



NATIONAL METEOROLOGICAL TRAINING SCHOOL

TRAINING CURRICULUM FOR DIPLOMA IN AGRICULTURAL
METEOROLOGY (DAM)



MAY, 2024

Ministry of Water and Environment

Table of Contents

1.0 TITLE OF THE PROGRAMME:	5
1.1: BACKGROUND	5
2 Justification of the programme	5
3 Objectives of the Programme	6
3.1 Main Objective:	6
3.2 Specific objectives:	6
4 Definition of terms	7
5 Resources	8
5.1 Staffing	8
5.3 Space	8
5.4 Funding	8
6 Admission requirements	8
6.1 Direct entry	8
6.2 Certificate holders	9
7 General Regulations	9
7.1 Name of the diploma	9
7.2 Nature of the programme	9
7.3 Duration of the programme	9
7.4 Earning a credit in a module	9
7.6 Academic Progress	9
8 Mode of delivery	11
9 Grading	11
9.1 Classification of the Diploma	12
9.1.1 Course work (CW)	12
9.1.2 Examinations	12
10 Curriculum	13
10.1 Duration	13
10.2 Structure of the Programme	13
10.3 Programme summary	14
11. Detailed Module description	15

11.1 Year one, 1st Semester.....	15
DAM 111: Mathematics – 60 Hours.....	15
DAM 112: Environmental Physics – 60 Hours.....	18
DAM 113: Soil science – 60 Hours.....	21
DAM 114: Introduction to Meteorology – 45 Hours	23
DAM 115: Communication and life Skills – 45 Hours	26
DAM 116: Introduction to Computer – 45 Hours	29
DM 117: Meteorological Instruments and Methods of Observations – 60 Hours	39
DAM 118: Crop Production and Management – 45 hours	41
11.2 Year one, 2nd Semester.....	44
DAM 121: Introduction to Agrobiology – 60 Hours	44
DAM 122: Agricultural Mechanization	47
DAM 123: Agricultural Climatology – 45 hours	49
DAM 124: Applied Statistics in Agricultural Meteorology – 60 Hours	51
DAM 125: Environmental Pollution and control – 45 Hours	54
DAM 126: Research Methods – 45 Hours	56
DAM 127: Gender and Climate – 45 Hours	59
11.3 Year two, 1st Semester	60
DAM 211: Elements of Hydrometeorology – 45 Hours	60
DAM 212: Micrometeorology – 45 Hours	63
DAM 213: Applications of Remote Sensing in Agriculture – 45 Hours.....	66
DAM 214: Agrometeorological Advisory Services – 45 Hours.....	68
DAM 215: Climate Change and Agriculture – 45 hours	72
DAM 216: Industrial Training – 75 Hours.....	74
DAM 217: Animal Production and Management – 45 Hour.....	76
11.4 Year two, 2nd Semester	82
DAM221: Forecasting and Agricultural Modelling Techniques – 45 hours	82
DAM 222: Sustainable Organic Agriculture – 75 Hours	84
DAM 223: Entrepreneurship Skills – 45 Hours	86
DAM 224: Weather and Climate Disaster Risk Management – 45 Hours	89
DAM 225: Research Project – 75 Hours	91
DAM 226: Agricultural Economics	93
APPENDICES	95

APPENDIX 1: List of Teaching Staff	95
APPENDIX 2: Teaching Facilities-Lecture Rooms	96
APPENDIX 3: Other Facilities	96
APPENDIX 4: List of Trainees	96
APPENDIX 5: Industrial Training Assessment Form for Academic Supervisor	97
APPENDIX 6: Industrial Training Assessment Form for Field or Onsite Supervisor.....	98
APPENDIX 7: Industrial Training Log Book.....	99
APPENDIX 8: Daily Records of Progress	100
APPENDIX 9: Guide on Marking of Industrial Training Report	100
APPENDIX 10: Industrial Training Results Submission Form.....	101
APPENDIX 11: Score Guide for Presentation of a Research Proposal	102
APPENDIX 12: Score Guide for Presentation of a Research Report.....	102

[G1][G2]

NMMS - CURRICULUM

1.0 TITLE OF THE PROGRAMME:

This programme shall be called Diploma in Agricultural Meteorology.

1.1: BACKGROUND

Agricultural Meteorology is the study and application of weather and climate information to enhance agricultural production. Agricultural meteorology mainly involves the interaction of meteorological and hydrological factors, on one hand and agriculture, which encompasses soil science, crop and animal husbandry as well as forestry.

Agricultural production in Uganda is dependent on weather and climate despite the impressive advances in agricultural technology over the last decades. All agricultural endeavors are influenced by weather and climate events. The benefits of understanding these events help in the establishment of techniques and controls that foster a healthier agricultural sector. It is therefore very important for farmers, researchers or persons interested in /who practice agriculture, to know that there are daily, monthly, seasonal and annual variations in weather and climate that play a vital role in crop response and survival. Therefore, Agro-meteorology involves the application of meteorological information and data to weather sensitive problems of Agriculture.

2 Justification of the programme

Weather and climate are key drivers of agricultural production. To maximize agriculture in all levels, for instance at subsistence and commercial, there is need to explore effectively the role of weather and climate in agriculture. Climate variability and change come with severe consequences and opportunities that can be harnessed with the services of an agricultural meteorologist. The most serious of these are changes of onset and cessation of rainfall, increase in intensity and frequency of floods and droughts among others. These affect the length of the growing season and may cause devastating damages in the agricultural sector which in turn affect people's livelihoods.

The consequences may include famine, increased food prices, reduced crop production, increased household poverty, domestic violence and water supply shortages. However, there is need for training of personnel that can competently apply weather and climate information to boost agricultural production. This is very important since Uganda is an agro-based economy with 72%

(NDPII, 2015/16 – 2019/20) of the population engaged in rain fed agriculture which is prone to climate variability and climate change.

This specialized programme in agricultural meteorology plays an important role in increasing yields and improving the quality of agricultural products. Therefore, there is need for continuous training in this programme to provide these critical services for user communities and other stakeholders.

3 Objectives of the Programme

3.1 Main Objective:

The main objective of this programme is to train competent agricultural-meteorological personnel to provide agricultural and meteorological services.

3.2 Specific objectives:

The specific objectives of this programme are to produce technical agricultural-meteorological personnel who can:

- Offer extension services such as providing and interpreting weather and climate information for day-to-day operations, seasonal and long-term planning in agriculture;
- Practice climate smart agriculture; and
- Conduct agricultural-meteorological research for improvement in agricultural production and services.

3.3 Learning outcomes

The learning outcomes of this programme are to produce graduates who can:

- Observe weather elements
- Prepare observation reports to aid the forecasting process for agricultural production
- Undertake agricultural-meteorological data quality control,
- Process and analyze agrometeorological data
- Transmit agricultural-meteorological data and information
- Install and maintain weather instruments at an agricultural-meteorological station

4 Definition of terms

Semester:

One standard semester shall comprise of 17 weeks – 15 weeks of teaching and learning and 2 weeks of examinations.

Contact Hours (CH)

A contact hour shall be equivalent to one (1) hour of Lecture or two (2) hours of tutorial/practical/field work.

Credit Unit (CU)

A credit unit is a measure that shall be used to reflect the relative weight of a given module towards the fulfillment of a Diploma in Agricultural Meteorology. One credit unit shall be one contact hour per week or a series of fifteen (15) contact hours.

Core module:

A core module is a module, which is essential to an Academic Programme and gives the Academic Programme its unique features. All the students who have registered for a particular programme take this module and must pass it.

Elective module:

An elective module is a module offered in order to broaden an Academic Programme or to allow for specialization. It is chosen from a given group of modules largely at the convenience of the student. Another elective module may be substituted for a failed elective module.

Audited Module:

An audited module is a module taken by a student for which a credit/credit unit is not awarded.

Pre-requisite Module:

A Pre-requisite is a condition (either module or classification) which must be satisfied prior to enrolling for the module in question. Pre-requisite Module, therefore, is a module offered in preparation for a higher-level module in the same area of study.

5 Resources

The programme requires significant number of resources ranging from personnel to space and equipment. Most of these are already in place, given that the programme has already been running.

5.1 Staffing

NMTS currently has 11 teaching staff capable of handling the programme with additional support sought from UNMA headquarters whenever necessary (see Annex 1).

5.2 Scholastic Materials

The sources of materials include Meteorology reference books at NMTS, UNMA and e-libraries. The school also has a fully functional computer laboratory with twenty (20) computers connected to the internet. There is a well-equipped demonstration weather station for both manual and automatic observations.

Specialized material such as weather charts, maps, tephigram and other instruments are available to support practical teaching and learning. For additional practical exposure of the learners, the school organizes regular study tours to various study and operational centers.

5.3 Space

The school has enough space to accommodate this programme. It already has 10 lecture rooms, one computer laboratory, one library and 18 offices.

5.4 Funding

[This programme shall be funded by government and private sponsored students. The fees charged shall be one approved by the school management and the UNMA board.] [G3]

6 Admission requirements

Admission to the Diploma in Agricultural meteorology is mainly through two avenues; direct entry (A-level) and National Certificate in any related field.

6.1 Direct entry

Minimum requirement for candidate of this category include;

- At least one (1) Principal pass in Biology or Agriculture in Uganda Advanced Certificate of Education (UACE) and at least two (2) Subsidiaries or National Certificate in any related field.
- The relevant subjects include: Mathematics, Physics, Chemistry, Geography, Economics and Entrepreneurship.

6.2 Certificate holders

Minimum requirements for this category include: Credit class in Certificate in Meteorology or National certificate in any related field from a recognized institution.

7 General Regulations

This section explains the regulations that will govern the programme.

7.1 Name of the diploma

This programme shall be called a Diploma in Agricultural Meteorology

7.2 Nature of the programme

This shall be a day programme for both government and privately sponsored students.

7.3 Duration of the programme

The programme shall take two years

7.4 Earning a credit in a module

Students shall earn credits for all the modules specified in the programme load for graduation. A credit is earned when a module has been passed. The minimum pass mark in any module shall be 50%.

7.6 Academic Progress

Progression through the programme shall be assessed in three ways:

Normal Progress (NP)

This occurs when a student passes each module taken with a minimum GP of 2.0.

Probational Progress (PP)

This is a warning stage and occurs if either the CGPA is less than 2.0 and/or the student has failed a core module. Probation is weaved when conditions cease to hold.

Retaking a module or modules

- a) A student shall retake a module or modules when next they are offered again in order to obtain at least the pass mark (50%) if she/he had failed during the first assessment in the module(s)
- b) While retaking a module(s), a student shall: -
 - i. Attend all the prescribed lectures/tutorials/practical/field work in the module(s)
 - ii. Satisfy all the requirements for the course work component in each module(s).
 - iii. Sit for the end of semester examinations in the module(s).
- c) Whenever a module(s) has (have) been retaken, academic transcript shall indicate so.

Discontinuation

- i. A student who has failed to obtain at least the pass mark (50%) during the third assessment in the same module(s) he/she had retaken shall be discontinued from his/her studies at the school.
- ii. A student who has overstayed in an academic programme by more than two years shall be discontinued from his/her studies at the school.[G4]

Absence from Examination

- i. If the academic board found out that a student has no justifiable reason for having been absent from a particular examination, such a student shall receive a failure (F) grade for the module(s) he/she had not sat the examination in. The module(s) in which the Fail (F) grade was (were) awarded shall count in the computation of the CGPA.
- ii. If the academic board found out that a student was absent from a final examination due to justifiable reason(s) such as sickness or loss of a parent/guardian, a module grade of ABS shall be assigned to that module(s). The student shall be permitted to retake the final examination when the module would be next offered or the next examination season if the lecturer concerned can make the appropriate arrangements for the examination.

8 Mode of delivery

- Most instruction is by lecture method. Students are allowed to interact with Lecturers, by asking questions and contributing to the flow of the lecture.
- Tutorials are organized by respective lecturers, where students are encouraged to solve problems by themselves
- Practical and field studies/ tours, attachment/coaching sessions are encouraged in this programme. Students will be guided by module instructors and tutorial assistants assigned to the module.
- Student discussion groups are encouraged outside lecture time. Use of other resources, including internet, is encouraged.

9 Grading

The overall marks a candidate obtains in each module he/she took shall be graded out of a maximum of one hundred (100) marks and assigned appropriate letter grades and Grade Points as follows:

UBTEB Grading System for Specialized Training Institutions Diploma programme.

Marks Boundary (%)	80-100	75-79	70-74	65-69	60-64	55-59	50-54	00-49
Letter Grade	A	B+	B	C+	C	D+	D	F
Grade Point (G.P)	5.0	4.5	4.0	3.5	3.0	2.5	2.0	1.5

Grade Point Average (GPA)

The GPA is calculated by three-step procedure: (1) multiply the grade points for each module by the number of CU for that module; (2) add the figures for each of these modules to arrive at the grade point total; (3) divide this grade point total by the total number of credits (CU) for which a grade was received.

Cumulative Grade Point Average (CGPA)

- (i) Multiplying the grade point obtained in case module by the Credit Units (CU) assigned to the module to arrive at the weighted score for the module.
- (ii) Adding together the weighted scores for all the modules taken up to that time.

- (iii) Dividing the total weighted score by the total number of Credit Units taken up to that time.

Semester load

A normal programme load per semester shall be between 21 – 27 CU.

A learner is considered to be making satisfactory progress towards a diploma in meteorology and climate science objective when he or she completes at least four modules in each semester and achieves the GPA of 2.0 in each semester required for his/her classification.

9.1 Classification of the Diploma

The Cumulative Grade Point Average (CGPA) for the various classes shall be as indicated in the table below.

Qualification of awards for specialized training institution programme.

