environment (2%).

AT10: Rehabilitation of a degraded aquatic environment (2%).

AT11: A 3-hour final written examination weighs 50%.

Subject Textbooks

Soils and Environment. Ellis, S. and Mellor, (1995). A. Routledge and CRC Press, Taylor and Francis.

Water management, Food security, and sustainable agriculture in the developing economies. Kumar et al., (2015). Routledge, Taylor and Francis.

References

Soils in our environment, 8th Edn, Prentice Hall. Van Nostrand Reinhold Company Miller, R.E. and Gardiner, D.T. Soils and environmental quality. CRC Press. Pierzynski *et al.*, (2000).

Agro-forestry in the humid tropics: its protective and ameliorative role to enhance productivity and sustainability. Nigerian *et al.*, (1998). Nigeria.

Conservation and agriculture. Hawks, J. J., (1979). London.

Environmental conservation. Fredric, D. R., (1984). New York.

Agricultural sustainability: definitions and implications for agricultural and trade policy. Young, T. and Burton, M. P., (1992). FAO, Rome.

Sustainable agriculture and the environment in the tropics. National Research Council Committee on Sustainable Agriculture and the Environment in the Humid Tropics, (1992). Washington DC.

Niugini Agrisaiens Journal, Available at: www.unitech.ac.pg/node/756

Papua New Guinea Journal of Agriculture, Forestry and Fisheries

Readings

Lecture notes and PowerPoints presentations (supplementary notes). The recommended textbook including other key eBooks are available on Google to help you study this subject.

AG 412 ANIMAL BREEDING

Course(s)	Agriculture (NQF Level 7)
Subject Name	Animal Breeding I
Subject Code	AG412
Duration	13 teaching weeks
Contact hours	6 hours per week (3 Lecture+ 3 Lab.)
Credit Points	16
Delivery Mode	On campus
Prerequisites	AG311 and AG352
Co-requisites	Nil
Subject Coordinator	Prof G Danbaro

Synopsis

Brief description of the content of the subject

This subject deals with the genetic improvement of farm animals for specific traits which are of economic and biological importance. Content is based mainly on genetics, statistics and modern biotechnology. The objective is to add value to animal products by improving the genetic status and, subsequently, the efficiency and productivity of farm animals leading to increased profitability of the business of animal production.

The first part of the course will be devoted to review concepts of classical (Mendelian) inheritance and population genetics. This will be followed by lessons on interpretation of performance records, estimated genetic values, genetic evaluation and selection principles for short- and long-term responses in herd improvement. The course will also include a presentation of new biotechnologies for genetic improvement of livestock and conservation of genetic diversity. The writing skills, analytical and quantitative abilities of students will be reinforced through reporting scientific work done in the laboratory and the field

Subject Topics

1. General introduction to animal breeding and conservation of farm animal genetic resources.
2. Genetic inheritance and introductory population genetics.
3. Estimation of genetic value of farm animals.
4. Prediction of response to selection for quantitative traits, multiple trait selection and correlated response to selection.
5. Mating systems and inbreeding.
6. Role of modern biotechnology in animal breeding.
7. Breeding schemes for farm animals.

Subject Outline

Topic	Content
1. General introduction to animal breeding and conservation of farm animal genetic resources.	Purpose of animal breeding, components of a breeding program; Target traits for various animal products e.g., meat, milk, eggs, wool; Quantitative and qualitative traits. Identification of different species and breeds of farm animals in PNG, Measuring and recording traits. Characterization of breeds

2. Genetic inheritance and introductory population genetics	Review of Mendel's experiments, structure of genes, DNA and replication of the genetic material, cell cycle, mitosis and meiosis, linkage and crossing over. Gene and genotype frequency, Hardy-Weinberg equilibrium law.
3. Estimation of genetic value of animals	Additive value, dominance deviation and the genetic mean; heritability and repeatability; estimated breeding values (EBV) and probable producing abilities (PA); adjustment of records
4. Prediction of response to selection for quantitative traits, multiple trait selection and correlated response to selection.	Factors which affect response to selection; calculation of response to selection for quantitative traits; selection by tandem, independent culling levels, economic selection indexes and BLUP overview.
5. Mating systems and inbreeding.	Random and assortative mating; positive assortative and negative assortative mating, crossbreeding systems inbreeding and inbreeding coefficients
6. Role of modern biotechnology in animal breeding	Reproductive and molecular biotechnologies for genetic improvement of animals including artificial insemination, Multiple ovulation and embryo transfer, cloning, DNA fingerprinting, marker assisted selection and gene transfer.
7. Breeding schemes for farm animals	Schemes for breeding of chickens, pigs, cattle and goats.

Subject Learning Outcomes (SLOs)

On completion of this subject, students will be able to:

1. Comprehend the genetic basis of animal breeding and Mendel's laws of inheritance
2. Design simple schemes for recording performance and calculate estimated breeding values (EBVs) and estimated progeny difference (EPDs) for evaluating the genetic merit of farm animals.
3. Outline the methods of single trait and multi-trait selection, and the importance of correlated response to selection
4. Design various mating schemes for genetic improvement of farm animals.

Assessment Tasks and Weightings

Students must attain at least 50% overall in the subject. There will be a final written examination weighing 50% and 50% formative assessment.

Formative assessments

Quizzes: there will be 2 quizzes, based on the reading materials. These quizzes will contribute total of 10% to continuous assessment.

AT 1: Quiz 1 in the first half of the semester weighing 5%

AT 2: Quiz 2 in the second half of the semester weighing 5%

Assignments: there will be two assignments based on the lessons. These assignments will contribute a total of 10% to continuous assessment

AT 3: Assignment 1 in the first half of the semester weighing 5%

AT 4: Assignment 2 in the second half of the semester weighing 5%

Tests: there will be two tests based on the lessons. These tests will contribute a total of 20% to continuous assessment.

AT 5: Test 1 in the first half of the semester weighing 10%

AT 6: Test 2 in the second half of the semester weighing 10%

Report: Based on the design of a rudimentary breeding program for a farm animal. Students will work in groups and each group will produce a single report. Group report will contribute 10% to continuous assessment.

AT 7: Group report on the breeding program for a selected farm animal in the second semester weighing 10%

AT8: Final written examination: A 2-3 hour written examination weighs 50%

Assessment Rubrics

Reports

All lab reports should be word-processed and electronic copies submitted through Google classroom. Individual reports will be assessed.

Laboratory Report Contents	1 Beginning or incomplete	2 Developing	3 Accomplished	4 Exemplary	Score
Introduction (4)	Very little background information provided or information is incorrect (1)	Some introductory information, but still missing some major points (2)	Introduction is nearly complete, missing some minor points (3)	Introduction complete and well-written; provides all necessary background principles for the experiment (4)	
Procedure (4)	Missing several important experimental details or not written in paragraph format (1)	Written in paragraph format, still missing some important experimental details (2)	Written in paragraph format, important experimental details are covered, some minor details missing (3)	Well-written in paragraph format, all experimental details are covered (4)	
Results/ Observations Data, figures, graphs, tables, etc. (8)	Figures, graphs, tables contain errors or are poorly constructed, have missing titles, captions or numbers, units missing or incorrect, etc. (2)	Most figures, graphs, tables OK, some still missing some important or required features (4)	All figures, graphs, tables are correctly drawn, but some have minor problems or could still be improved (7)	All figures, graphs, tables are correctly drawn, are numbered and contain titles/captions. (8)	
Interpretation/ Conclusions (6)	Conclusions missing or missing the important points (2)	Conclusions regarding major points are drawn, but many are misstated, indicating a lack of understanding (4)	All-important conclusions have been drawn, could be better stated (5)	All-important conclusions have been clearly made; student shows good understanding (6)	
Spelling, grammar, sentence structure (4)	Frequent grammar and/or spelling errors, writing style is rough and immature (1)	Occasional grammar/spelling errors, generally readable with some rough spots in writing style (2)	Less than 3 grammar/spelling errors, mature, readable style (3)	All grammar/spelling correct and very well-written (4)	

Appearance and formatting (4)	Sections out of order, too much handwritten copy, sloppy formatting (1)	Sections in order, contains the minimum allowable amount of handwritten copy, formatting is rough but readable (2)	All sections in order, formatting generally good but could still be improved (3)	All sections in order, well-formatted, very readable (4)	
Total (30)	8	16	24	30	
Comments for improvements					

Subject Textbook

Understanding Animal Breeding by Richard M. Bourdon. Prentice Hall. 1997

Dalton's Introduction to Practical Animal Breeding by Malcolm B. Willis. 3rd Edition. Blackwell. 1991.