CGPA Boundary	4.40 – 5.00	2.80 – 4.39	2.00 – 2.79
Class of Award	Class I (Distinction)	Class II (Credit)	Class III (Pass)
Explanations for Class of Award	Excellent Competences Acquired	Competences Above Average Acquired	Competences Acquired

9.1.1 Course work (CW)

- i. Course work shall consist of marks obtained in tests, assignments, practical, tutorials, presentations and field work. At least one assignment, one test and one practical (where applicable) shall be administered.
- ii. Course work shall contribute 40% of the final mark in each module.

9.1.2 Examinations

Assessment mode;

Each module shall be assessed in two parts as follows:

- (i) The course work shall contribute 40% of the total mark and shall consist of marks obtained in tests, assignments, practical, tutorials, presentations and field work. At least one assignment, one test and one practical (where applicable) shall be administered.

- (ii) Course work
- (iii) The final examinations, which will be done at the end of the semester shall contribute 60% of the final mark.[G5]

Pass Mark

A candidate is deemed to have passed the semester examination if he/she obtains at least 50% of the marks in each module,

Note:

- Assessment results from industrial training supervision of learners are also calculated from field supervisors score, academic supervisor score, and score from the learners' marked Industrial training reports.
- Research proposals and research project reports are also assessed at the end of the programme.

9.1.3 Graduation requirements

- (i) Completion of the school's core curriculum.
- (ii) A minimum of 102 CU.
- (iii) A CGPA of at least 2.0.

10 Curriculum

10.1 Duration

The curriculum for the programme shall cover a period of four (04) semesters. Each module will be covered in fifteen (15) weeks of the total seventeen (17) week long semester. The last two weeks of the semester are slated for examinations.

10.2 Structure of the Programme

The teaching will include lectures, practicals, study trips, projects and tutorials. Every student registered for this programme shall take the prescribed module units as indicated below, where; L = Lectures, P = Practical, CH = Contact Hours, PH = Practical Hours, CU = Credit Unit.

10.3 Programme summary

MODULE CODE	MODULE NAME	LH	PH	CH	CU
FIRST YEAR					
Semester I					
DAM 111	Mathematics	45	30	60	4
DAM 112	Environmental Physics	45	30	60	4
DAM 113	Soil Science	30	30	60	4
DAM 114	Introduction to Meteorology	30	30	45	3
DAM 115	Communication and Life Skills	30	30	45	3
DAM 116	Introduction to Computer	15	60	45	3
DAM 117	Meteorological Instruments and Methods of Observation	30	60	60	4
DAM 118	Crop Production and Management	30	30	45	3
Semester Load=28 CU					
Semester II					
DAM 121	Introduction to Agrobiology	45	30	60	4
DAM 122	Agricultural Mechanization	30	30	45	3
DAM 123	Agricultural Climatology	30	30	45	3
DAM 124	Applied Statistics in Agricultural Meteorology	45	30	60	4
DAM 125	Environmental Pollution and Control	30	30	45	3
DAM 126	Research Methods	30	30	45	3
DAM127	Gender and climate	30	30	45	3
Semester Load = 23 CU					
SECOND YEAR					
Semester I					
DAM 211	Elements of Hydrometeorology	30	30	45	3
DAM 212	Micrometeorology	30	30	45	3
DAM 213	Applications of Remote Sensing in Agriculture	15	60	45	3

DAM 214	Agro-meteorological Advisory Services	15	60	45	3
DAM 215	Climate Change and Agriculture	30	30	45	3
DAM 216	Industrial Training		75	75	5
DAM 217	Animal Production and Management	45	30	60	4
Semester Load= 28 CU					
Semester II					
DAM 221	Forecasting and Agricultural Modelling Techniques	30	30	45	3
DAM 222	Sustainable Organic Agriculture	45	60	75	5
DAM 223	Entrepreneurship Skills	30	30	45	3
DAM 224	Weather and Climate Disaster Risk Management	30	30	45	3
DAM 225	Research Project		75	75	5
DAM 226	Agricultural Economics	45	30	60	4
Semester Load= 23 CU					

11. Detailed Module description

11.1 Year one, 1st Semester

DAM 111: Mathematics – 60 Hours

Module Code and Name: DAM 111 MATHEMATICS

Level: YEAR I, SEMESTER I

Credit: 4 CU

Module description

The module unit aims at developing and strengthening the mathematical skill and attitude which is very useful to any student undertaking a module in Agrometeorology together with its related applications in our everyday life.

Module objective	
To enable students, comprehend meteorological processes and make appropriate calculations, approximations, conversions and representations in Agrometeorological operations.	
Learning outcomes	
By the end of the module, the learner should be able to:	
<ul style="list-style-type: none"> • Identify and manipulate basic metric measurements in meteorology • Apply mathematical concepts to explain the dynamics of the atmosphere. • Suggest solutions to real life meteorological challenges 	
Indicative content	Duration
1. Algebra: <ul style="list-style-type: none"> a) Equations: Linear and quadratic functions b) Matrices - inverse and determinants up to the third order and applications c) Remainder theorem d) Series: Arithmetic Progression and Geometric Progressions e) Functions: Exponential, Logarithmic and hyperbolic functions f) Binomial theorem and its application g) Complex numbers: cartesian and polar forms, including De Moivre's theorem 	20 Hours
2. Calculus: <ul style="list-style-type: none"> a) Differentiation <ul style="list-style-type: none"> • Polynomial functions (product, quotient and chain rule, parametric equations, implicit functions and rates of change) • Trigonometric and inverse functions • Logarithmic and Hyperbolic functions b) Series: Taylor's and Maclaurin's expansions c) Integration <ul style="list-style-type: none"> • Methods of integration • Change of variables • Solids of revolution, d) Differential equations: Linear first order and Linear second order 	20 hours
3. Geometry: <ul style="list-style-type: none"> a) Locus and circle b) Conic section: equation of a parabola, ellipse, hyperbola c) Elementary trigonometry d) Parametric representations 	12 hours

<p>4. Numerical Methods:</p> <p>a) Location of roots of an equation - Linear interpolation and extrapolation, Newton Raphson method and the general iterative technique</p> <p>b) Approximate techniques for integration - Trapezium rule, Simpson's rule and Mid-ordinate rule</p>	<p>8 hours</p>
<p>Mode of delivery:</p> <ul style="list-style-type: none"> ➤ Traditional lectures ➤ Video lectures and Mathematical soft wares ➤ Mathematics competition and challenges ➤ Peer tutoring ➤ Online mathematics for a and communities, interactive whiteboards 	
<p>Mode of Assessment:</p> <ul style="list-style-type: none"> ➤ Course work <ul style="list-style-type: none"> • Practical Assignments 20% • Practical Tests 20% ➤ Final Examination 60% <p>Total 100%</p>	

References

1. Pure Mathematics 1 and 2 by JK Backhouse
2. Understanding Pure Mathematics by Thorning and Sadler
3. Engineering Mathematics A Stroud
4. Advanced level Mathematics by Tranter
5. Engineering mathematics by John Bird

DAM 112: Environmental Physics – 60 Hours

Module Code and Name: DAM 112: ENVIRONMENTAL PHYSICS	
Level: YEAR I, SEMESTER I	
Credit: 4 CU	
Module description This unit is designed to illustrate the many aspects of physics that pervade environmental processes in our everyday life and in naturally occurring phenomena. It is largely a descriptive module though some basic mathematical skills are necessary to gain a full understanding of some parts of the module.	
Module objective <ul style="list-style-type: none">• The student should be able to think critically and reason quantitatively in agro-meteorological experiments and problem solving.	
Learning outcomes By the end of this module, the learner should be able to: <ul style="list-style-type: none">• Describe and explain the origins of global effects on the environment caused by human activities and the physical basis for the exploitation of various energy sources• Make assessments on different energy technologies (potential, pros and cons).• Apply the knowledge and skills gained to address real environmental challenges, such as developing safe and clean energy and dealing with the forecasted climate change.	
Indicative content	Duration
1. Review of basic concepts of force, pressure and motion <ul style="list-style-type: none">a) Types of forces and their relation; pressure gradient, frictional, viscous, Coriolis, gravitational, centrifugal, centripetal forces.b) Energy and workc) Linear motiond) Laws of motion	6 hours

<p>2. The human environment</p> <p>a) Survival of plants and animals in hot and cold environments</p> <p>b) Energy and metabolism</p> <p>c) Laws of nature: laws of thermodynamics and Newton's law of cooling</p> <p>d) Principles of entropy, enthalpy, and the Gibbs free energy,</p> <p>e) Principles of conduction, convection, radiation, evaporation, Evapotranspiration,</p>	<p>6 hours</p>
<p>3. Atmosphere and Radiation</p> <p>a) Structure and composition of the atmosphere:</p> <p>b) Atmospheric radiation</p> <ul style="list-style-type: none"> • Radiation terms - radiance, emittance and equilibrium • Electromagnetic spectrum • Radiation laws: Stefan-Boltzmann's Law, Plank's Law, Wein's Displacement Law • Transmissions of electromagnetic waves in the atmosphere: Absorption, Refraction, Reflection, albedo and scattering, Atmospheric aerosol, Dissociation and ionization, Surface energy balance, Bowen ratio and its application in agriculture 	<p>10 hours</p>

<p>4. Energy:</p> <ul style="list-style-type: none"> a) Definition and units b) Types of energy; renewable and non-renewable c) Energy sources <ul style="list-style-type: none"> • Primary sources • Secondary sources d) Fossil fuels, nuclear power e) Carbon capture and sequestration f) Wind energy- Measuring the wind, wind creation, forces acting on air masses, wind power g) Wave energy; wave power, wave energy flux and harvesting wave energy h) Solar energy; Solar power, Hydroelectric power, Tidal power, i) Wave energy; Wave power, Biomass, j) Geothermal energy; Heat pump system, Hot dry rock conversion k) Tidal energy; causes of tides, harnessing tidal energy, advantages and disadvantages of tidal energy, tidal power l) Energy demand and conservation m) Heat transfer in farm buildings 	<p>16 hours</p>
<p>5. Water</p> <ul style="list-style-type: none"> a) Hydrosphere b) Hydrologic cycle c) Water in the atmosphere (change of states and equations) d) Physics of cloud formation e) Precipitation mechanisms 	<p>8 hours</p>
<p>6. Atmospheric electrostatics</p> <ul style="list-style-type: none"> a) Charges, Lightning formation, types of lightning b) Dangers or hazards (Thunder, Lightning, hail, strong winds) and Safety measures c) Thunderstorm formation and Photo-meteors (corona, halo, rainbow) 	<p>6 hours</p>

7. Soil physics a) Soil temperature b) Soil and hydrologic cycle c) Surface tension and soils d) Water and mineral flow e) Evaporation	8 hours
Mode of delivery: <ul style="list-style-type: none"> ➤ Traditional lectures ➤ Visual aids and interactive simulations ➤ Field trips, ➤ Case studies and guest speakers 	
Mode of assessment: <ul style="list-style-type: none"> ➤ Course work <ul style="list-style-type: none"> • Practical Assignments 20% • Practical Tests 20% ➤ Final Examination 60% Total 100% 	

References

1. Nigel Mason and Peter Hughes: Introduction to Environmental Physics: Planet Earth, Life and Climate, Taylor and Francis, 2001.
2. Gaylon S. Campbell, John M. Norman; An Introduction to Environmental Biophysics, Second Edition.

DAM 113: Soil science – 60 Hours.

Module Code and Name: DAM 113 SOIL SCIENCE
Level: YEAR I, SEMESTER I
Credit: 4 CU
Module description

This module involves the study of soil science. It focuses on soil formation and its profile, composition, types, properties, degradation and different land use. It also comprises of soil management and conservation practices.

Module Objective

Learners should be able to understand soil science, use, management, degradation and conservation of soils.

Learning outcomes

By the end of the module, the learners should be able to;

- Apply the knowledge of soil science in optimal agricultural production, wetland management, land use, waste disposal and management.
- The learner should be able to assess soil quality
- The learner should be able to classify soils

Indicative content	Duration
1. Introduction to soil science a) Soil formation b) Soil composition c) Soil classification and distribution	6 hours
2. Soil properties (physical, chemical and biological) a) Bulk density and porosity b) Soil profile c) Soil nutrients (nitrogen, Sulphur, potassium, calcium) d) Concepts on soil water retention and potential and its movement in the soil e) Soil moisture and temperature ^[66]	12 hours
3. Soil degradation a) definition b) causes of degradation c) human activities that lead to degradation d) effects of degradation	8 hours
4. Soil conservation and management a. planting cover crops b. applying manure and fertilizers c. bush fallowing d. afforestation and re-afforestation	18 hours

<ul style="list-style-type: none"> e. practicing crop rotation f. irrigation g. mulching h. terracing i. land tenure system 	
<p>5. Land use forms (influence of weather and climate)</p> <ul style="list-style-type: none"> a) Timely planting b) Timely harvesting c) Application of manure and fertilizers d) Irrigation e) Application of pesticides 	16 hours
<p>Mode of delivery:</p> <ul style="list-style-type: none"> ➤ Traditional lectures ➤ Visual aids and interactive simulations ➤ Field trips ➤ Laboratory work ➤ Case studies and guest speakers 	
<p>Mode of assessment:</p> <ul style="list-style-type: none"> ➤ Course work <ul style="list-style-type: none"> • Practical Assignments 20% • Practical Tests 20% ➤ Final Examination 60% <p>Total 100%</p>	

References

1. The nature and properties of soils, Nc Brandy and Ray.R.well
2. A text book of soil science T.D. Biswas and S.K. Mukhejee
3. Fundamentals of soil science-indian society of soil science
4. Conception application of pedologyJ.L.Sehgal
5. Soil physics-B.P.Ghidyai and R.P Tripany.

DAM 114: Introduction to Meteorology – 45 Hours

<p>Module Code and Name: DAM 114: INTRODUCTION TO METEOROLOGY</p> <p>Level: YEAR I, SEMESTER I</p> <p>Credit: 3 CU</p>

Module description	
<p>This module introduces the basic concepts of meteorology and their applications in the real world. The purpose of this basic module is to prepare students for more advanced modules in agricultural meteorology through a thorough discussion on the fundamental aspects of meteorology.</p>	
Module objective	
<ul style="list-style-type: none"> To introduce students to the basic principles of meteorology as a module and its applications in agriculture. 	
Learning outcomes	
<p>By the end of the module, the learners should be able to;</p> <ul style="list-style-type: none"> Describe the vertical structure, composition and physical processes of the atmosphere to appreciate the sun earth relationships and how it influences weather and climate. Identify seasons in relation to sun earth interactions. Understand the importance of monitoring weather and climate Understand the role of meteorology in agricultural management and production. 	
Indicative content	Duration
1. The fundamentals of meteorology <ul style="list-style-type: none"> a) Definitions (weather, climate, meteorology, climatology) b) Branches of meteorology c) Elements of weather and their measurements d) Importance and application of meteorology in agriculture. e) Meteors (Hydrometeors, Litho-meteors, Photo-meteors, Electro-meteors) 	4 Hours
2. The Earth and the atmosphere <ul style="list-style-type: none"> a) Composition b) Vertical structure of the atmosphere. Sun–Earth relationships (revolution, tilt and rotation of the earth) c) Thermodynamics of dry air (gas laws, heat exchange) d) Stability of the atmosphere (adiabatic processes, lapse rates) 	8 Hours

3. Solar radiation a) The electromagnetic spectrum b) Laws of radiation c) Radiation interaction with the atmosphere and earth's surface d) Heat balance of the Earth and atmosphere	5 Hours
4. Pressure and wind systems a) Pressure systems (cyclones, anticyclones and severe storms) b) Local winds (land breeze, sea breeze, mountain and valley winds) c) Planetary: Trade winds and Inter-tropical Convergence Zone (ITCZ)	10 Hours
5. Air masses and fronts a) Definition of key terms b) Classification of air masses c) Modification of air masses d) Types of fronts, characteristics and weather associated with fronts e) Representation of fronts	10 Hours
6. Clouds a) Cloud formation process b) Classification of clouds c) Thunderstorms (types, stages of development) d) Condensation nuclei and precipitation growth mechanisms e) Precipitation forms and types	08 Hours
Mode of delivery: <ul style="list-style-type: none"> ➤ Traditional lectures ➤ Visual aids and interactive simulations ➤ Field trips ➤ Case studies and guest speakers ➤ Meteorological soft wares 	
Mode of assessment: <ul style="list-style-type: none"> ➤ Course work <ul style="list-style-type: none"> ● Practical Assignments 20% ● Practical Tests 20% ➤ Final Examination 60% 	

Total 100%

References

1. Colin Buckle; Weather and Climate in Africa
2. C. Donald Ahrens, Essentials of Meteorology; An invitation to the Atmosphere
3. Roger G. Barry and Richard J. Chorley, Atmosphere, Weather and Climate, 9th Edition.

DAM 115: Communication and life Skills – 45 Hours

Module Code and Name: DAM 115 COMMUNICATION AND LIFE SKILLS

Level: YEAR I, SEMESTER I

Credit: 3 CU

Module description

This module is intended to enhance the learners' technical and analytical communication skills and their general application.

Module objective

- The learner should be able to communicate effectively and efficiently to peers and the public

Learning outcomes

By the end of this module, learners should be able to:

- Communicate both orally and in writing.
- Use different tools of communication
- Use modern channels for communication.
- Build capacity and raise awareness through communication to different stakeholders

Indicative content

1. Introduction to communication skills

- a) Definition and process of communication.
- b) Importance of communication.
- c) Types of communication
- d) Communication channels.
- e) Communication flows: vertical and horizontal communication
- f) Forms of communication
- g) Internal and external communication.

Duration

5 hours

<p>2. Elements of communication process.</p> <p>a. Planning for communication (consultation, drafting, choose appropriate tools and methods etc.)</p> <p>b. Effective communication:</p> <ul style="list-style-type: none"> • Communication etiquette, • Barriers to effective communication, • How to achieve effective communication, • Consequences of not understanding or getting a different meaning 	6 hours
<p>3. Language syntax</p> <p>a) Verbs.</p> <p>b) Descriptive adjectives.</p> <p>c) Conjunctions (Linking words).</p> <p>d) Spelling.</p> <p>e) Prefixes and suffixes.</p> <p>f) Homophones and synonyms.</p> <p>g) Composition, Comprehension and summary writing.</p>	10 hours
<p>4. Correspondences</p> <p>a) Note-taking: importance of taking notes and how to take good notes Writing of memo and loose minute</p> <p>b) Writing of application letter and curriculum vitae</p> <p>c) Questionnaires.</p> <p>d) Circulars (formats, types and importance)</p> <p>e) Notices (formats, types and importance)</p> <p>f) Writing business letters: importance of business letters, principles of effective letter-writing, and elements of a business letter</p> <p>g) Cover letter and other letters</p> <p>h) Press releases (types, procedures)</p>	10 hours
<p>5. Meeting.</p> <p>a) Definition and purpose</p> <p>b) Terms used in meetings (agenda, minutes, venue etc.)</p> <p>c) Organizing and conducting effective meetings</p> <p>d) Types of meetings.</p> <p>e) Roles of the chairperson, secretary and members in a meeting</p> <p>f) Documents used in meetings</p> <p>g) Committees (Advantages and limitations of Committees).</p>	4 hours
<p>6. Public speaking</p> <p>a) Types of public speaking.</p> <p>b) Stage fright (Nervousness) Causes and how to overcome it</p> <p>c) Interviews: types of interviews, preparing for an interview, handling questions in an interview, and organizing an interview</p> <p>d) Negotiation; procedure, rules, considerations, challenges and how to overcome them.</p>	8 hours

7. Communication channels and tools a) Communication tools; Telephone, Radios, Television, Mails and Print Media b) Communication Channels; Face to face or Personal; Video and Audio conferencing; Electronic channels (electronic mails social media); Publications; articles, magazines; folk media	6 hours
8. Listening and reading skills a) Definition. b) Stages of listening. c) Importance of listening. d) Causes of poor listening. e) Text reading	6 hours
Mode of delivery: ➤ Lectures ➤ Workshops, Case studies and group activities ➤ Role playing and simulations ➤ Debates and discussions	
Mode of assessment: ➤ Course work • Practical Assignments 20% • Practical Tests 20% ➤ Final Examination 60% Total 100%	

References;

1. Steanblerg, S (1997), introduction to communication, 3rd edition. Durban: JUta& Co.
2. Stanton N (2004), Mastering Communication 4th edition. Pelgrave Macmillan
3. Carlin D and J Payne (1989), public speaking today. Chicago: NTC publishing group.
4. Brig. (Dr.) R. S Grewal VSM, Communication skills, (2007)
5. DeVito, J A (2009), The Interpersonal Communication book

DAM 116: Introduction to Computer – 45 Hours

Module Code and Name: DAM 116 INTRODUCTION TO COMPUTER Level: YEAR I, SEMESTER I Credit: 3 CU	
Module description This module introduces the learner to computer enabling them prepare, manage and share documents. It also equips learners with knowledge and skill of computer maintenance and internet browsing.	
Module objective: To enable learners, apply acquired computer knowledge and skills to enhance performance in their day-to-day operations	
Learning outcomes By the end of the module, the learner should be able to; <ul style="list-style-type: none">• Identify different components of a computer• Use computer hardware and software• Manage computer files• Design print media• Processing numerical data• Prepare and make presentations• Browse the internet	
Indicative content	Duration
1. Computer basics <ul style="list-style-type: none">a) Introduction:<ul style="list-style-type: none">• History of computers• The future of computers• Computer generations and classificationb) Computer system:<ul style="list-style-type: none">• Meaning• Types of computers• Types of data/ Information processing• Caring for computers• Data and computer security and risks• Ergonomics (physical health and mental health)• Computer ethicsc) Information technology:<ul style="list-style-type: none">• Meaning• Manual versus computerized systems• Limitations of using computers• Applications• Social impact of computers and information technology	2 hours

<p>2. Hardware components of a computer</p> <p>a) Introduction:</p> <ul style="list-style-type: none"> • Meaning of hardware • Hardware parts of the computer <p>b) Input devices:</p> <ul style="list-style-type: none"> • Meaning and associated characteristics • Types and examples of input devices • Utility of input devices in business solutions • Maintenance and security of input devices • Input device specifications, characteristics and capabilities <p>c) Output devices:</p> <ul style="list-style-type: none"> • Meaning • Types and examples of output devices • Utility of output devices in business solutions • Maintenance and security of output devices • Output device specifications, characteristics and capabilities <p>d) Storage devices:</p> <ul style="list-style-type: none"> • Meaning and characteristics of computer storage • Primary storage devices • Secondary storage devices • Storage device selection • Purpose and role of computer hardware <p>e) Processing devices (CPU)</p> <p>f) Uninterrupted power supply</p> <p>g) Ports and cables</p>	<p>2 hours</p>
<p>3. Software components of a computer</p> <p>a) Computer software:</p> <ul style="list-style-type: none"> • Meaning • Characteristics and applicability of computer software to businesses • Types • Application packages and suites <p>b) Operating systems:</p> <ul style="list-style-type: none"> • Meaning and characteristics • Functions • Types and examples <p>c) Utility programs:</p> <ul style="list-style-type: none"> • The role of utility programs as common computing requirements • Characteristics and examples • Commonly used utility programs <p>d) Programming languages:</p> <ul style="list-style-type: none"> • Meaning and characteristics • Generation languages (machine code to artificial intelligence) 	<p>2 hours</p>

<p>4. Data communication</p> <p>a) Data transmission:</p> <ul style="list-style-type: none"> • Data communication • Transmission and control of data • Components of data communication <p>b) Computer networks:</p> <ul style="list-style-type: none"> • Meaning of computer network and applicability • Types and characteristics of networks • Network architecture and protocols • The internet and the world wide web, Web browsers and search engines • Electronic mail services; Opening an email address, composing, saving, sending, and receiving mail, downloading documents, attaching files. • Social media <p>c) Network topologies</p> <ul style="list-style-type: none"> • Meaning, interconnection of elements and characteristics of network topologies • Basic types of network topologies and connectivity • Selection of network topology <p>d) Network models</p> <ul style="list-style-type: none"> • Meaning, characteristics and applications of: Client-server system and Peer-to-peer models 	2 hours
<p>5. Care and security of computer systems and networks</p> <p>a) Meaning and characteristics of computer virus</p> <p>b) Meaning of software and data security</p> <p>c) Dangers to computer software and information systems</p> <p>d) Precautions and safeguards against data/file loss</p> <p>e) Characteristics of antivirus software</p>	2 hours
<p>6. General information systems concepts</p> <p>a) Nature and types of information systems</p> <p>b) Information systems architecture</p> <p>c) Control and feedback in information systems</p> <p>d) Nature, types, value and role of information</p> <p>e) Office automation.</p> <p>f) Data and information: definition, distinction and characteristics, data processing cycle and value of information</p> <p>g) Models of data processing (real-time/online, batch processing, distributed and centralised processing) [G7]</p>	2 hours
<p>7. Hardware and software considerations</p> <p>a) Acquisition issues: identifying business requirements and recommending business solutions</p> <p>b) Classical systems development life cycle/ process:</p> <ul style="list-style-type: none"> • Stages of the systems development life cycle pertaining to development of a business system • Relating failures or shortcomings with inappropriate/ inconsistent conduct/ omissions in the development cycle 	4 hours

<p>8. Terminologies of basic end-user packages</p> <p>a) Understanding how to use a computer; booting the computer</p> <p>b) User interface:</p> <ul style="list-style-type: none"> • Types • Windows environment <p>c) Desktop components:</p> <ul style="list-style-type: none"> • Quick launch toolbar • Taskbar • Icons • Start button and menu • My computer • Task manager • Recycle bin <p>d) File management:</p> <ul style="list-style-type: none"> • Files and folders; creating a new folder • Copy/ move files from one folder to another • Drag and drop files • Create different file types with varying extensions • Create shortcuts to frequently used files or applications • Use of hard drive and other drives for file management • Renaming/ deleting folders or files • Using the recycle bin • Storage options: Internal and external drives, Flash drives, CDs/ DVDs, My computer, Save As, Save and Exit without changes 	<p>4 hours</p>
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<p>9. Word processing.</p> <p>a) Familiarizing with the MS Word interface:</p> <ul style="list-style-type: none"> • The Quick access toolbar • The Title bar • The Ribbon; The Ruler: the text area, the vertical and horizontal scroll bars • The Status bar • Understanding document views: minimize, maximize, close and resize buttons • Understanding non-printing characters • Executing commands with keyboard shortcuts • Zoom slider • Starting a new paragraph • Help <p>b) Creating a basic document:</p> <ul style="list-style-type: none"> • Creating a blank document • Customizing the word environment • Entering text • Saving files and exiting word <p>c) Editing a document:</p> <ul style="list-style-type: none"> • Navigating and selecting text in a document • Inserting, deleting, or rearranging text • Undoing changes • Searching and replacing text • Cutting and pasting • Copying and pasting • Using the clipboard • Finding and replacing • Checking spelling, grammar and word count • Enhancing textual meaning using the thesaurus Customizing autocorrect options • Previewing and printing documents <p>d) Formatting text and paragraphs:</p> <ul style="list-style-type: none"> • Changing font appearance • Highlighting text • Adding bullets and numbers • Setting tabs to align text • Paragraph layout • Borders and shading • Applying styles • Creating lists • Managing formatting • Adding spaces before or after paragraphs • Changing line spacing • Creating first-line indents 	<p>6 hours</p>
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- Indenting paragraphs
- Aligning paragraphs
- Creating hanging indent

e) Tables:

- Creating
- Modifying
- Formatting
- Converting text to tables or tables to text

f) Inserting graphic objects:

- Adding visual effects using symbols and special characters
- Inserting illustrations, clip art

g) Managing page appearance:

- Page layout
- Borders and colours
- Watermarks
- Headers and footers
- Page numbering
- Orientation
- Page size
- Margins
- Page and section breaks

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10. Basic Presentation <ul style="list-style-type: none">a) The fundamentals of presentationb) Presentation basicsc) Formatting a presentationd) Working with objectse) Working with tablesf) Working with charts and smart artg) Applying transition and animation effectsh) Finalizing a presentation	4 hours
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NMMS - CURRICULUM

<p>11. Spreadsheets and Microsoft Excel</p> <p>a) Introduction to spreadsheets</p> <ul style="list-style-type: none"> • Characteristics of spreadsheet application • Application of spreadsheet software for day-to-day operations • Spreadsheet application functions: - inputting data, formatting, saving, and renaming • Spreadsheet data manipulation • Relative referencing and nested functions • Spreadsheet output <p>b) Getting started with Excel:</p> <ul style="list-style-type: none"> • Starting Excel • Excel working environment • Using the ribbon as the Excel user interface • Navigating within the worksheet/ workbook • Selecting a cell or range of cells • Entering data • Cutting, copying, and pasting cell values • Copy and paste special • Saving and opening a workbook <p>c) Managing rows and columns:</p> <ul style="list-style-type: none"> • Inserting, moving and deleting cells • Managing columns and rows • Hiding and unhiding rows/ columns • Formatting column widths and row heights <p>d) Managing worksheets:</p> <ul style="list-style-type: none"> • Formatting worksheet tabs • Inserting and deleting worksheets • Moving and copying worksheets • Hiding and unhiding worksheets <p>e) Formatting cells:</p> <ul style="list-style-type: none"> • Number and date formatting • Finding and replacing text • Working with styles <p>f) Working with formulas and functions:</p> <ul style="list-style-type: none"> • Entering formulas • Arithmetic operators and order of operations • Using auto-fill options • Using commonly used functions e.g VLookup, Sum, IF, Max and Min, Sumif, Countif, And, Or, Left, Right and Concatenate, Round, Proper, Now <p>g) Organizing worksheet and table data:</p> <ul style="list-style-type: none"> • Creating and modifying tables • Sorting and filtering data in tables • Summarizing information in tables <p>h) Working with charts:</p>	<p>8 hours</p>
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- Summarizing data visually using charts
 - Customizing chart data
 - Formatting chart legend and titles
 - Changing chart bodies
 - Saving charts as templates
 - Creating pie-charts
- i) Managing workbooks:
- Linking worksheets
 - Printing worksheets
 - Setting page setup options
 - Setting page breaks

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12. Databases <ul style="list-style-type: none"> a) Characteristics of a database application/system b) Types of databases c) Application of database system software for day-to-day business operations d) Database applications hands-on e) Character, field, record, table, database f) Database objects: tables, queries, forms and reports g) Entity and attributes h) Data types, primary key, foreign key i) Data input, manipulation, reporting and saving 	7 hours
Mode of delivery <ul style="list-style-type: none"> ➤ Hands on practices ➤ Workshops and discussions ➤ Lectures 	
Mode of assessment <ul style="list-style-type: none"> ➤ Course work <ul style="list-style-type: none"> ● Practical Assignments 20% ● Practical Tests 20% ➤ Final Examination 60% ➤ Total 100% 	

References:

1. Tukamushaba E & Moya M (2007): Practical Approach to ICT
2. Microsoft office suite manual (usually for all Microsoft packages)
3. Bocij Paul, Chaffey Dave, Greasley Andrew and Hickie Simon (2008), Business Information Systems: Technology, Development and Management in the E-Business, Prentice Hall. Special Edition.
4. <http://www.internet4classrooms.com>

DM 117: Meteorological Instruments and Methods of Observations – 60 Hours

Module Code and Name: DAM 117 METEOROLOGICAL INSTRUMENTS AND METHODS OF OBSERVATIONS

Level: YEAR I, SEMESTER I

Credit: 4 CU

Module description

The earth's atmosphere is dynamic and therefore, there is need for continuous monitoring of its state. This module deals with the instruments used to measure weather elements and their characteristics as well as the key methods of weather observations. It aims at developing knowledge and skill required for monitoring meteorological parameters and dissemination of the weather information to end users.

The final examination paper for this module shall consist of two sections; A (20%) and B (80%). Section A shall always be on codes and decoding of meteorological information (Both surface and upper air - METAR, SYNOP, TEMP). Section B shall have seven questions with twenty (20) marks and a student shall be required to choose any four.

Module objective

- Make meteorological observations
- Prepare meteorological reports
- Transmit meteorological reports
- Interpret meteorological reports

Learning outcomes

By the end of this module, the learner should be able to;

- Identify different weather elements and their measuring instruments
- Use meteorological instruments
- Maintain weather instruments
- Make timely weather observations
- Encode and decode meteorological data
- Represent meteorological data on weather charts.
- Transmit meteorological information to different centers.

Indicative content

Duration

<p>1. Principles of meteorological measurements</p> <ul style="list-style-type: none"> • Definition of terms (weather, climate, meteorology etc) • Regulatory organizations (WMO, ICAO, IGAD, ICPAC, UNMA Etc) • World weather watch (WWW) • Classifications of meteorological: observations; instruments and stations. • Network, Siting, standardization of meteorological stations and instruments. • Methods and procedures of calibration of instruments • Time of meteorological observations (standard time and official time of observation) • Duties of a meteorological technician. • Importance and applications of meteorological observations. 	6 Hours
<p>2. Meteorological Elements and their Measurements</p> <ul style="list-style-type: none"> • Meteorological elements and their units of measurements (Sunshine, Temperature, pressure, wind direction and force, Clouds, relative humidity, precipitation, Visibility). • Meteorological instruments: Exposure and Principle of operation, Sources of errors, Maintenance. • Method of observations for different weather elements. 	16 hours
<p>3. Meteorological Codes and Plotting</p> <p>a) Traditional Alphanumeric Codes (TAC) report:</p> <ul style="list-style-type: none"> • METAR/SPECI (Structure, Decoding and encoding, Time of Issue and Meteogram plotting model and code symbols,). • SYNOP/SHIP (Structure, Decoding and encoding, Time of Issue, surface chart plotting model and code symbols). • TEMP (Structure, Decoding and encoding, Time of Issue, upper air chart plotting model and Tephigram). • Special Codes (Decoding and encoding) <p>b) Table Driven Code Forms (TDCF)</p> <ul style="list-style-type: none"> • CREX: Character Representation and Exchange (encoding and decoding, advantages and disadvantages) • BUFR: Binary Form of Representation (encoding and decoding, advantages and disadvantages) 	32 hours
<p>4. Quality Control and Transmission of Meteorological Information</p> <ul style="list-style-type: none"> • Internal Quality control measures (QMS-procedures) and avoidance of errors • Data flow; Global Telecommunication System (GTS) and transmission tools. 	10 Hours

<p>Mode of delivery:</p> <ul style="list-style-type: none"> • Classroom sessions • Practical sessions in the meteorological station • Field visits to Agrometeorological stations[G8]
<p>Mode of Assessment:</p> <ul style="list-style-type: none"> ➤ Course work <ul style="list-style-type: none"> • Theory and practical Assignments 20% • Theory and practical Tests 20% ➤ Examination 60% <p>Total 100%</p>

References

- Mike M.N Mwebesa (1976): East African Observer's Handbook, (handbook of standard procedures for surface weather observing and recording of climatological data) Rev. Ed east African community, East African Meteorological Dept. in Nairobi.
- Severe Pettersen (1956): weather analysis and forecasting, volume 1, McGraw-Hill
- C. Donald Ahrens, Essentials of Meteorology; An invitation to the Atmosphere
- Roger G. Barry and Richard J. Chorley, Atmosphere, Weather and Climate, 9th Edition.
- Guide to meteorological instruments and methods of observation: Seventh edition, 2008.
- Compendium of lecture notes on meteorological instruments for training class III and class IV meteorological Personnel

DAM 118: Crop Production and Management – 45 hours

<p>Module Code and Name: DAM 118 CROP PRODUCTION AND MANAGEMENT</p> <p>Module level: YEAR II,</p> <p>SEMESTER I Module Credit: 3 CU</p>
<p>Module description</p> <p>The module focuses on general crop agronomy, nursery and nursery management, field operations and crop protection.</p>
<p>Learning outcomes</p> <p>By the end of the module, the learner should be able to;</p> <ul style="list-style-type: none"> • Explain the basic agronomic principles • Apply the basic agronomic practices in crop production • Carry out land preparations for planting. • Prepare and manage a nursery bed • Carry out planting using seeds and vegetative materials

<ul style="list-style-type: none"> • Use water for agricultural production efficiently • Identify weeds, pests, diseases, their damages and methods of control 	
Indicative content	Duration
1. Crop production (principles, planting materials, farming practices)	15 hours
<p>a) Field operations in crop production</p> <ul style="list-style-type: none"> • Land and seedbed preparation • Types of seedbed endorsement • Importance of seedbed preparations • Methods of seedbed preparations • Timing of seedbed preparations • Tillage equipment and tools for seedbed preparation • Land clearing • Levelling and draining an area for a seedbed <p>b) Tillage and Tillage operations</p> <ul style="list-style-type: none"> • Tillage equipment • Spacing • Weeding • Tinning • Fertiliser application • Harvesting techniques for crops 	
2. Horticultural crops (groups, varieties and their management practices)	10 hours
a) Nursery and nursery management	
<ul style="list-style-type: none"> • Meaning of nursery and types • Nursery bed preparation • Soil sterilization • Principles of nursery management • Nursery records 	
3. Crop improvement	7 hours
<ul style="list-style-type: none"> • Reproduction • Mendelism and its applications 	
4. Crop protection (pests, weeds and diseases)	8 hours
<p>a) Introduction to weed science</p> <ul style="list-style-type: none"> • Meaning and classification of weeds 	

<ul style="list-style-type: none"> • Economic importance of weeds • Methods of weed control namely; physical, cultural, mechanical, biological and chemical • Meaning of pests and pest damage • Classification of pests • Economic importance of pests • Methods of pest control b) Plant diseases • Meaning of plant diseases • Classification of diseases like fungal, bacterial and viral • Disease epidemiology control • Suggested practical • Land preparation • Planning of crops • Weeding and weed identification • Fertilizer / manure application • Pest and disease control • Field visits 	
5. Perennial and annual crops (varieties)	5 hours
Learning Materials/ Resources <ul style="list-style-type: none"> a) Projector b) Computer c) Plant specimen d) Microscopes e) Farm land f) Pathogen/ parasite specimens 	
Mode of delivery <ul style="list-style-type: none"> • This module shall be conducted through lectures, demonstrations, field trips, laboratory and field practical 	
Mode of assessment <ul style="list-style-type: none"> ➤ Course work 40% 	

- Assignments 10%
- Tests 10%
- Practical 20%
- **Examination 60%**
- Total 100%

References

1. Dr. Ker et al (1978) Agriculture in East Africa: An introduction to principles and Practices.
2. Mukiibi j (2001) Agriculture in Uganda Volume IV NARO Livestock and fisheries.
3. Mukiibi J.K (2001) Agriculture in Uganda Volume I & II NARO Mukiibi.
4. J.K (2001) Agriculture in Uganda. Volume I-IV NARO
5. Sabiiti E.N, Katurumunda, S and Kitakweba, A (2010) Agriculture principles and practices for schools and colleges: Animal production Fountain Publishers, Kampala
6. Sabiiti E.N, Katurumunda, S and Kitakweba, A (2010) Agriculture principles and practices for schools and colleges: Crop production Fountain Publishers, Kampala
7. Kansime, M.J., Mulema, D., Karanja, D., Romney and Day, R. (2017) crop pests and disease management in Uganda: status and investment needs.

11.2 Year one, 2nd Semester

DAM 121: Introduction to Agrobiolgy – 60 Hours

Module Code and Name: DAM 121 INTRODUCTION TO AGROBIOLOGY

Module level: YEAR I, SEMESTER II

Module Credit: 4 CU

Module description

This module provides an introductory approach to agricultural biology, taxonomy, cell biology, organisms and their ecological environment, genetics and physiology.

Module objective

The module is aimed at enabling the learner to apply the knowledge and skills gained from agrobiolgy in improving the agricultural production.

Learning outcomes

By the end of this module, learners should be able to:

- Identify animal and plant cells.
- Investigate the role of genes in animal and plant species.
- Promote the role and process of physiology in agricultural practice
- Investigate the role and process of transpiration and photosynthesis by protecting the green.

Indicative content

Duration

1. Taxonomy

6 hours

- Introduction to taxonomy
- Identification, classification and description of plants
- Identification, classification and description of animals
- Classification systems

2. Cell biology

12 hours

- Draw and label both cell structures.
- Identify the functions of each part.
- Cellular transport
- Cellular transpiration
- Macromolecules in cells
- Safety in agricultural laboratory.

3. Plant physiology

12 hours

- Osmosis
- Diffusion
- Active and passive transport
- Photosynthesis
- Transpiration
- Reproduction
- Chemical and environmental affecting plant growth.