References

Introduction to Quantitative Genetics by Falconer , D. S. and T. F. C. MacKay. 4th Edition. Longman. 1996

An Introduction to Animal Breeding by Bowman J. S. Edward. Arnold. 1974

Niugini Agrisaiens Journal, Available at: www.unitech.ac.pg/node/756

Papua New Guinea Journal of Agriculture, Forestry and Fisheries

Readings

Lecture notes and power point outlines will be uploaded to the learning management system (Google classroom).

AG413 - AGRICULTURE FIELD ENGINEERING

Course(s)	Agriculture (NQF Level 7)
Subject Name	Agriculture Field Engineering
Subject Code	AG413
Duration	13 teaching weeks
Contact hours	4 hours per week: (1 lecture + 3 Practical)
Credit Points	13
Delivery Mode	On campus
Prerequisites	Nil
Co-requisites	Nil
Subject Coordinator	TBA

Synopsis

This undergraduate course provides an introduction to understanding the principles of Agriculture Field Engineering. The course provides the theoretical definition of Agriculture Field Engineering and its importance to Agriculture. The introduction and importance of land survey methods: map reading, chain surveying, compass surveying, levelling, GPS and Photogrammetry. Soil erosion its cause and prevention. Runoff estimate and drainage channel design. Irrigation methods and irrigation systems. Farm structure such as farm buildings, roads etc. Various examples of Agriculture farming systems. The importance of Agriculture Field Engineering research and extension aspects in developing countries is highlighted.

Subject Topics

1. Introduction to Agriculture Engineering & Land Surveying Methods
2. Agricultural Machinery Operations, Power and Maintenance
3. Introduction to Precision Farming & Energy Systems for Agriculture

4. Land and Water Use Planning
5. Introduction to Agriculture Irrigation, Soil Erosion and land drainage Systems

Topics	Contents
1. Introduction to Agriculture Engineering & Land Surveying Methods	<ul style="list-style-type: none"> - What is Agricultural Engineering? - Why study Agricultural Engineering, Man & Machinery relationship, factors behind in improving Agricultural Engineering - Map reading, Chain Surveying, Levelling, Compass Survey, GPS and Photogrammetry
2. Agricultural Machinery Operations, Power and Maintenance	<ul style="list-style-type: none"> - Operating principle of the small internal combustion engines, Preventative Maintenance and troubleshooting Applications - Evaluating of Agricultural Machinery and Tractor Power performance. Equipment and implements including Primary and Secondary Tools. (Field Trip)
3. Introduction to Precision Farming & Energy Systems for Agriculture	<ul style="list-style-type: none"> - Theory and Application of Energy sources and systems. Sources such as heat systems, biomass, biodiesel, direct energy conversion and solar systems - Theory and Application of Energy sources and systems. Sources such as heat systems, biomass, biodiesel, direct energy conversion and solar systems - Concepts of Precision Farming System and required system elements, Yield Mapping, Soil and Weed Mapping, Control of Field Operations and Information Management
4. Land and Water Use Planning	<ul style="list-style-type: none"> - The Planning Issue, Why Land and Water Use Planning is important; Land Use Planning for farming
5. Introduction to Agriculture Irrigation, Soil Erosion and land drainage Systems	<ul style="list-style-type: none"> - Irrigation Scheduling Techniques, Irrigation Methods - Types of soil erosion, its cause and Preventative Measures - Types of Drainage Systems, Drainage Investigations, Runoff Estimate and Drainage Channel Design, Drainage and the Environment: Water Quality Aspects

Subject Learning Outcomes (SLOs)

On completion of this subject students will be able to:

SLO1: Define Agriculture Field Engineering;

SLO2: Understand the importance and objectives of Agriculture Field Engineering;

SLO3: Implement the various Field Engineering Management tools;

SLO4: Demonstrate the various Agriculture Field Engineering practices and techniques in farming Systems;

SLO5: Evaluate the importance of Agriculture Field Engineering in developing countries

Assessment Tasks and Weightings

To obtain a pass grade in this subject at least 50% overall must be achieved. There is a final examination in this subject. The final written examination weighs 50% and continuous assessment weighs 50%.

Continuous assessments

Continuous assessments consist of periodic assignments, quizzes and tests as summarized below. Student must also refer to the guidelines provided with each individual assessment for detailed information.

Tests:

There will be 2 tests (AT 1 & AT2) each weighing 10%. Tests will be used to measure learning progress and achievement, and to evaluate the effectiveness of educational programs. It will also provide a simulated environment for the final exam.

AT1: Test 1 – Test covering topics 1 & 2 10%

AT2: Test 2 – Test covering topics 3, 4, and 5 10%

Assignment:

There will be two assignments (AT3 & AT4) weighing 5%. Student will take home assignment tasks consisting of a number of questions/numerical problem/diagram covering the below mentioned topics. Student can refer to internet and other study materials with proper referencing.

AT3: Assignment 1 – Assignment covering topics 1 & 2 (5%)

AT4: Assignment 2 – Assignment covering topics 3, 4 and 5 (5%)

Major Project:

There will be a project (**AT5**) weighing 20%. Students will be assigned a major project beginning in Week 5 and will proceed through the Semester until submission of the final plan in Week 12 as their practical covering the 3 hours of practical assigned. The purpose of this practical is to give students hands on experience and practical skills on the use of handheld GPS and basic knowledge into drafting out simple maps using Coordinates provided by the Handheld GPS. This project includes the use of handheld GPS, simple Survey Computation and drafting Techniques.

Final written examination: (AT6)

A three (3) hour written examination weighs 50%. Final exam will emphasize on all topics covered during the semester. In general, so optional questions will be provided accommodating learning gaps.

Subject Text

Hudson, N.W. 1975. Field Engineering for Agriculture Development. Oxford Uni. Press.

References

1. Schwab, G.O., Fervert, R.K. Barnes, K.K. and Edminster, T.W. 1971. Elementary Soil and Water Engineering (2nd). John Wiley, New York.
2. Clancy J. 1991. Site Surveying and Leveling. Edward Arnold, London.
3. Surveying for Engineers (2nd Edition). J. Uren and W. F. Price.
4. Moffitt, F.H. & Mikhail, E.D. 1980. Photogrammetry (3rd Edition). Harper & Row Publishers, New York.
5. Lillesand, T.M. & Kiefer, R.W. 1987. Remote Sensing & Image Interpretation (2nd Edition) John Wiley, New York.
6. Departmental Modules and Lecture Notes.

7. Internet Sites directed by the subject lecturer.
8. Niugini Agrisaiens Journal, Available at: www.unitech.ac.pg/node/756
9. Papua New Guinea Journal of Agriculture, Forestry and Fisheries.

Readings

Handouts/class notes/PowerPoint slides will be uploaded into Google classroom.

AG414 AGRICULTURAL EXTENSION

Course(s)	Agriculture (NQF Level 7)
Subject Name	Agricultural Extension
Subject Code	AG414
Duration	13 teaching weeks
Contact hours	6 hours per week (3 Lecture+ 3 Lab)
Credit Points	16
Delivery Mode	On campus
Prerequisites	AG121 Rural Sociology & Community Development
Co-requisites	Nil
Subject Coordinator	TBA

Synopsis

This subject covers the concept and philosophies of agricultural extension and various extension models around the world and in Papua New Guinea (PNG), looking at the history of extension in PNG and its present status. The subject also covers adult learning and learning activities that are appropriate to adults and their learning process. Students will learn about the importance of decision-making process in the adoption of innovations by the farmers. Hands-on practicals on needs analysis of specific clienteles using participatory rural appraisals (PRA) techniques, data entry and analysis in order to propose need-based programs and appropriate monitoring and evaluation techniques in extension are emphasised. Students are given insights into the concept of planning, organising, staffing, leading, controlling and problems of an extension organisation.

Subject Topics

1. Concept and philosophies of agricultural extension and various extension models around the world and PNG
2. Adult learning in extension
3. Decision-making process, communication in extension and adoption of innovations by the farmers
4. Farmer information need assessment (FINA) and program planning in extension
5. Monitoring and evaluation in extension
6. Management of extension organisation

Subject Outline

Topic	Content
1. Concept and principles of agricultural extension and various extension models around the world and PNG	Definition, concepts and philosophies of extension; extension goals and various extension models around the world; and the history of extension in PNG and its present status.
2. Adult learning in extension	Extension educational process; principles of teaching adult learners; essential elements to consider when teaching adult learners.
3. Decision-making process and adoption of innovations by the farmers	Decision-making process in extension and adoption of innovation in a social system; communication process in extension and the use of appropriate aids for specific target groups of clientele.
4. Farmer information need assessment and program planning in extension	FINA and its importance; PRA techniques; data entry and analysis; program planning in extension and annual activity plan.
5. Monitoring and evaluation in extension	Importance of monitoring and evaluation. Knowledge, Attitude and Practice (KAP) surveys; Knowledge, Attitude, Skills, Aspiration (KASA) surveys. Impact indicators in extension programs.
6. Management of extension organisation	Concept of extension organization and its structure and roles, staffing, qualities of an extension agent.

Subject Learning Outcomes (SLOs)

On completion of this subject students will be able to:

1. Explain the concepts and philosophies of extension, extension goals and different extension models to address the goals and the history of extension education.
2. Identify the educational process in extension and adult learning.
3. Analyse decision-making process and the adoption of innovations in a social system.
4. Identify farmers' needs and plan appropriate extension programs.
5. Evaluate extension programs using KAP and KASA evaluation tools.
6. Discuss the roles of extension organisations and the qualities of an extension agent.

Assessment Tasks and Weightings

Students must attain at least 50% overall in the subject. There will be a final written examination weighing 50% and 50% formative assessment.

Formative assessments

Quiz: There will be a quiz weighing 10%

AT 1: Quiz will be given in the first half of the semester

Tests: There will be 2 tests weighing 25%

AT 2: Test 1 in the first half of the semester weighs 15%

AT 3: Test 2 in the second half of the semester weighs 10%

Assignment: There will be 2 assignments weighing 15%. Assignment 1 will be given in the first half of the Semester and assignment in the second half of the Semester. Students will submit individual reports.

AT 4: Assignment 1: Develop an extension intervention program weighs 5%

AT 5: Assignment 2: Evaluate an extension program using KAP analysis weighs 10%

Final written examination: A 3 hour written examination weighs 50%.

AT 6: 3 hours final written examination

Assessment Rubrics

All written reports should be word-processed and electronic copies submitted through Google classroom or other learning management system. Individual reports will be assessed.

Assignment 1

	Very good (Meet all criteria)	Good (Meet two thirds of the criteria)	Fair (Meet one third of the criteria)	Criteria not met	Total Mark	Comment (s)
Introduction	Clearly indicate the aim of the assignment, methods used in need analysis and the expected outcome (3 pts).	1 of the criteria's not met (2pts)	2 of the criteria's not met (1pts)	All criteria's not met (0pt)		
Methodology	Briefly mention the methods that were used to assess the needs of the farmers (5 pts)	1 of the criteria's not met (3pts)	2 of the criteria not met (2pts)	All criteria not met (0pt)		
Results	Clearly indicate what the needs are (2 pts)	1 of the criteria not met (1pt)	2 of the criteria not met (0.5pt)	All criteria not met (0pt)		
Program intervention	Develop a detailed program to address farmer's needs (10 pts)	1 of the criteria not met (7pts)	2 of the criteria not met (3pts)	All criteria not met (0pts)		
Conclusions	Summarizes the assignment, indicating the program developed and the expected outcome (5pts).	1 of the criteria not met (3pts)	2 of the criteria not met (2pts)	All criteria not met (0pt)		
Total	25	16	10	0		

Assignment 2

	Very good (Meet all criteria)	Good (Meet 2/3s of the criteria)	Fair (Meet 1/3 of the criteria)	Criteria not met	Total Mark	Comment (s)
Introduction	Clearly indicate the aim of the assignment, methods used in program evaluation and the expected outcome (3 pts).	1 of the criteria not met (2 pts)	2 of the criteria not met (1pts)	All criteria not met (0 pt)		
Methodology	Briefly mention the methods that were used to evaluate an extension program (5 pts)	1 of the criteria not met (3 pts)	2 of the criteria not met (2pts)	All criteria not met (0 pt)		
Results	Clearly indicate the KAP results. State clearly the	1 of the criteria	2 of the criteria	All criteria		

	indicators and innovations that were adopted (10 pts)	not met (7pts)	not met (3pts)	not met (0 pt)		
Conclusions	Summarizes the findings, clearly stating the indicators and innovations that were adopted (5pts).	1 of the criteria not met (3pts)	2 of the criteria not met (2)	All criteria not met (0pt)		
Total	23	15	8	0		

Subject Textbook

Swanson, B. E. and Rajalahri, R. 2010. Strengthening Agricultural Extension and Advisory Systems: Procedures for Assessing, Transforming and Evaluating Extension Systems. The World Bank. 1818 H Street, Washington DC, USA.

References

Halim, A and Kaida, Y. 2001. Agricultural Extension in South East Asia – Historical Review. Centre for Farming System and Environmental Studies. Bangladesh Agricultural University, Mymensingh, Bangladesh.

Ray, G. L. 2003. Extension Communication and Management. Kalyani Publishers. New Delhi, India.

Rogers, E. M. 1983. Diffusion of Innovations. Free Press. New York, USA.

Van. Den Ban, A.W. 2001. Agricultural Extension 2nd Edition. CBS Publishers & Distribution. PVT. LTD. New Delhi, India.

Readings

Lecture notes and power point outlines will be uploaded to the google classroom.

AG421 PLANT BREEDING

Course(s)	Agriculture (NQF Level 7)
Subject Name	Plant Breeding
Subject Code	AG421 Plant Breeding
Duration	13 teaching weeks
Contact hours	6 hours per week (3+3)
Credit Points	16
Delivery Mode	On campus
Prerequisites	
Co-requisites	Nil
Subject Coordinator	TBA

Synopsis

Brief description of the content of the subject:

This undergraduate course examines the application of Mendelian, population, and molecular genetics principles in plant improvement programs. The course provides the theory and

procedures of each of the traditional methods of developing improved cultivars of self-pollinated, cross-pollinated, and asexually propagated crops. Examples are drawn from a wide range of crops, including cereal and grain crops, forages, fruits, vegetables, and ornamentals. Special topics include germplasm conservation, disease resistance, ploidy manipulation and applications of biotechnology to plant improvement programs. Important traits of major crops of PNG are reviewed, and current breeding programs of some of these crops are highlighted.