<p>4. Organisms and their ecological environment</p> <ul style="list-style-type: none"> a. Biodiversity b. Conserving natural resources c. Agricultural practices beneficial and harmful effect to the environment d. Ecosystem and population fluctuations e. Nitrogen cycle f. Oxygen cycle g. Food web 	<p>10 hours</p>
<p>5. Animal physiology</p> <ul style="list-style-type: none"> a. Digestive system b. Reproductive system c. Nervous system d. Endocrine system e. Urinary system f. Respiratory system g. Circulatory system h. Muscular system i. Blood; components, formation, groups j. Active and passive transport k. Skeletal system l. Lymphatic system 	<p>12 hours</p>
<p>6. Genetics</p> <ul style="list-style-type: none"> a. Definition b. Traits (heritability and genetics) c. Alleles (homozygous and heterozygous) d. Genes (dominant and recessive) e. Mitosis and meiosis f. DNA and types g. Proteins; amino acids and their types 	<p>8 hours</p>

Mode of delivery:

- Lectures
- Case studies and group activities
- Guest lectures
- Visual aids
- Field trips, hands-on activities and group projects

Mode of Assessment:

- **Course work**
 - Assignments 10%
 - Tests 10%
 - Practical work 20%
- **Examination 60%**
Total 100%

References

1. <https://doi.org/10.1029/2006JG000255>. Plant transpiration. Journal of geophysical research. Jingfeng, W., Rafael, L. B., Lerdau, M. and Guido, D. S.
2. Sabiiti, E.N., Katurumunda, S. and Kitakweba, A. 2010. Agriculture Principles and Practices for schools and colleges: Animal Production. Fountain Publishers, Kampala. 278 pp Vision Group (2019) Harvest money with 50 of Uganda's Best Farmers. New Vision Printing press, Kampala- Uganda.
3. Edward Arnold Publishers Ltd. London. Dr. Sylvia Mader (2007) Essentials of Biology. Penn Foster School edition London.
4. Jon Wieringa; J Lomas; R W Gloyne; Lecture notes for training agricultural meteorological personnel; World Meteorological Organisation Secretariat.
5. R. W. Gloyne and J. Lomas, 1980, Revised edition of Lecture notes for training class II and class III agricultural meteorological personnel.

DAM 122: Agricultural Mechanization

Module CODE and NAME: DAM 122 AGRICULTURAL MECHANIZATION
LEVEL: DIPLOMA
CREDIT: 3CU

Module description	
The module involves study of machines in performing different agricultural activities. It focuses on different sources of power, farm tools and equipment, tractor systems and engines	
Module objective	
<ul style="list-style-type: none"> Learners should be to understand how machines can be used in enhancing agricultural activities. 	
Learning outcomes	
By the end of the module, the learner should be able;	
<ul style="list-style-type: none"> Apply knowledge of mechanization in agricultural activities. To use different power sources on the farm. To know to maintain farm tools and equipment. 	
Indicative content	Duration
1. Introduction to farm mechanization. <ul style="list-style-type: none"> Definition of key terms Advantages and disadvantages of mechanization Precautions taken when handling farm machines 	6 hours
2. Power sources <ul style="list-style-type: none"> Human power Electric power Animal power Solar power Engine power 	6 hours
3. Tractor implements <ul style="list-style-type: none"> Disc ploughs Planters Mould board ploughs 	12 hours
4. Tractor systems <ul style="list-style-type: none"> Electrical systems Cooling systems Lubricants and lubrication systems Transmission system 	15 hours
5. Farm tools and equipment <ul style="list-style-type: none"> Examples and their maintenance Objectives of using farm tools and equipment Factors considered when buying tools and equipment Classification of tools and equipment 	6 hours
Mode of delivery:	
➤ Lectures	

<ul style="list-style-type: none"> ➤ Field trips ➤ Guest speakers
<p>Mode of assessment</p> <ul style="list-style-type: none"> ➤ Course work <ul style="list-style-type: none"> • Assignments 10% • Tests 10% • Practical 20% ➤ Final examination 60% <p>Total 100%</p>

References

2. Agricultural Mechanization and Automation. Paul McNulty, Patrick m. Grace, Vol 2.
3. Textbook on Farm machinery and Power, 2018. Shri Rajlakshmi Prakashan, Aurangabad. ISBN:978-93-84710-87-3.
4. Agricultural Structures and Mechanization. J Perez-Alonso, 2022.

DAM 123: Agricultural Climatology – 45 hours

<p>Module Code and Name: DAM 123 AGRICULTURAL CLIMATOLOGY</p> <p>Module level: YEAR I, SEMESTER II</p> <p>Module Credit: 3 CU</p>
<p>Module description</p> <p>This module focusses on the relationship between climate and agricultural practices, and how weather and climate information can be applied in agricultural production.</p>
<p>Module objective</p> <ul style="list-style-type: none"> • The student should be able to carry out specific agro-meteorological planning and production according to climate zones.

Learning outcomes	
<p>By the end of the module, students should be able to:</p> <ul style="list-style-type: none"> • Identify and classify different climates determine the agricultural activities for particular climates • Apply climatological information in agricultural planning and day to day operations for decision making. • apply climatological information for agricultural zoning • Determine agricultural zones vis-à-vis climate zones in effectively and sustainably use climate resources for agricultural production • To protect and preserve climatic resources • Compile and process climatological data for decision making in agriculture. 	
Indicative content	Duration
<p>1. Introduction to climatology</p> <ul style="list-style-type: none"> a) Definition of key terms; b) Importance and application of climatology c) Climate as a natural resource and hazard d) Branches of climatology (urban climatology, paleo-climatology, dynamic climatology etc) e) Elements of Climate: solar radiation and sunshine, atmospheric temperature, atmospheric pressure, wind speed and direction, atmospheric humidity, cloud cover, precipitation, visibility f) Climate system: atmosphere, biosphere, hydrosphere, lithosphere, cryosphere 	8 hours
<p>1. Weather and Climatic controls</p> <ul style="list-style-type: none"> a) Definitions b) Factors that control climate c) The Earth-Sun relations: Associated terms: Rotation of the earth on its axis, revolution for the earth around the sun, tilting of the earth on its axis, 	8 hours
<p>2. Global circulations</p> <ul style="list-style-type: none"> a) Circulation Theories b) Air masses and frontal systems – Formation, types and modifications c) Pressure systems – highs/ anticyclones/ridges, low/cyclones, d) Planetary wind systems (trades, monsoons, westerlies, polar easterlies) e) Planetary waves: Jetstream, ITCZ, ocean currents. f) Atmospheric tele-connections: vertical fluxes; Madden-Julian Oscillation (MJO), El-Nino Southern Oscillations (ENSO), Indian Ocean Dipole 	8 hours

3. Micro climatology a) Local circulations (land & sea breezes, katabatic & anabatic wind systems, urban heat island), b) vertical stability of the atmosphere; atmospheric turbulence c) temperature inversions and their effects on atmospheric stability	8 hours
4. Climate classification a) Classification schemes b) Climatic regions and their characteristics c) Climate of East Africa: climatic regions, factors that affect the climate of East Africa	8 hours
5. Climate data processing and management: Software i.e. CLIMSOFT, GRADS, NCL a) Maintaining climatological records, climate proxies, extreme values b) Preparation and dissemination of routine climatological information (The CLIMAT message)	5 hours
Mode of delivery: <ul style="list-style-type: none"> ➤ Traditional and virtual lectures ➤ Field trips to agricultural and meteorological stations ➤ Real world Case studies and guest lectures ➤ Workshops and collaborative projects 	
Mode of Assessment <ul style="list-style-type: none"> ➤ Course work <ul style="list-style-type: none"> • Assignments 20% • Tests 20% ➤ Examination 60% <p style="margin-left: 20px;">Total 100%</p>	

References:

1. Time series analysis in Meteorology and Climatology by Claude Duchon and Robert Hale
2. Climatology, Fourth Edition by Robert V. Rohli and Anthony J. Vega
3. Climate: Causes and effects of Climate Change by Dana Desonie
4. C. Donald Ahrens, Essentials of Meteorology; An introduction to the Atmosphere
5. Roger G. Barry and Richard J. Chorley, Atmosphere, Weather and Climate, 9th Edition.
6. WMO Guide to Agricultural Meteorological Practices

DAM 124: Applied Statistics in Agricultural Meteorology – 60 Hours

Module Code and Name: DAM 124 APPLIED STATISTICS IN AGRICULTURAL METEOROLOGY Module level: YEAR I, SEMESTER II Module Credit: 4 CU

Module description	
This module deals with various statistical methods that can be used in the analysis of agro-meteorological data to generate information. This can be used for planning and decision making by end users such as farmers and other stakeholders in the agricultural sector.	
Module Objective	
The aim is to enable the learner apply the knowledge gained in statistics to analyze, model, represent and make inferences on Agro-meteorological data.	
Learning outcomes	
By the end of this module, learners should be able to:	
<ul style="list-style-type: none"> • Relate statistical theories and models to agricultural meteorology • Apply the knowledge of statistics to analyze data related to agriculture, weather and climate • Use statistics to overcome weather and climate related challenges and support decision making in agriculture 	
Indicative content	Duration
1. Introduction to statistics: a) Statistical definitions, b) Types of statistics, c) Importance of statistics d) Data Collection methods and tools,	8 hours
2. Descriptive statistics a) Data presentation b) Measures of central tendency: mean, mode, and median c) Measures of dispersion: range, standard deviation and variance, quartiles, coefficient of variation d) Skewness and kurtosis.	10 hours
3. Methods of data analysis a) Estimation of missing values (averaging, normal ratio, interpolation methods), data quality control and tests of data homogeneity (single and double mass curves) and adequacy. b) Common errors in the measurements of continuous and discrete variables	10 hours
4. Measures of relationships between variables. a) Correlation coefficients b) Linear regression analysis c) Significance tests	10 hours

<p>5. Probability theory</p> <ul style="list-style-type: none"> a) Definition of terms b) Simple probability c) Set notation d) Sum and product laws (possibility space, independent events, mutually exclusive events, events that are not mutually exclusive) e) Conditional probability f) Probability involving permutations and combinations 	<p>8 hours</p>
<p>6. Random variables:</p> <ul style="list-style-type: none"> a) Discrete - Binomial distribution b) Continuous- Normal 	<p>8 hours</p>
<p>7. Sampling:</p> <ul style="list-style-type: none"> • Sampling techniques: probabilistic and non-probabilistic sampling techniques, • Methods of sampling – simple random, stratified, cluster sampling among others and determination of sample size, • Hypothesis testing- The student's t-test, Chi-square (χ^2), Significance tests of research hypotheses 	<p>10 hours</p>
<p>Mode of delivery:</p> <ul style="list-style-type: none"> ➤ Traditional lectures to introduce statistical concepts ➤ Real life examples and case studies ➤ Practical workshops and laboratory experiments ➤ Data collection and analysis ➤ Statistical soft wares 	
<p>Mode of assessment:</p> <ul style="list-style-type: none"> ➤ Course work <ul style="list-style-type: none"> • Assignment 20% • Tests 20% ➤ Examination 60% <p>Total 100%</p>	

References

1. Gregory S.(1968).Statistical Methods and Geographer, second edition Longmanns
2. Murray R.Spiegel and Larry J.S (2008):Theory and Problems of Statistics,4Th Edition, McGraw-Hill
3. Ronald E.Walpole, 3Rd Edition (1982), Introduction to Statistics.
4. Collins K.J et al 9th Edition (2000) , Research in the Social Sciences

5. J. Crawslaw and J. Chambers, Advanced level statistics with worked examples, fourth edition

DAM 125: Environmental Pollution and control – 45 Hours

<p>Module Code and Name: DAM 125 ENVIRONMENTAL POLLUTION AND CONTROL Module level: YEAR I, SEMESTER II Module Credit: 3 CU</p>	
<p>Module Description</p> <p>The module introduces learners to different forms of pollution, natural and human activities that pollute the environment, impact of pollution to the environment and control and management measures.</p>	
<p>Module Objective</p> <ul style="list-style-type: none"> • The student should be able control and manage waste and pollution affecting agro-meteorological production. 	
<p>Learning outcomes</p> <p>By the end of the module, students should be able to:</p> <ul style="list-style-type: none"> • Explain the different types of pollution, impacts of pollution to the environment and pollution control measures. • Discuss different types of waste and its management 	
Indicative content	Duration
<p>1. Introduction:</p> <ul style="list-style-type: none"> • Definition of key terms– Environment, pollution, pollutants, sources of pollution 	4 hours
<p>2. Types of environmental pollution:</p> <ul style="list-style-type: none"> a) Air pollution b) Water pollution – including hydrological cycle c) land/soil pollution d) Sound/Noise pollution e) Light pollution f) Radioactive pollution 	8 hours

3. Impacts of pollution on the environment and their control measures a) Impacts of the different types of pollution on the environment b) Control measures for the different types of pollution	6 hours
4. History and composition of the Earth's Atmosphere a) Evolution of Earth's atmosphere b) Composition of the Earth's atmosphere c) Atmospheric aerosols and particulate matter d) Photochemical smog - ozone formation and depletion e) Volcanic ash and dust f) Greenhouse gases, greenhouse effect and global warming g) The urban heat Island h) Air pollution measurement and monitoring i) Air pollution models j) Dispersion of pollutants	15 hours
5. Waste and its management a) Definition b) Classification of waste c) Economics of wastes d) Waste management and disposal	6 hours
6. Environmental pollution Management, regulations and challenges. a) Control of air pollution. b) Policies and Regulations: <ul style="list-style-type: none"> • Nationally - NEMA, NFA, UNMA, CSOs, NGOs, CBOs • Regionally –EAC, ICPAC, ACMAD • Globally (International conventions on environmental pollution)– GEMS, UNEP, WMO, WHO, UNFCCC, IPCC, COP3, DOHA ACODE e.t.c 	6 hours
Mode of delivery: <ul style="list-style-type: none"> ➤ Lectures and presentations ➤ Field visits and site inspection to industries, polluted sites, waste treatment plants etc ➤ Case studies to analyze real-life studies ➤ Guest lectures and experts 	

Mode of assessment:

- **Course work**
 - Assignment 20%
 - Tests 20%
- **Examination 60%**
Total 100%

References

1. Daniel A. Vallero (2008). Fundamentals of Air Pollution, Academic Press
2. J. Jeffrey Pierce, Ruth F. Weiner, P. Aarne Vesilind (1998): Environment Pollution and Control, Bultermorth – Heinemann.
3. Atmospheric Pollution: History, Science, and Regulation, by Mark Z. Jacobson, Cambridge University Press, Cambridge, 2002.
4. Fundamentals of Air Pollution. 4th Edition, by Daniel Vallero. Academic Press, Burlington, MA, 2008.
5. Air Pollution and Health, S.H. Holgate, J.M. Samet, H.S. Koren, and R.L. Maynard, Eds., Academic Press, 1999.
6. Atmospheric Chemistry and Physics, by John Seinfeld and Spyros Pandis, John Wiley & Sons, 1997
7. Daniel J. Jacob, Introduction to Atmospheric Chemistry, 1999, Princeton University Press.
8. This book is available for free on the web:
9. <http://acmg.seas.harvard.edu/people/faculty/djj/book/index.html>.
10. Smith, B.J., Peters, R.J. and Owen, S.2001.Acoustic and NoiseControl.2nd edition. Essex: Longman Group.
11. Chobanoglous, Thiensen .H, and Vigil.S.1993. Integrated Solid Waste Management. Singapore: McGraw-Hill.

DAM 126: Research Methods – 45 Hours**Module Code and Name: DAM 126 RESEARCH METHODS****Module level: YEAR I, SEMESTER II****Module Credit: 3 CU****Module description**

This module explores the skills, approaches and tools applied in research.

Module Objectives

The aim is to enable learners;

- Understand the fundamental concepts and principles of research methods.
- Identify appropriate research designs and methods for different research questions.
- Ethically conduct research and consider the rights and welfare of research participants.
- Collect, manage, and analyze research data using relevant techniques and tools.
- Evaluate the validity and reliability of research findings.

Communicate research findings effectively through written and oral presentations.

Learning Outcomes:

By the end of the research method, learners should be able to

- Develop research questions and objectives for a study.
- Design a research project with appropriate research design and sampling techniques
- Questions / hypothesis can be used.
- Apply ethical guidelines and obtain necessary approvals for research.
- Collect, organize, and analyze data using appropriate methods and software tools.
- Evaluate and interpret research findings, considering validity and reliability.
- Communicate research findings clearly and effectively through written reports and presentations.

Critically evaluate and appraise existing research studies in their field of study.

Indicative Content

Duration

1. Introduction to Research Methods:

- a) Importance of research methods in various fields
- b) Types of research (quantitative, qualitative, mixed methods)
- c) Ethical considerations in research
- d) Research process and steps

5 hours

2. Research Design

- a) Formulating research questions and objectives
- b) Types of research designs (experimental, correlational, descriptive, etc.)
- c) Sampling techniques and sample size determination
- d) Validity and reliability in research design

8 hours

3. Data Collection Methods

- a) Surveys and questionnaires
- b) Interviews (structured, semi-structured, unstructured)
- c) Observations (participant and non-participant)
- d) Document analysis
- e) Case studies

8 hours

4. Data Collection Methods: a) Surveys and questionnaires b) Interviews (structured, semi-structured, unstructured) c) Observations (participant and non-participant) d) Document analysis e) Case studies	8 hours
5. Data Analysis: a) Quantitative data analysis techniques (descriptive statistics, inferential statistics) b) Qualitative analysis techniques (thematic analysis, content analysis) c) Data coding and interpretation d) Use of statistical software (SPSS, R, etc.)	12 hours
6. Research Ethics: a) Ethical considerations in research (informed consent, confidentiality, minimizing harm) b) Institutional review boards (IRBs) and ethics approval process c) Ethical challenges and dilemmas in research	6 hours
7. Writing and Presenting Research: a) Structure and components of a research proposal/paper. b) Writing literature reviews and methodology sections c) Effective data visualization d) Presenting research findings in oral and written formats e) Referencing styles (e.g., APA) and tools	6 hours
Mode of delivery: <ul style="list-style-type: none"> ➤ Lectures and presentations to introduce fundamental concepts and theories ➤ Hands on workshops and practical exercises ➤ Case studies to appreciate application of research methods ➤ Interactive discussions 	
Mode of assessment: <ul style="list-style-type: none"> ➤ Course work <ul style="list-style-type: none"> • Assignment 20% • Tests 20% ➤ Examination 60% <p style="margin-left: 40px;">Total 100%</p>	

References

1. Lyman R. and Michael T. (Edition 2000), An Introduction to Statistical Methods and Data Analyses, 5th Edition, Duxbury Press
2. Ronald E. Walpole, 3rd Edition (1982), Introduction to Statistics.
3. Collins K.J et al 9th Edition (2000), Research in the Social Sciences
4. Stephen Polgar/share A. Thomas (1999), Introduction to Research in the health sciences

5. Murray R. Spiegel and Larry J.S (2008), Theory and Problems of Statistics, 4th Edition, McGraw – Hill.
6. Gregory S (1968), Statistical Methods and the Geographer, 2nd Edition.

DAM 127: Gender and Climate – 45 Hours

Module Code and Name: DAM 127 GENDER AND CLIMATE	
Module level: YEAR I, SEMESTER II	
Module Credit: 3 CU	
Module description	
This module introduces learners to gender aspects and how they relate to weather and climate services.	
Module objective	
<ul style="list-style-type: none"> • The learner should be able to appreciate gender concepts and apply them in real life situations. 	
Learning outcomes	
By the end of the module, learners should be able to;	
<ul style="list-style-type: none"> • Understand different gender concepts • Apply gender concepts in the provision of weather and climate services • Advocate for gender mainstreaming in provision of weather and climate services • Understand published literature, policies and publications relating to gender, weather and climate services. • Appreciate the role of gender in sustainable natural resource use and management • comprehend and appreciate gender legislations related to weather and climate services 	
Indicative content	Duration
1. Introduction	3 hours
a) Gender concepts and principles.	
b) Patriarchy (meaning, emergence of patriarchy, inequalities)	
2. Introduction to feminism (feminist theories)	3 hours
3. Theoretical perspectives of gender (biological explanations, social aspects of gender)	6 hours
4. Gender and social institutions (gender issues in education, obstacles to girls' education, gender issues in the work place, women and work, obstacles to job satisfaction, gender issues in the media)	9 hours
5. Gender and natural resource use and management.	3 hours
6. Gender and the access and utilization of weather and climate information	3 hours
7. Gender based violence (forms of domestic violence, cycle violence, effects of domestic violence, strategies to end domestic violence)	6 hours
8. Introduction to human rights and gender related instruments (Gender and sustainable development, Laws related to weather and climate and gender dimension,	6 hours
9. Gender and improved resilience to the impacts of climate change	3 hours
Mode of delivery:	
<ul style="list-style-type: none"> ➤ Lectures and presentations ➤ Workshops and discussions 	

➤ **Field visits and tours**

Mode of assessment

➤ **Course work**

- Assignment 20%
- Tests 20%

➤ **Examination 60%**

Total 100%

References

1. Khosha & Masaud, Cities, climate change and gender
2. Sandra L. Russo Uganda (1993). Ministry of Water, Energy, Mines, and Environmental Protection, National Environmental Action Plan (Uganda), United States. Agency for International Development
3. Susan Buckingham-Hatfield (2000): Gender and Environment, Routledge
4. Coates, J. (1986). Women, Men and Language: A Sociolinguistic Account of Gender Difference. London and New York: Longman.
5. Coates, J. (1996). Women Talk. Oxford: Blackwell.
6. Coates, J. (1998). Language and Gender: A Reader. London: Blackwell.
7. Eckert, P. and McConnell-Ginet, S. (2003). Language and Gender. Cambridge: CUP.
8. Thorne, B. and Henley, N. (1975). Language and Sex: Difference and Dominance. Boston: New bury House Publication.
9. Uchida, A. (1992). When “difference” is “dominance”: A critique of the anti-power- based cultural approach to sex differences. Language in Society. 21, 547-568.

11.3 Year two, 1st Semester

DAM 211: Elements of Hydrometeorology – 45 Hours

Module Code and Name: DAM 211 ELEMENTS OF HYDROMETEOROLOGY

Module level: YEAR II, SEMESTER I

Module Credit: 3 CU

Module description

This module deals with the study of the link between hydrology and meteorology. In this module, interactions among hydrology, agro-meteorology and climate, and how these contribute to the

water cycle on the earth will be studied. Land surface is at the core of such interactions, thus dynamical and physical processes of the land-atmosphere interaction will be addressed.

Module Objective

- The aim is to enable learners to determine crop and animal water needs, availability and solve challenges that come with water deficits or scarcity.

Learning outcomes

By the end of the module, learners should be able to:

- Describe the processes of the hydrological cycle and their respective measurements
- Explain how the hydrological cycle processes affect agricultural practices
- Illustrate the challenges of climate change on water resources for agriculture
- Describe the impact of climate change on the agricultural sector of Uganda.

Indicative content

Duration

1. Introduction to Hydrometeorology;

4 hours

- a) General overview (Definitions of key terms, sources of water,
- b) Importance of hydrometeorology in agriculture

2. Hydrological cycle

4 hours

- a) Processes/components in the hydrological cycle (Evaporation and transpiration, Condensation, Precipitation, Infiltration, Percolation and Runoff)

3. Water balance

2 hours

- Definition
- Different measurement of water balance

3. Evapotranspiration (ET)

5 hours

- a) Definition of term ET
- b) Measurement and units
- c) Importance of ET in water resources management for agriculture
- d) Factors influencing ET

<p>4. Cloud and Precipitation.</p> <ul style="list-style-type: none"> a) Formation process of clouds and precipitation b) Cloud forms c) Types of precipitation (convective, orographic/relief, frontal/cyclonic) d) Forms of precipitation (liquid form –rainfall, drizzle, virga, dew or solid form – snow, hail, ice) e) Rainfall measurement f) Rain gauge distribution g) Checking rainfall data consistency h) Areal precipitation measurements <ul style="list-style-type: none"> • Aerial precipitation measurement (Aircrafts, Radar and satellite) 	10 hours
<p>5. Infiltration and percolation</p> <ul style="list-style-type: none"> a) Definition of terms b) 6.2 Influencing factors c) Measurement (Infiltrimeters, Observations, Phi-Index, Horton’s equation) 	6 hours
<p>6. Hydrometrics</p> <ul style="list-style-type: none"> a) Definitions b) Site for a hydrometric station c) Measurement of stage (manual and automatic methods) d) Measurement of discharge (Current meters, slope area method, dilution method, floating object method, hydraulic structures, radioactive tracers method) e) Water quality and quantity measurements 	8 hours
<p>7. Storm measurement</p> <ul style="list-style-type: none"> a) Impact of climate change on water resources b) Definitions and concepts c) Impacts of Climate variability and change on water resources 	2 hours

Mode of delivery:

- Traditional lectures
- Laboratory and field work
- Videos and multimedia
- Case studies and group projects
- Guest speakers

Mode of assessment

- **Course work**
 - Assignment 20%
 - Tests 20%
- **Examination 60%**
Total 100%

References

1. Compendium of Meteorology – Hydrometeorology by S.I S and I Cordery
2. Land surface hydrology, meteorology and climate observation and monitoring by V.J Albert and T. Schande, 2011

DAM 212: Micrometeorology – 45 Hours**Module Code and Name: DAM 212 MICROMETEOROLOGY****Module level: YEAR II, SEMESTER I****Module Credit: 3 CU****Module description**

Micrometeorology is the branch of meteorology concerned with atmospheric processes occurring at the earth/atmosphere interface up to 1km where most of agricultural activities occur. It determines how much water and energy can be gained or lost in the crops, soils and the effect on animals. The module provides a comprehensive understanding of basic theories, physical mechanisms and measurement procedures and methods.

Module objective

- The students should be able to describe the balance of water and heat energy gain and loss in the soil, crops and around the animal environment.

Module outcomes	
By the end of the module students should be able to:	
<ul style="list-style-type: none"> • Describe the profiles of different meteorological parameters within the boundary layer, surface-atmosphere exchange of gases and heat energy • Describe the boundary layer processes on the survival and growth of plants and animals • Apply turbulent transfer processes to agricultural phenomena under different field conditions. 	
Module content	Duration
1. Introduction to micrometeorology <ul style="list-style-type: none"> a) Meaning and scope of micrometeorology <ul style="list-style-type: none"> • Distinctive features of microscale compared with macro, meso and synoptic scale meteorology b) Nature of Planetary Boundary layer (PBL) <ul style="list-style-type: none"> • The surface and Ekman layers • Profiles of temperature, humidity and wind under different stability conditions • Processes in the boundary layer: heat transfer and gas exchange between the soil, water, air, animals and plants, turbulence, mixing, evapotranspiration • Importance of the PBL in agriculture; • Surface Energy Budget: flux at an ideal surface, budgets of bare surfaces, canopies and water surfaces • Soil Temperature and heat transfer • Water temperature • e and heat transfer 	20 hours

<p>2. Fundamentals of turbulence</p> <ul style="list-style-type: none"> • Basic turbulence theory • Turbulent flow; Turbulent Kinetic Energy and PBL Momentum Equations • Laminar flow • Transfer of mass, momentum, and energy • Reynold and Richardson number • Application of turbulent transfer processes to agricultural phenomena under field conditions 	<p>16 hours</p>
<p>3. Micro climates in low plant cover</p> <ul style="list-style-type: none"> • Condition of soil on microclimates • Influences of slopes and topography on insolation, temperature and winds; atmospheric diffusion. 	<p>9 hours</p>
<p>Mode of delivery:</p> <ul style="list-style-type: none"> ➤ Traditional lectures ➤ Field work and observations ➤ Laboratory experiments and visual aids ➤ Case studies, videos and multimedia ➤ Guest speakers 	
<p>Mode of assessment</p> <ul style="list-style-type: none"> ➤ Course work <ul style="list-style-type: none"> • Assignment 20% • Tests 20% ➤ Examination 60% <p>Total 100%</p>	

References

1. Jon Wieringa; J Lomas; R W Gloyne; World Meteorological Organization Secretariat, Lecture notes for training agricultural meteorological personnel (WMO No. 551-1961), 2nd edition.
2. Pal S Arya, 2001, introduction to micrometeorology, volume 79 second edition
3. Boundary layer books “an introduction to atmospheric boundary layer” R.B. stull and “Atmospheric boundary layer” J. Garrat.