Subject Topics

1. Art and science of plant breeding, definitions, and history.
2. Genetic basis of plant breeding
3. Reproductive systems of plants
4. Plant breeding objective and methods: self- and cross-pollinating plants
5. The use of molecular biology techniques in plant breeding
6. Genetics of major crops in the PNG, and discussion of their priority traits for improvement

Subject Outline

Topic	Content
1. Art and science of plant breeding	The art and science of plant breeding History of plant breeding The plant breeding strategy Important plant breeders Evolutionary processes and genetic variability of plant populations Plant domestication and genetic diversity Plant germplasm conservation Consequences of insufficient diversity
2. Genetic basis of plant breeding	The genetic code Mendelian inheritance Variations in chromosome number and structure Mutation Population genetics Quantitative inheritance
3. Plant reproductive systems	Modes of reproduction Modes of pollination Fertility-regulating mechanisms and their manipulation
4. Methods of breeding self- and cross-pollinating, and clonally-propagated plants	Plant breeding objectives Classification of plant breeding methods Types of cultivars Methods of breeding self-pollinating plants <ol style="list-style-type: none"> I. Mass selection II. Pure line selection III. Pedigree selection IV. Early generation testing Backcross methods <ol style="list-style-type: none"> I. Backcrossing a dominant trait

	<p>II. Backcrossing a recessive trait Methods of breeding cross-pollinating and clonally-propagated plants</p> <ol style="list-style-type: none"> a) Recurrent selection theory b) Phenotypic recurrent selection c) Genotypic recurrent selection <p>Development of hybrid cultivars</p> <ol style="list-style-type: none"> I. Genetic basis of heterosis and implication on cultivar development II. Evaluation of combining ability III. Prediction of double-cross hybrid performance IV. Production of hybrids through the use of cytoplasmic male sterility <p>Line evaluation and Cultivar development</p>
5. The use of molecular biology techniques in plant breeding	<p>Ploidy manipulation Mutation breeding Genetic transformation DNA Markers - DNA profiling, gene mapping and marker-assisted selection</p>
6. Genetics of major crops in PNG, and discussion of their priority traits for improvement	<p>Genetics and breeding of:</p> <ol style="list-style-type: none"> i) a tree crop, ii) a grain crop, iii) a root crop and iv) an ornamental plant

Subject Learning Outcomes (SLOs)

On completion of this subject students will be able to:

1. Explain the overview and background of the art and sciences of plant breeding, its history, and the importance of plant genetic resources.
2. Explain the genetic basis of plant breeding
3. Identify and explain the different reproductive systems that exist in plants
4. Explain the different plant breeding methods for self- and cross-pollinated and clonally-propagated plants
5. Explain the use of molecular biology techniques that can be used to enhance breeding programs
6. Identify and explain genetics of major crops in PNG, and discussion of their priority traits for improvement.

Assessment Tasks and Weightings

Students must attain at least 50% overall in the subject. There will be a final written examination weighing 50% and 50% formative assessment.

Formative assessments

Breeding project assignment: This will be a semester-long assignment. Students will write a paper (with references) on a specific breeding objective within a particular crop of interest. Papers include a literature review (citation of peer reviewed publications required),

characteristics of the plant, and breeding scheme and methods. This assignment will contribute 15% to continuous assessment.

AT 1: Breeding project assignment

Field and laboratory practical reports: there will be four practical reports, two in each half of the semester, based on field and laboratory exercises. The practical reports will contribute 10% to continuous assessment.

AT 2: Practical 1 in the first half of the semester

AT 3: Practical 2 in the first half of the semester

AT 4: Practical 3 in the second half of the semester

AT 5: Practical 4 in the second half of the semester

Tests: There will be 2 tests, each weighing 10%

AT 6: Test 1 in the first half of the semester

AT 7: Test 2 in the second half of the semester

Journal article critique: There will be two journal article reviews, one in each half of the semester, related to selected lecture topics. Each review will contribute 5% to continuous assessment.

AT 8: Journal article critique 1 in the second half of the semester

AT 9: Journal article critique 2 in the second half of the semester

Final written examination: A 3-hour written examination which will contribute 50% to overall assessment.

AT 10: 3-hour final written examination.

Assessment Rubrics

Breeding project assignment

The written assignment should be word-processed and electronic copies submitted through Google classroom or other learning management system. Individual reports will be assessed.

Component	Weighting	Exemplary [4 points]	Accomplished [3 points]	Developing [2 points]	Beginner [1 point]	Score (/38)
1. Abstract/ Summary	1	Presents a clear abstract or summary of the report	Either lacks clarity or is missing one of the primary elements.	Weak or missing primary elements.	No real abstract or summary.	4
2. Introduction	1.5	Presents a clear background and rationale of the project(s) or activities undertaken, aims of these activities and their significance. Includes one or more references to supporting sources.	Either lacks clarity or is missing one of the primary elements.	Weak or missing primary elements.	No real introduction.	6
3. Genetic background of the crop and the trait of interest	1.5	Presents a clear genetic background of the crop and the trait of interest. Includes one or more references to supporting sources.	Either lacks clarity or is missing one of the primary elements.	Weak or missing primary elements.	No real genetic background of the crop and the trait.	6
4. Breeding objective(s)	0.5	Presents clear breeding objectives	Either lacks clarity or is missing one of the primary elements.	Weak or missing primary elements.	No real breeding objective(s).	2

Component	Weighting	Exemplary [4 points]	Accomplished [3 points]	Developing [2 points]	Beginner [1 point]	Score (/38)
5. Materials and Methods,	2	Gives the reader a clear picture of the materials and methods used. Does not use prescriptive language. Uses specific, not general, terminology. Detailed, step-by-step procedures are clearly referenced. Avoids long, redundant descriptions.	Some methods are presented so briefly and/or vaguely that it is unclear how or why they were done. May be some written as a protocol rather than a description.	Some methods are omitted; others are presented in a piecemeal, vague form.	Methods barely mentioned.	6
6. Expected outcome of the breeding program	1.5	It is clear that the methods and results have been understood. The results (including controls) are related to the questions posed and analysed for their effectiveness. Possible explanations for inconsistencies and/or unexpected results are given.	There may be some lack of clarity. Did the writer understand why certain methods were used, and how the results could shed light on the questions asked? Incomplete analysis of inconsistencies and unexpected results.	Very little analysis of the results. Statements are vague and general. Inconsistencies are explained by 'human error' or something similar.	Mostly a restatement of results. No analysis given. No recognition of error sources. No understanding of controls.	6
7. Cohesiveness	0.5	It is clear that the report covers a group of related procedures with a clear set of goals.	Sometimes the goals are not clearly related to the report. Some fragmentation occurs, with methods and results	Transitions are abrupt. Each day's work seems unrelated to the next. Aims	Disjointed. No flow. Very little use of headings, or explanatory sentences.	2