DAM 213: Applications of Remote Sensing in Agriculture – 45 Hours

Module Code and Name: DAM 213 APPLICATIONS OF REMOTE SENSING IN AGRICULTURE	
Module level: YEAR II, SEMESTER I	
Module Credit: 3 CU	
Module description	
This module covers the different aspects of Remote Sensing (RS) and its application to agriculture. It deals with the different vegetative indices, crop classification using RS, ET (Evapotranspiration) calculation, yield prediction and soil moisture monitoring using RS data.	
Module Objective	
The module aims to enable learners to make agrometeorological remote observations and applications for agricultural production.	
Learning outcomes	
At the end of this module a student should be able to;	
<ul style="list-style-type: none">• Explain the basics and principles of operation of Remote Sensing systems• Describe the different satellites and Radar systems of particular interest to Agriculture• Apply the principles of remote sensing in agriculture• Apply Geographical Information Systems (GIS) and Geographical Positioning Systems (GPS) in agricultural practices.	
Indicative content	Duration
1. Basic principles of remote sensing: <ul style="list-style-type: none">a) Definitions,b) Elements measured by remote sensors,c) Remote sensing system components,d) Principle of operation of remote sensing system,e) Platforms (ground based, aircraft based, satellite based),f) Characteristics, merits and demerits of remote sensing.	8 hours

<p>2. Types of remote sensing</p> <p>a) Passive remote sensing: Remote sensing channels, their characteristics, merits and demerits.</p> <p>b) Active remote sensing: Principles and applications of active sensors (RADAR, LIDAR and SODAR).</p>	<p>6 hours</p>
<p>3. Radiation:</p> <p>a) Electromagnetic spectrum,</p> <p>b) Radiation laws,</p> <p>c) EMR interaction with the atmosphere and the target and the sensor, radiation budget (mean global energy balance),</p> <p>d) Radiative transfer equation (RTE).</p>	<p>06 hours</p>
<p>4. Satellite sounding system:</p> <p>a) Satellites, Orbits & orbital parameters,</p> <p>b) Types and characteristics of satellites,</p> <p>c) Advantages and limitations of satellite systems.</p>	<p>06 hours</p>
<p>5. Applications of remote sensing in agriculture;</p> <p>a) Monitoring crop status (LAI, NDVI), water content of field crops,</p> <p>b) Combating disease & pests,</p> <p>c) Crop yield estimation and forecasting,</p> <p>d) Crop identification, image interpretation; types of resolutions, visual elements,</p> <p>e) Spectral signatures for soil, vegetation, water and snow surfaces.</p>	<p>14 hours</p>
<p>6. GIS and GPS basics and applications in agriculture:</p> <p>a) Introduction to GIS and GPS,</p> <p>b) Coordinate system and projection,</p> <p>c) Use of GIS software (Arc GIS/ Arc Map/QGIS) for meteorological data manipulation and analysis.</p>	<p>5 hours</p>

Mode of delivery:

- Traditional lectures
- Hands-on workshops
- Field demonstrations
- Case studies, videos and multimedia
- Guest speakers

Mode of assessment

- **Course work**
 - Assignment 20%
 - Tests 20%
- **Examination 60%**
Total 100%

References

1. Arthur P. Cracknell and L. Hayes (1991): Introduction to Remote Sensing, Taylor and Francis
2. James B. Campbell (2008): Introduction to Remote Sensing, Guilford Publications
3. Doviak R. J and Zrnica D. S., 1993: Doppler Radar and Weather Observations; Academic Press; 562 pp
4. Stephens G.L. 1994: Remote Sensing of the Lower Atmosphere; Oxford Univ. Press; 544 pp
5. Otto Huisman and Rolf A. de By (Eds.) 2009: Principles of Geographic Information Systems, (ITC Educational Textbook Series, 1).
6. Klaus Tempfli, Norman Merle, Gerrit C. Huurneman and Lucas L. F. Janssen (Eds.) 2009: Principles of Remote Sensing (ITC Educational Textbook Series, 2), Fourth edition.

DAM 214: Agrometeorological Advisory Services – 45 Hours

Module Code and Name: DAM 214 AGROMETEOROLOGICAL ADVISORY SERVICES

Module level: YEAR II, SEMESTER I

Module Credit: 3 CU

Module description	
<p>This module covers the different aspects of the products and services of agro-meteorology; what products and services are available, how they are generated, how they reach the end users and their utilization. It also emphasizes on the feedback mechanism and coproduction of agrometeorological products and services.</p>	
Module Objective	
<ul style="list-style-type: none"> • The module is aimed to enable learners to disseminate agro-meteorological extension products and services for agricultural production. 	
Learning outcomes	
<p>At the end of this module the learners should be able to;</p> <ul style="list-style-type: none"> • Exhibit desirable characteristics of an effective extension worker during farmer trainings • Communicate effectively to encourage adoption of new innovations and technologies in agriculture • Appropriately execute and evaluate farming programs • Prepare and present reports on farming programs • Use principles of extension education to communicate agricultural innovations to farmers • Adhere to the principles of adult teaching and learning • Prepares effective extension education messages and information • Organizes effective meetings for farmers • Organize farmer groups • Build capacity of farmers by Developing farmers' leadership skills • Review the current state of agrometeorological services and products in Uganda and the world. 	
Indicative content	Duration

<p>1. Basic concepts of agrometeorological extension;</p> <ul style="list-style-type: none"> a) Meaning and objective of extension b) Reason for extension c) Elements of agrometeorological extension d) Principles of extension e) Extension agents and their functions f) Knowledge, skill and personal qualities requirement for agrometeorological extension workers g) Target or audience of agrometeorological extension workers h) Basics of adult learning 	<p>15 hours</p>
<p>2. Agrometeorological extension planning, monitoring and evaluation</p> <ul style="list-style-type: none"> a) Introduction to planning, monitoring and evaluation b) Events planned in advance c) Follow up events d) Steps for preparation of an annual plan for agrometeorological extension programs e) Implementation, evaluation and monitoring of extension programs f) Preparation of an extension program report g) Agro-meteorological extension Products and services: relevance and Application of agro-meteorological information for agricultural production h) The evolution of agro-meteorological services; current trends in extension service delivery i) Factors affecting agrometeorological extension. 	<p>15 hours</p>
<p>3. Communication for agrometeorological extension</p> <ul style="list-style-type: none"> a) Meaning of communication b) Extension communication system c) Importance of listening and feedback in agrometeorological extension communication d) Mass media; types, importance and tools used e) Factors that affect effective communication 	<p>8 hours</p>

<p>4. Extension methods used in agrometeorological extension</p> <p>a) Introduction to key extension methods</p> <p>b) Classification of extension methods</p> <ul style="list-style-type: none"> • Individual methods • Group methods • Mass extension methods • Cyber extension • Farmer led extension • Market led extension <p>c) Group formation and dynamics</p> <ul style="list-style-type: none"> • Participatory approaches • Characteristics of a good and successful group • Challenges and possible solutions • Role of group members and group leadership <p>d) Coproduction of agrometeorological products and services</p> <p>e) National Agriculture extension policy, guidelines, standards and strategy of Uganda</p>	<p>7 hours</p>
<p>Mode of delivery</p> <p>➤ Participatory, field attachment, demonstration, presentation, mass methods, exhibition, display and role play.</p>	
<p>Mode of Assessment</p> <p>➤ Course work</p> <ul style="list-style-type: none"> • Assignments 10% • Tests 10% • Practical 20% <p>➤ Examination 60%</p> <p>Total 100%</p>	

References

1. WMO Lecture notes for Training Class IV Agricultural Met Personnel WMO No. 593
2. De, D. and Jirli, B. (2010). A Handbook of Extension Education. Agrobios (India), Jodhpur.

3. Mondal, S. (2019). Fundamentals of Agricultural Extension Education. Kalyani publishers, New Delhi
4. Kmunda, B.M. (2005). Business communication skills, 2nd Edition. Mukono Printing and Publishing Co.
5. Hoffman. V, Christinck. A and Lemma M (2009) Hndbook: Rural Extension Volume 1 and 2 CTA Magraf Publishers
6. Akumu, H. T. (2014). A guide to communication skills. 1st Ed. Kampala
7. Chester, L. W. and Vanneman, E. (1983). Business Communications. Edward Arnold, London.
8. Hartley, J. (1980). The Psychology of writing communication. Kogan Page Limited, London.

DAM 215: Climate Change and Agriculture – 45 hours

Module Code and Name: DAM 215 CLIMATE CHANGE AND AGRICULTURE	
Module level: YEAR II, SEMESTER I	
Module Credit: 3 CU	
Module description	
This module introduces students to concepts of climate variability and change and its application in agricultural production.	
Module objective	
<ul style="list-style-type: none"> • The module aims at enabling learners to mitigate and adapt agricultural production practices to climate change and variability. 	
Learning outcomes	
By the end of the module the student should be able to:	
<ul style="list-style-type: none"> • Differentiate between climate variability and climate change • Explain causes of climate variability and change • Explain the impacts of climate variability and change in agriculture • Apply adaptation and mitigation measures in agriculture • Explain the climate change policies 	
Indicative content	Duration

<p>1. Introduction</p> <ul style="list-style-type: none"> a) Recall Climate Basics (Weather and climate; b) Atmospheric composition, structure and circulation; c) Factors that determine climate, d) Climate classification; e) Climate systems components, characteristics, interactions and feedback mechanisms – Atmosphere, Hydrosphere, Lithosphere, Cryosphere, Biosphere) 	<p>6 hours</p>
<p>2. Climate change science</p> <ul style="list-style-type: none"> a) Climate Change (definition, modes of climate change, global warming) b) Climate Variability (definition, Impacts of climate variability (extreme weather events) and climate change in agriculture) c) Difference between climate change and climate variability d) Climate change and variability concepts (time scales) e) History of climate change science f) Climate change research (Study of past/paleo, recent and future climate change - Modeling and Projections; climate change study; causes/forcings and evidence of climate change; impacts, consequences and evidence of global warming; adaptation and mitigation measures; Challenges and benefits in curbing climate change) 	<p>25 hours</p>
<p>3. Climate sensitivity and feedback mechanisms</p> <ul style="list-style-type: none"> a) Climate response b) Climate feedback process (positive & negatives) c) Climate sensitivity and feedback parameter d) Examples of feedbacks e) Risk, vulnerability and Capacity in agricultural sector 	<p>10 hours</p>
<p>4. Climate change control policies and measures relevant to agriculture</p> <ul style="list-style-type: none"> a) Global b) Regional c) National 	<p>4 hours</p>

Mode of delivery:

- Lectures
- Visual aids, video and multimedia
- Case studies and guest speakers
- Field trips
- Group projects

Mode of assessment

- Course work
 - Assignments 10%
 - Tests 10%
 - Practical 20%
 - Examination 60%
- Total 100%

References

1. IPCC reports
2. Houghton, D. David., (2002): Introduction to Climate Change, Lecture notes for meteorologists, WMO-No. 926
3. C. Donald Ahrens, Essentials of Meteorology; An invitation to the Atmosphere
4. Roger G. Barry and Richard J. Chorley, Atmosphere, Weather and Climate, 9th Edition.
5. IPCC (2013). Climate Change 2013. The Physical Science Basis -Summary for Policymakers
6. UNEP (2009). Climate Change Science Compendium
7. The state of the climate of Uganda, 2017 and 2018
8. Climate: Causes and effects of Climate Change by Dana Desonie

DAM 216: Industrial Training – 75 Hours**Module Code and Name: DAM 216 INDUSTRIAL TRAINING****Module level: YEAR II, SEMESTER I****Module Credit: 3 CU****Module description**

Agro-meteorology is a comprehensive programme that requires a great deal of hands-on practices. Therefore, Industrial training exposes students to the field of work so as to appreciate real-life working experiences in the field of agriculture.

Module Objective	
<ul style="list-style-type: none"> The modules aimed at equipping the learners with real life on job experiences and manage themselves in a working environment. 	
Learning outcomes	
By the end of this module, learners should be able to;	
<ul style="list-style-type: none"> Acquire more knowledge, practical skills, competencies and attitudes in the agrometeorological practices through working with professionals in the field of agrometeorology. Appraise the training programme Market themselves and develop their career paths Prepare and write industrial training reports 	
Indicative content	Duration
Industrial training report Guidelines:	
Each student is expected to produce a report at the end of the industrial training exercise. This brief provides a guideline on the expected contents of the report.	
1. Title page of the report <ul style="list-style-type: none"> a) Title b) Name of Organization c) Author d) Purpose e) Date 	
2. Preliminary pages <ul style="list-style-type: none"> a) Declaration b) Acknowledgement c) Short summary or abstract d) Table of contents 	
3. Report Content	

<ul style="list-style-type: none"> a) Profile of organization, mission, vision, aims and objectives, organizational structure b) Functions of the department / office c) Internship activities d) Positive and negative experiences e) Lessons learned/skills acquired f) Recommendations g) Conclusion 	
<p>4. Length of the report</p> <ul style="list-style-type: none"> • The report should not exceed 40 pages 	
<p>Mode of delivery Guided step by step process by Field and Academic supervisors at the school</p>	
<p>Mode of Assessment</p> <p>Final mark for industrial training shall be cultivated using assessment tools which include Appendices 5-8 and Industrial training report prepared by the student by the end of the training.</p> <ul style="list-style-type: none"> ➤ Academic supervisor assessment =20% ➤ Field supervisor assessment =60% ➤ Final Industrial Training report =20% ➤ Total = 100% 	

DAM 217: Animal Production and Management – 45 Hour

<p>Module Code and Name: DAM 217: ANIMAL PRODUCTION AND MANAGEMENT Module level: YEAR I, SEMESTER II Module Credit: 3 CU</p>
<p>Module description</p> <p>The module provides an introductory approach to farm animals majorly cattle pigs, goats, sheep, rabbit and birds. It also covers general aspects of routine management practices, principles of prevention and control of major livestock diseases and other health problems and economic aspects.</p>

Module Objective

To equip the learner with knowledge and skills in farm animal management.