Component	Weighting	Exemplary [4 points]	Accomplished [3 points]	Developing [2 points]	Beginner [1 point]	Score (/38)
			apparently unrelated to each other.	are not clearly present throughout.		
8. Spelling/grammar	0.5	No spelling or grammatical errors.	An occasional error.	Apparently not proofread for errors.	Frequent grammatical errors: incomplete sentences, tense changes, misspellings.	2
9. Reference	0.5	More than 5 current sources, of which at least 3 are peer-review journal articles or scholarly books. Sources include both general background sources and specialized sources. Special-interest sources and popular literature are acknowledged as such if they are cited. All web sites utilized are authoritative.	5 current sources, of which at least 2 are peer-review journal articles or scholarly books. All web sites utilized are authoritative.	Fewer than 5 current sources or fewer than 2 of 5 are peer-reviewed journal articles or scholarly books. All web sites utilized are credible.	Fewer than 5 current sources or fewer than 2 of 5 are peer-reviewed journal articles or scholarly books. Not all web sites utilized are credible, and/or sources are not current	2
10. Citation	0.5	Cites all data obtained from other sources. APA citation	Cites most data obtained from other	Cites some data obtained	Does not cite sources	2

Component	Weighting	Exemplary [4 points]	Accomplished [3 points]	Developing [2 points]	Beginner [1 point]	Score (/38)
		style is used in both text and bibliography.	sources. APA citation style is used in both text and bibliography.	from other sources. Citation style is either inconsistent or incorrect.		
Total score:						
<p>NOTE: Grammar and Style: This written assignment is expected to demonstrate excellent writing, including proper grammar, spelling, punctuation, and APA 6th style (both paper format and citations). Up to 10% of your report total grade may be deducted for failure to demonstrate excellent writing skills and following formatting guidelines.</p>						

Writing of laboratory reports

All written reports should be word-processed and electronic copies submitted through Google classroom or other learning management system. Individual reports will be assessed.

Grading Category	Weighting	Exemplary (5 points)	Accomplished (4 points)	Developing (2.5 points)	Incomplete (1 point)	Score (/33)
Abstract	0.6	Presents a clear abstract or summary of the report	Either lacks clarity or is missing one of the primary elements.	Weak or missing primary elements.	No real abstract or summary.	3
Introduction	1	Presents a clear summary of the aims of the study and its significance. Briefly describes experimental design. Probably includes one or more references to supporting sources.	Either lacks clarity or is missing one of the primary elements.	Weak or missing primary elements.	No real introduction.	5
Materials and Methods	1.5	Gives the reader a clear picture of the methods and materials used. Does not use prescriptive language. Uses specific, not general, terminology. Detailed, step-by-step procedures are clearly referenced. Avoids long, redundant descriptions.	Some methods are presented so briefly and/or vaguely that it is unclear how or why they were done. May be some written as a protocol rather than a description.	Some methods are omitted; others are presented in a piecemeal, vague form.	Methods barely mentioned.	7.5
Results	1.5	All figures and tables have titles and legends. All results	Some data may be missing, or legends may	Data is presented haphazardly. It is	No logical connection	7.5

		are clearly presented, with a logical sequence. Controls are clearly indicated.	be brief, vague or uninformative.	sometimes not possible to tell what material or procedure was used to obtain the data.	between methods and data. Irrelevant data may be included, and relevant data left out. No legends.	
Discussion	1	It is clear that the methods and results have been understood. The results (including controls) are related to the questions posed and analysed for their effectiveness. Possible explanations for inconsistencies and/or unexpected results are given.	There may be some lack of clarity. Did the writer understand why certain methods were used, and how the results could shed light on the questions asked? Incomplete analysis of inconsistencies and unexpected results.	Very little analysis of the results. Statements are vague and general. Inconsistencies are explained by 'human error' or something similar.	Mostly a restatement of results. No analysis given. No recognition of error sources. No understanding of controls.	5
Cohesiveness	0.5	It is clear that the report covers a group of related procedures with a clear set of goals.	Sometimes the goals are not clearly related to the report. Some fragmentation occurs, with methods and results apparently unrelated to each other.	Transitions are abrupt. Each day's work seems unrelated to the next's. Aims are not clearly present throughout.	Disjointed. No flow. Very little use of headings, or explanatory sentences.	2.5

Spelling/grammar	0.5	No spelling or grammatical errors.	An occasional error.	Apparently not proofread for errors.	Frequent grammatical errors: incomplete sentences, tense changes, misspellings.	2.5
Total score:						
NOTE: Grammar and Style: This written assignment is expected to demonstrate excellent writing, including proper grammar, spelling, punctuation, and APA style (both paper format and citations). Up to 10% of your assignment total grade may be deducted for failure to demonstrate excellent writing skills and following formatting guidelines.						

Writing of Journal article critique

All reviews of journal articles should be word-processed and electronic copies submitted through Google classroom or other learning management system. Individual reviews will be assessed separately.

Grading Category	Exceptional (5 points)	Good (4 points)	Needs Improvement (3 points)	Inadequate (2 points)	Missing (0 point)	Score (/30)
1. Summary of article's major points	Presents a thorough summary of the article that is succinct and correct in both major points and supporting details.	Demonstrates complete understanding of the article and has highlighted most major points.	Shows an understanding of the information in the article, but has not included some major points and/or supporting details.	Understanding of the article major points is incomplete or many misconceptions are demonstrated.	Article summary is not present.	

2. Critique of the literature review and theoretical framework	Addresses all elements and offers a complete and clear critique of weak or missing elements.	Constructs a valid judgment about the article and explains the basis of the judgment. Some elements are omitted when they should be addressed.	Constructs a judgment about the article; however, important elements are omitted or not supported.	Judgments are not constructed or are not supported by the facts contained within the article.	Critique of the literature review and theoretical framework is not present.	
3. Critique of the study design and methods	Addresses all elements and offers a complete and clear critique of weak or missing elements.	Constructs a valid judgment about the article and explains the basis of the judgment. Some elements are omitted when they should be addressed.	Constructs a judgment about the article; however, important elements are omitted or not supported.	Judgments are not constructed or are not supported by the facts contained within the article.	Critique of the study design and methods is not present.	
4. Critique of the results and discussion	Addresses all elements and offers a complete and clear critique of weak or missing elements.	Constructs a valid judgment about the article and explains the basis of the judgment. Some elements are omitted when they should be addressed.	Constructs a judgment about the article; however, important elements are omitted or not supported.	Judgments are not constructed or are not supported by the facts contained within the article.	Critique of the results and discussion is not present.	
5. Evidence of critical thinking	Addresses all elements and makes accurate	A few accurate judgments about the article are	Judgments about the article and relation to course	Incorrect judgments are made that are not	Judgments regarding the article or study	

	judgments about the article	made, based on research principles; some omissions or inconsistencies. Critique relates to course content, but is incomplete or inconsistent.	content are not clear, lack specificity, or are only partially correct.	based on course content or misrepresent the article content.	design are not present.	
6. Conclusion	Strengths and limitations are clearly and thoroughly summarized with appropriate supporting details. Relevance of the article to crop improvement is clearly addressed and convincing rationale presented.	Strengths and limitations are discussed, but not appropriately supported with supporting details. Relevance of the article to crop improvement is addressed, but a convincing rationale for clinical practice implications is omitted.	Strengths and limitations are not clearly or thoroughly discussed. Supporting details are not provided. Weak or inconclusive conclusions regarding the relevance of the article to crop improvement.	Strengths and limitations of the article and study are not discussed, or are too limited to provide a conclusion regarding the evidence. No or very limited reflection on the clinical relevance of the article to crop improvement.	Conclusion paragraph is not present.	
Total score:						

NOTE: Grammar and Style: This written assignment is expected to demonstrate excellent writing, including proper grammar, spelling, punctuation, and APA style (both paper format and citations). Up to 10% of your assignment total grade may be deducted for failure to demonstrate excellent writing skills and following formatting guidelines.

Subject Textbook

Sleper, D. A. and Poelhman, J. M. (2006) Breeding field crops. Blackwell Publishing, Iowa.

References

- Jones, R. N. and Karp, A. 1986. Introducing Genetics, John Murray, London.
- Falconer, D. S. and Mackay, T. F. C. 1996. Introduction to quantitative Genetics, 4th Ed. Longman. London.
- Chapman, A. B. 1991. General and Quantitative Genetics. Elsevier Science, Amsterdam.
- Simmonds, N. W. 1979. Principles of crop improvement. Longman, London.
- Simmonds, N. W. (Ed.). 1976. Evolution of crop plants. Longman, London.
- Mayo, O. 1980. The theory of plant breeding. Clarendon, Oxford.
- Niugini Agrisaiens Journal, Available at: www.unitech.ac.pg/node/756.

Readings

Lecture notes and presentations will be uploaded to the Google classroom.

AG422 AGRICULTURAL BIOTECHNOLOGY

Course(s)	Agriculture (NQF Level 7)
Subject Name	Agricultural Biotechnology
Subject Code	AG422 Agricultural Biotechnology
Duration	13 teaching weeks
Contact hours	6 hours per week (3+3)
Credit Points	16
Delivery Mode	On campus
Prerequisites	AG111 Biochemistry
Co-requisites	Nil
Subject Coordinator	TBA

Synopsis

Brief description of the content of the subject:

This undergraduate course introduces the principles and concepts of agricultural biotechnology for both plants and animals. Definitions and scope of appropriate agricultural biotechnology in developing countries and technology-transfer are discussed. It introduces major biotechnological techniques and equipment used in crop and animal improvement, breeding, and disease diagnosis in lectures and laboratory exercises. DNA sequencing, recombinant DNA technology, polymerase chain reaction, enzyme-linked immuno-sorbant assay, nucleic acid hybridisation assays, etc. are reviewed. It examines the ecological, sociological and ethical

issues associated with genetically-modified organisms (GMO) and their products. Current status and potential opportunities in the application of agricultural biotechnology in PNG are reviewed.

Subject Topics

- a) Overview and principles of biotechnology in agriculture
- d) Biology of biotechnology and their applications
- e) Application of biotechnology for the genetic improvement of farm animals
- f) Application of biotechnology for the genetic improvement of crop plants
- g) Application of biotechnology in crop protection
- h) The state of agricultural biotechnology and its perception in PNG

Subject Outline

Topic	Content
1. Overview and principles of biotechnology in agriculture	Introduction of biotechnology in agriculture. Review of prokaryotic and eukaryotic cell structure and function Cell and cellular biomolecules.
2. Biology of biotechnology	Nucleic acids – their structure and function Genetic code -Central dogma of molecular biology. Eukaryotic gene: its structure, replication, transcription, translation and regulation Recombinant DNA technology, enzymes, and restriction maps, PCR, electrophoresis
3. Application of biotechnology in genetic improvement of farm animal	Reproductive biotechnologies: artificial insemination, MOET, cloning DNA fingerprinting, marker assisted selection, gene transfer (mostly descriptive/ explanatory) Applications of biotechnology in animal nutrition and health
4. Application of biotechnology in genetic improvement of crop plants	Plant genotyping: techniques, process & application Marker development - common marker systems Applications of marker-assisted selection Tissue culture technology: types and application The genetic manipulation of insect resistance
5. Application of biotechnology in crop protection	PCR-based disease diagnosis Protein-based (serological) diagnosis. Virus indexing – process & application
6. The state of agricultural biotechnology and its perception in PNG	Status of biotechnology in PNG – opportunities, risks and challenges; some research opportunities. Risks and benefits of biotechnology; genetically products/organisms; public perceptions.

Subject Learning Outcomes (SLOs)

On completion of this subject students will be able to:

1. Review and explain the basic principles and biology of biotechnology in agriculture;

2. Explain the biology of biotechnology and identify the appropriate tools and techniques of genetic engineering;
3. Identify and apply techniques of biotechnology for the improvement of farm animals, gain basic skills in artificial insemination and embryo transfer in domestic animals, and appreciate the role of this technology in improving animal production in PNG;
4. Identify and apply techniques of biotechnology for the genetic improvement of crop plants, creation of variation, plant genetic modification, and enhancement of breeding programs;
5. Identify and apply techniques of biotechnology in diagnosis of crop diseases.
6. Review and evaluate the status of biotechnology and its perceptions in PNG.

Assessment Tasks and Weightings

Students must attain at least 50% overall in the subject. There will be a final written examination weighing 50% and 50% formative assessment.

Formative assessments

Quizzes: there will be two quizzes, one in each half of the semester, based on the reading materials. Each quiz will contribute 5% to continuous assessment.

AT 1: Quiz 1 in the first half of the semester

AT 2: Quiz 2 in the second half of the semester

Tests: There will be 2 tests each weighing 10%

AT 3: Test 1 in the first half of the semester

AT 4: Test 2 in the second half of the semester

Field and laboratory practical reports: there will be four practical reports, two in each half of the semester, based on field and laboratory exercises. The practical reports will contribute 20% to continuous assessment.

AT 5: Practical 1 in the first half of the semester

AT 6: Practical 2 in the first half of the semester

AT 7: Practical 3 in the second half of the semester

AT 8: Practical 4 in the second half of the semester

Final written examination: A 3-hour written examination which will contribute 50% to overall assessment.

AT 9: 3-hour final written examination.

Subject Textbook

Chawla H. S. 2009. Introduction to Plant Biotechnology (3rd Edition). Science Publishers, USA.

References

Channarayappa . 2007. Molecular Biotechnology: Principles and practices. University Press, India, pp. 1217.

Sheeler, P. and Bianchi, D. 1987. Cell and Molecular Biology (3rd Edn). John Wiley and Sons Inc, pp. 704.

Sambrook, J. and Russell, D.W. 2001. Molecular Cloning: A Laboratory Manual (3 vol. set), 3rd Edn, Cold Spring Harbour Laboratory Press, pp. 999.

Understanding Animal Breeding by Richard M. Bourdon. Prentice Hall. 1997

Niugini Agrisaiens Journal, Available at: www.unitech.ac.pg/node/756

Readings

Lecture notes and power point outlines will be uploaded to the google classroom.

Relevant Unitech Policies

It is important that all students familiarize themselves with the University of Technology Assessment Guidelines **99** including those on plagiarism www.unitech.ac.pg/Plagiarism/

AG423 POSTHARVEST TECHNOLOGY

Programs	Agriculture (NQF Level 7)
Subject Name	Postharvest Technology
Subject Code	AG423
Contact hours	6 hours per week (3 Lecture+ 3 Lab.)
Duration	13 teaching weeks
Credit Points	16
Delivery Mode	On campus
Prerequisites	
Co-requisites	Nil

Synopsis

Postharvest is the stage of crop and livestock production immediately following harvest and the processes undertaken include cleaning, cooling, sorting, curing, packing, storage and transportation, Postharvest loss is a change in quantity or quality of the produce after harvest that decreases the produces' value. This subject examines the factors that lead to postharvest losses and how the losses can be managed using appropriate postharvest management technologies. The subject begins by initially determining what can be done at the production stage to minimise postharvest losses and goes on to establish the factors that are responsible for the losses. Towards the end, postharvest technologies that are available to prevent and manage the losses are discussed.

Subject Topics (ST)

Major areas to be covered in this subject are:

1. Concepts of postharvest technology.
2. Postharvest handling and losses.
3. Postharvest loss assessment.
4. Low-cost and low technology food processing methods.
5. Low-cost cooling, curing and ripening methods and cool transport.

Topic	Content
1. Importance of postharvest technology	Introduction of the concepts of harvesting, postharvest, postharvest technology, postharvest loss (quality and quantity), choice of crop and livestock and factors affecting their production; harvesting methods.
2. Postharvest handling and losses.	Cleaning and sorting, cooling and packing, storage and transportation, factors of deterioration, components of quality, and principles of quality management. Meat preservation, milk handling
3. Postharvest loss assessment	Measurement of damages and estimation of losses, assessment of various types of losses, identification and management of casual agents of losses, storage temperature and relative humidity loss management.
4. Low cost and low technology food processing methods	Solar drying, solar cooking and combined methods, and packing and shading for protection of harvest.
5. Low-cost cooling, curing and ripening methods and cool transport.	Evaporative forced air cooling, hydro-cooling, insulated boxes, natural curing, heated air curing, and 1-methyl cyclopropane (1-MCP), ethylene, and calcium carbide treatment of fruits, and cooled transports. Salting

Subject Learning Outcomes (SLOs)

Upon completing this subject, students should be able to:

1. Define key concepts of postharvest and postharvest technology.
2. Explain quality and quantity management of produce after harvesting.
3. Demonstrate the basic principles of crop and livestock production and harvesting methods.
4. Apply skills in identifying factors responsible for postharvest losses.
5. Adapt various postharvest technologies available to manage postharvest losses.
6. Determine how postharvest technologies can be used to manage postharvest losses.

Assessment Tasks and Weightings

Students must attain at least 50% overall in the subject. The assessment types and weightings for formative assessment and a final written examination are:

Tests: There will be 3 tests (AT1, AT2 and AT3) each weighing 10%.

AT1: Weighing 10%

AT2: Weighing 10%

AT3: Weighing 10%

Sequence of test administration: AT1 given after ST2, AT2 given after ST4 and AT3 given mid ST5.

Assignments: Two assignments, each weighing 5%, will be given. The sequence of assignment administration is: AT4 given after ST1 and AT5 given after ST3, respectively.

AT4: Assignment 1 weighs 5% (title and description to be given from time to time).

AT5: Assignment 2 weighs 5% (title and description to be given from time to time).

Laboratory report: Written report(s) for all practical sessions weigh 10%.

There are five (5) laboratory practicals (LP) to be given, each weighing 2%. The LPs will be delivered in the following sequence: ST1-LP1; ST2-LP2; ST3-LP3; ST4-LP4, and ST5-LP5. Areas of investigation for LPs are:

AT6: Identification of causes of postharvest losses (2%).

AT7: Assessment of postharvest handling losses (2%).

AT8: Assessment of losses in quality and quantity (2%).

AT9: Different methods of curing (natural and artificial) (2%).

AT10: Packing and shading (2%).

AT11: A 3-hour final written examination weighs 50%.

Subject Textbooks

Arteca, R. N. 2006. Introduction to Horticultural Science, Thomson Learning, Asia.

Brooker, D.B., Bakker – Arkema, F.W., and Hall, C.W. 1992. Drying and Storage of Grains and Oilseeds. AVI. Publication, USA.

References

Acquaah, G. 2008. Horticulture: Principles and Practices (4th edn.), Prentice Hall.

Hagulua, V. and Natera, E. 2007. Quality Management of Fresh Produce from the Highlands of Papua New Guinea. *Post-Harvest Manual*. ACIAR Monograph No: 128, 88p

Ingels, J. 2009. Ornamental Horticulture (4th Ed.). Delmar Cengage Learning.

Ingels, J. E. 2003. Landscaping Principles and Practices (6th Ed.), Thomson Learning

Poincelot, R. P. 2004. Sustainable Horticulture Today and Tomorrow. Prentice Hall

Preece, J. E. and Read, P. E. 2005. Biology of Horticulture: An Introductory Textbook. John Wiley & Sons Inc.

Rice, L. W. and Rice, R. P. 2010. Practical Horticulture (7th edn.). Prentice Hall.

Payne, W.J.A. 1990. An Introduction to Animal Husbandry in the Tropics (4th Edn). Longman Scientific & Technical, New York, USA

Niugini Agrisaiens Journal, Available at: www.unitech.ac.pg/node/756

Papua New Guinea Journal of Agriculture, Forestry and Fisheries

Readings

Lecture notes and PowerPoint presentations (supplementary notes). The recommended textbook including other key eBooks are available on Google to help you study this subject.

AG424 FARM MANAGEMENT ECONOMICS

Programs	Agriculture (NQF Level 7)
Subject Name	Farm Management Economics
Subject Code	AG 424
Duration	13 teaching weeks
Contact hours	6 hours (4 lectures + 2 tutorials)
Credit Points	18
Delivery Mode	On campus
Prerequisites	Agribusiness and entrepreneurship
Co requisites	
Subject Coordinator	TBA

Synopsis

Farm Management enables student to obtain the fundamental knowledge of decision-making process, management tools, and economic principles used in farm management. It will impart cognitive skills to think critically about the farm management tools and the economic relationships between inputs and outputs relevant for agricultural enterprise management. The Subject examines the principles of planning, decision making, managing resource use and how they impact on agricultural enterprises. The course covers a range of management tools from principles of decision making to enterprise planning, capital budgeting, economic principles of enterprise management, risk and uncertainty and strategies to mitigate risk and uncertainty. The subject adopts a hands-on approach using real time farm data from the Agriculture Farm to reinforce theoretical concepts.

SUBJECT TOPICS

1. Topic 1: Decision making process
2. Topic 2: Economics principles
3. Topic 3: Farm management information
4. Topic 4: Farm planning methods
5. Topic 5: Capital budgeting
6. Topic 6: Risk and uncertainty

Subject outline

Topic	Contents
1. Decision making process	Introduction Definition, function and classification of decisions within physical, social and economic environments. Management decisions. Farm management, concerned with decisions that affect the profitability of the farm business. Decisions: production and marketing.

	<p>Successful farm manager. Identify and solve problem: what ought to be vs what it is, correct vs right decisions, analysis, action, and bear responsibility.</p> <p>Classification of decisions Importance, frequency, imminence, revocability, available alternatives.</p> <p>Tools of farm management. Access to farm information, farm manager knowledge & skill, the scientific approach to solving problems, economic principles, farm planning methods: budgeting and simulations.</p> <p>Production environment. Physical, social and economic environments.</p>
<p>2. Economic Principles</p>	<p>Introduction Definition – Theories of production and cost of production: production function, long-term vs short-term production horizons, law of diminishing returns, profit maximization and minimization of costs.</p> <p>Economic principles Productive resources, production function, input-output relations, input-input relations, output-output relations and cost and revenue relationships.</p> <ol style="list-style-type: none"> 1. Productive resources. Land, labour, capital, gifts of nature. 2. Production function. Relationship between inputs and outputs, law of diminishing returns, stages of production, deciding on the level of inputs to use, deciding on the level of output to produce, rational production, profit maximization. 3. Deciding on the combination of inputs.. Input-input relationships, least cost combination of inputs. 4. Deciding on the combination of products. Output-output relationships, optimum combination of products.
<p>3. Farm Management Information</p>	<p>Enterprise record systems. Input-output physical and monetary records.</p> <p>General farm record systems. Sales, tax, financial, purchase, and service records.</p> <p>Valuation of farm inventory. Cost base of price base valuation approaches, income capitalization.</p> <p>Depreciation Purpose, and methods: straight line, declining –balance and sum-of-the- years digits methods.</p> <p>The income statements Purpose, components of income statement, performance ratios.</p>

	<p>The cash flow statement Purpose, uses and sources of funds, production and financing aspects as they influence production operations.</p> <p>The net worth statement Purpose, assets and their classification, liabilities and their classification, net worth, performance ratio analysis.</p>
4.Farm planning methods	<p>Budgeting Purpose and types of budgets: enterprise, whole, partial, and gross margin budgets and linear programming.</p> <p>Enterprise budgets Purpose, structure and components of enterprise budget, allocation of fixed costs.</p> <p>Whole farm budget Purpose, structure and components of whole farm budget, allocation of fixed costs.</p> <p>Partial budget Purpose and types: adding to an enterprise, introducing a new enterprise, purchasing a new machine, structure to make accept/reject decisions.</p> <p>Gross margin Purpose, a tool to assess: enterprise profitability, enterprise selection.</p> <p>Linear program Purpose, assumptions, activity vs enterprise, activity requirements, activity constraints, non-negativity condition, optimum solution, effective vs non-effective constraints and shadow prices, application using Unitech/Agriculture farm data.</p>
5 Capital budgeting.	<p>Capital Distinction between capital budget and other budget; capital has economic life, provides a stream of services over that economic life; its purchase and use decisions in terms of cash flows needs to be assessed.</p> <p>Time value of money. Compounding vs discounting approaches and reasons for using the discounting approach.</p> <p>Discounted measures of capital purchase decisions. Net present value, benefit-cost ratio, applications.</p>

6. Risk and uncertainty.	<p>Definition Risk vs uncertainty</p> <p>Causes of uncertainty. Physical environment: soil type, climatic conditions, natural disasters; biological environment: pests and diseases; economic environment: prices of inputs and outputs, government policy; social environment: ill-health, strike, etc.</p> <p>Measures of risk and uncertainty Variances, standard deviation, covariance, correlation analysis.</p> <p>Strategies to mitigate uncertainty Insurance: property, liability, yield, life, health.</p> <p>Production: Choice of reliable enterprises, diversification, keeping reserve food supplies, maintaining flexibility, discount for risk, collecting more information, contracting prices in advance.</p>
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Subject learning outcomes

1. Determine the production environments, identify and categorize decisions, and apply the decision-making process.
2. Explain the concept of production function, assess the production and cost relationships between inputs and outputs and calculate profit the profit maximizing and cost minimizing levels of inputs and outputs.
3. Formulate farm budgets and asses impacts to changing production and economic environments.
4. Formulate financial statements, appraise business performance, and adapt changes.
5. List and discuss decision categories, information sources for planning and performance analysis, inventory procedures and depreciation methods.
6. Identify the sources of risk and uncertainty and identify relevant mitigating strategies of risk and calculate variances for decision choices and diversification options.

Assessment tasks and weightings

To obtain a pass grade in this Subject, 50% overall must be achieved. Subject Assessment consists of assignments, tests and a final examination as summarized below. Students shall be provided with the details of the assignments in the Assignments and the Subject Assessment Guide.

AT1: Assignment 1 (group) - The assignment provides student with the opportunity to undertake a critical analysis of farm management problems on the Agriculture Farm. It contributes **6%** of the total marks for the Subject.

AT2: Assignment 2 (individual): This assignment is to identify production relationships and calculate profit maximizing levels of inputs, output, and least cost input combinations and optimum output combinations. The assignment is worth **6%** of the total marks for the Subject.

AT3: Assignment 3 (individual): This assignment involves construction of partial and breakeven budgets and evaluates decision choices. The assignment is worth **6%** of the total marks for the Subject.

AT4: Assignment 4 (group): This assignment involves the identification, inventory and valuation of the Agriculture Farm Assets. The assignment is worth **6%** of the total marks for the Subject.

AT5: Assignment 5 (group) - This assignment involves the review and synthesis of Agriculture Farm information. The assignment is worth **6%** of the total marks for the Subject.

AT6: Tests – Each of the tests listed below will carry 4% of total marks for the subject.

AT6A: Test 1: Topic 1 (Decision making process) – 4%

AT6B: Test 2: Topic 2 (Economic principles) – 4%

AT6C: Test 3: Topic 3 (Farm management information) – 4%

AT6D: Test 4: Topics 4 & 5 (Farm planning tools and capital budgeting) – 4%

AT6 E: Test 5: Topic 6 (Risk and uncertainty) – 4%

AT7: Final examination – 50%

Textbooks

Ronald Kay and William Edwards and Petricia Duffy (2016). Farm Management 8th edition. Mc Graw Hill.

References

Freddie L. Barnard, John Foltz, Elizabeth A. Yeager, and Brady Brewer (2020). Agribusiness Management. 6th edition. CRC Press, Taylor & Francis Group.

Emery N Castle, Manning H Becker & Frederick J Smith (1972). Farm Business Management. 2nd Edition. Macmillan Publishing Co., Inc. New York.

Niugini Agrisaiens Journal, Available at: www.unitech.ac.pg/node/756

Papua New Guinea Journal of Agriculture, Forestry and Fisheries

Readings

Lecture notes and Power-Point presentations (supplementary notes).

AG425 PROFESSIONAL WORK EXPERIENCE

Program	Agriculture (NQF7)
Subject Name	Professional Work Experience
Subject Code	AG425
Duration	60 days in the workplace
Contact Hours	Not Applicable
Credits:	0
Delivery Mode	Workplace
Prerequisites	Completion of Year 1
Co-requisites	Nil
Subject Coordinator	TBA

Synopsis

Students must complete a minimum of 60 days in total of professional practice in agriculture to meet professional requirements and be eligible to graduate in Bachelor of Science in Agriculture degree course. The 60 days will normally consist of not more than 3 periods of employment with each period

normally being of 20 days minimum duration. The subject requires students to document details of the practical work and professional practice skills they acquire within the workplace. Since students may obtain work experience over their full course, experience may take numerous forms ranging from roles as junior members of teams to leading parts of projects. Students maintain a diary and prepare a portfolio that describe the work undertaken and how the work experience has contributed to the development of Unitech Graduate Capabilities and agriculture discipline course learning outcomes. A diary with regular entries must be maintained as a true and faithful record of the days/hours the student has completed and each work experience period must be certified by the employer.

Subject Topics

1. Review the Unitech Graduate Capability statements and Course Learning Outcomes for their Discipline.
2. Arrange and prepare for Professional Work Experience.
3. Undertake the required amount of Professional Work Experience.
4. Document periods of Professional Work Experience in a Diary
5. Prepare a single Professional Work Experience portfolio that outlines key professional aspects of the work experience and reflects on work experience participation.

Subject Learning Outcomes (SLOs)

On completion of this subject students will be able to:

1. Demonstrate practical skills in a selected discipline.
2. Undertake and complete assigned tasks in the workplace and maintain a professional level record of those tasks.
3. Critically reflect on achievements within the workplace in the context of the course learning outcomes of agriculture program.
4. Communicate workplace experiences and achievements through a professional portfolio.
5. Understand and apply basic workplace health and safety principles in agriculture discipline setting.

Assessment Tasks and Weightings

This subject has Pass/Fail criteria. There is no final examination in this subject. Both assessment tasks should be submitted during the student's final year of study to enable eligibility for graduation.

AT1: Assessment 1 – Professional Work Experience Diary. The diary will provide details of 60 days minimum of workplace employment. The diary may consist of up to 3 separate employment periods, each with 20 days minimum duration. Each period of employment must be accompanied by a statement from the employer. **The combined diary contributes 40% towards the final grade for the subject.**

AT2: Assessment 2 - Professional Work Experience Portfolio: The single portfolio will provide descriptions of the work experience undertaken including salient aspects of major projects undertaken and the student's role within those projects. While being a single portfolio it may consist of up to 3 episodes of workplace experience. The student will also reflect on each period with the workplace within the context of the learning outcomes of their course. **The single portfolio contributes 60% towards the final grade for the subject.**