Learning outcomes

By the end of this module, learner should be able to;

- Demonstrate routine livestock husbandry practices and apply their skills to run profitable livestock projects.
- Identify ill-health in livestock, manage and control livestock diseases and parasites
- Classify different livestock species by breed and function
- Carry out routine livestock production practices
- Carry out disease and parasite control measures in livestock
- Select suitable livestock types and breeds for rearing
- Take appropriate measures to control livestock diseases and parasites
- Handle animals appropriately
- Distinguish between ruminants and non-ruminants based on physical characteristics
- Differentiate ruminants and non-ruminants based on physiological characteristics
- Carries out animal husbandry practices
- Keep farm records

Indicative content**Duration**

1. Overview; definition of terms, livestock species, breeds and their management. **15 hours**

2. Poultry management **5 hours**

a) Introduction to poultry management

- Definition of key terms
- Importance of poultry
- Constraints to the poultry industry
- Breeds of poultry

b) Chick management

- Brooding
- Vaccination

<ul style="list-style-type: none"> • Feed formulation • Feeding • Housing • Health • Biosecurity <p>c) Growers' management</p> <ul style="list-style-type: none"> • Feeding • Vaccination • Spacing <p>d) Layer management</p> <ul style="list-style-type: none"> • Housing: space requirement, light and temperature control • Health of layers; pests and diseases • Vaccination regime • Debeaking and cannibalism • Egg nesting / laying boxes • Egg collection • Egg handling and packaging • Egg candling • Off layer management and culling • Marketing layers and eggs • Layers and egg value chain management 	
<p>3. Piggery management</p> <ul style="list-style-type: none"> • Definition of key terms • Importance of pig production • Major pig breeds and types • Constraints to pig production • Systems of pig management • Feeding of pigs • Breeding practices • Piglet management practices 	<p>5 hours</p>

<ul style="list-style-type: none"> • Sanitation and hygiene management • Housing • Identification • Record keeping • Biosecurity 	
<p>4. Goat management</p> <ul style="list-style-type: none"> • Definition of key terms • Importance of goat production • Major goat breeds and types • Constraints of goat production • System of goat management • Feeding of goats • Breeding practices • Management of kids • Sanitation and hygiene management • Record keeping 	5 hours
<p>5. Rabbit management</p> <ul style="list-style-type: none"> • Definition of key terms • Importance of rabbit production • Major rabbit breeds and types • Constraints of rabbit rearing • Systems of management of rabbits • Breeding of rabbits • Managements of kits • Sanitation and hygiene management • Record keeping • Identification 	5 hours
<p>6. Sheep management</p> <ul style="list-style-type: none"> • Definition of key terms • Importance of sheep production 	4 hours

<ul style="list-style-type: none"> • Sheep breeds • Constraints of sheep rearing • Management systems of sheep • Feeding of sheep • Breeding of sheep • Rearing of lambs • Maintenance of hygiene in the units • Records keeping • Identification 	
<p>7. Cattle management</p> <ul style="list-style-type: none"> • Definition of key terms • Breeds of cattle • Types of cattle • Importance of rearing of cattle • Constraints of rearing of cattle • Management systems of cattle • Feeding and pasture management • Breeding and reproduction • Hygiene and biosecurity • Health • Identification • Housing Record keeping 	<p>5 hours</p>
<p>Mode of delivery Guided discussion, demonstrations, practical, guided discovery, project and experimentation</p>	

Mode of Assessment

- **Course work**
 - Assignments 10%
 - Tests 10%
 - Practical work 20%
- **Examination 60%**
- **Total 100%**

References

1. Payne WJA et al (1978) Introduction to animal husbandry in the tropics. Longman Group Ltd.
2. Sastry N S P (1982) Farm Animal Management and Poultry production. Macmillan Publishers Ltd.
3. Sabiti, E.N, Katuromunda, S and Kitakweba, A. 2010. Agriculture Principles and Practices for schools and Colleges: Animal Production. Fountain Publishers, Kampala. 278 pp Vision Group (2019) Harvest money with 50 of Uganda's Best Farmers. New Vision Printing press, Kampala Uganda.
4. East African agriculture by D.N. Ngugi, P.K. Kamau and W. Nguyo
5. East African crops by J.D. Acland
6. Agriculture in Uganda by J.K. Mukiibi (volume 1&2)
7. Jon Wieringa; J Lomas; R W Gloyne; Lecture notes for training agricultural meteorological personnel; World Meteorological Organisation Secretariat.
8. R. W. Gloyne and J. Lomas, 1980, Revised edition of Lecture notes for training class II and class III agricultural meteorological personnel.

11.4 Year two, 2nd Semester

DAM221: Forecasting and Agricultural Modelling Techniques – 45 hours

Module Code and Name: DAM 221 FORECASTING AND AGRICULTURAL MODELLING TECHNIQUES	
Module level: YEAR II, SEMESTER II	
Module Credit: 3 CU	
Module description	
<p>Weather and climate predictions are very key for agricultural production and research. This module covers basic forecasting principles in agricultural meteorology, the types and state of Agro-meteorological forecasts.</p> <p>Crops and animals are affected by weather and climate conditions which are sometimes not easily captured due to the erratic nature of the atmosphere. This module therefore, introduces students to the basic concepts of agro-meteorological modeling, the available methods and application.</p>	
Module objective	
<ul style="list-style-type: none">• To enable the learner to forecast weather and climate for agricultural production.• To enable the learner to model simple crop and animal environments.	
Learning outcomes	
<p>By the end of this module the learner should be able to;</p> <ul style="list-style-type: none">• Describe basic forecasting principles• Examine the available types of Agrometeorological forecasts• Develop the different forecasts important to Agriculture sector using the different techniques available• Explain the relevance of Agrometeorological forecasts in farm management• Interpret and disseminate agro-meteorological forecasts• Describe what is meant by an agro-meteorological model• Explain the importance of agro-meteorological modeling• Apply different types of agrometeorological models in agricultural production	
Indicative content	Duration

<p>1. Introduction</p> <p>a) Definition of key terms</p> <p>b) Overview of Agrometeorological Forecasting, crop and animal Modelling</p>	<p>4 hours</p>
<p>2. Agrometeorological forecasting</p> <p>a) Overview of agrometeorological forecasting</p> <p>b) Principles of weather forecasting</p> <p>c) Requirements and importance of agrometeorological forecasting</p> <p>d) Weather and climate forecasts: types, tools, techniques and uses of forecasts</p> <p>e) Agro-meteorological forecasts: types, tools, techniques and uses of forecasts</p> <p>f) Agrometeorological forecasting in Uganda: current state, comparison with other economies, desired state and the limitations</p> <p>g) Interpretation and dissemination of agro-meteorological forecasts</p>	<p>18 hours</p>
<p>3. Crop and animal modeling</p> <p>a) The history of agro-meteorological modeling</p> <p>b) Types and uses of agro-meteorological models: CENTURY soil organic model, carbon sub model, water budget sub model, nitrogen sub model, phosphorus sub model, sulfur sub model, forest sub model and DNDC model, crop and animal models.</p> <p>c) Methods of agrometeorological modeling: systematic approach</p> <p>d) Basic structure of crop growth simulation models; mechanistic crop growth simulation model, a simple crop model, growth function, simulation on the growing or developing stages and phenology, models of leaf photosynthesis (rate of crop dry weight growth, daily crop photosynthesis, photosynthesis versus Leaf Area Index (LAI), photosynthesis versus daytime mean temperature, photosynthesis versus drought stress, photosynthesis versus light), growth and development of organs and assimilation partition, simulation of soil water balance, simulation on nitrogen balance.</p>	<p>23 hours</p>

<p>Mode of delivery:</p> <ul style="list-style-type: none"> ➤ Traditional lectures ➤ Visual aids ➤ Guest speakers ➤ Hands-on workshops and case studies ➤ Field trips 	
<p>Mode of assessment</p> <ul style="list-style-type: none"> ➤ Course work <ul style="list-style-type: none"> • Assignments 10% • Tests 10% • Practical 20% ➤ Final examination 60% <p>Total 100%</p>	

References

1. Jackson I. J (1963): Agricultural Met. Part, Israel Programme for Scientific Translation, Jerusalem.
2. Harpal Singh Mavi and Graeme J. Tupper (2004) Agro-meteorology; Principles and Appliace of Climate Studies in Agric. Haworth Press Inc. NY.
3. Jackson I. J (1963): Agricultural Met. Part, Israel Programme for Scientific Translation, Jerusalem.
4. WMO Guide to Agricultural Meteorological Practices

DAM 222: Sustainable Organic Agriculture – 75 Hours

<p>MODULE NAME: DAM 222 SUSTAINABLE ORGANIC AGRICULTURE</p>
<p>Module level: YEAR II, SEMESTER II</p>
<p>Module credit: 5CU</p>
<p>Module Description This module involves management systems which promote and enhance eco-systems like biological cycles and soil biological activities.</p>
<p>Module Objectives Learners should be able to understand how to recycle existing animal and plant waste.</p>

Learning outcomes	
By the end of the module the learner should be able;	
<ul style="list-style-type: none"> • Apply knowledge of managing, utilizing and conserving agricultural resources. • To know to protect, renew soil fertility and natural resource base. • To integrate of natural biological cycle and controls. 	
Indicative content	Duration
1. Introduction <ul style="list-style-type: none"> • Definition of key terms • Features • Aims • Contributions 	4 hours
2. Convectional agriculture <ul style="list-style-type: none"> • Definition • Features • Limitations 	4 hours
3. Soil fertility management <ul style="list-style-type: none"> • Definition • Soil organic matter • Soil fertility • Factors that contribute to soil fertility • Maintenance of soil fertility 	15 hours
4. Mushroom growing <ul style="list-style-type: none"> • Facts about mushrooms • Nutritional values • Health and medical importance • Procedures 	16 hours
5. Use of natural pesticides <ul style="list-style-type: none"> • Advantages • Examples 	4 hours
6. Organic manure <ul style="list-style-type: none"> • Farm yard manure • Green manure • Compost manure • Liquid manure 	8 hours
7. Organic medicine <ul style="list-style-type: none"> • Mango fruits • Pawpaw, lemon leaves, ginger 	6 hours

8. Indigenous microorganisms <ul style="list-style-type: none"> • Definition • Advantages • Procedures 	6 hours
9. Bio- gas production <ul style="list-style-type: none"> • Definition of key terms • Uses • Advantages and disadvantages • Components of bio- gas • Bio gas production 	8 hours
Mode of delivery: <ul style="list-style-type: none"> ➤ Interactive lectures ➤ Field trips and workshops ➤ Group projects ➤ Guest speakers 	
Mode of assessment <ul style="list-style-type: none"> ➤ Course work <ul style="list-style-type: none"> • Assignments 10% • Tests 10% • Practical 20% ➤ Final examination 60% <p>Total 100%</p>	

References

1. Organic Farming and Farming Systems for Sustainable Agriculture by S.Krishnaprabu, ISBN:9789388892117 Binding: Paperback, 2020
2. Margaret Robertson. Sustainability and Practice 3rd Edition, 2021, ISBN:13978-0367365219.
3. P. L. Maliwal, 2021, Principles of Organic Farming: (As per syllabus of V Dean's Commetit ICAR), ISBN: 9789389184501.

DAM 223: Entrepreneurship Skills – 45 Hours

Module Code and Name: DAM 223 ENTREPRENEURSHIP SKILLS
Module level: YEAR II, SEMESTER II
Module Credit: 3 CU
Module description This module is designed to acquaint learners with entrepreneurship knowledge, skills and attitudes. The goal is to provide a solid background with a practical application of important concepts applicable to entrepreneurial environment.

Module Objective	
The learner should be innovative and able to develop essential entrepreneurship skills in order to meet market demand.	
Learning outcomes	
By the end of this module, a learner should be able to;	
<ul style="list-style-type: none"> • Come up with an effective business plan. • Apply entrepreneurship skills to run a business • Demonstrate ability to work effectively with others. • Identify resources to start up business ventures. • Manage business challenges and ethical issues involved in production, marketing and sales 	
Indicative content	Duration
1. Introduction: a) Concepts of entrepreneurship b) Entrepreneurship process c) Integrative model of entrepreneurship d) Roles of entrepreneurship in an economy	4 hours
2. Applications of entrepreneurship a) A business career b) Business communication c) Negotiation d) Innovation e) Creativity f) Risk in business.	6 hours
3. Forms of enterprises a) Micro enterprises b) Small enterprises c) Medium enterprises	4 hours
4. Business plan a) Components of business plan b) Nature of successful business plan c) Business model to business plan. d) Issues of business failures.	8 hours
5. Types of entrepreneurs a) Entrepreneur b) Intrapreneur c) Enterprising Person	3 hours

6. Business ideas a) Ways of generating business ideas, sources and types of ideas. b) Evaluating the idea c) Factors undemanding the idea.	6 hours
7. Finance and Accounting a) Sources of finance b) Reasons for financing ventures c) Types of costs d) Financial statements e) Income statement f) Statement of cash flows g) Statement of financial position (balance sheet)	7 hours
8. Marketing management a) Marketing evolution in start ups b) Marketing mix. c) Setting prices	5 hours
9. Business ethics a) Nature of ethics b) Unique ethical challenges in entrepreneurship c) Ethical reference points d) Creating an ethical business environment.	7 hours
Mode of delivery: <ul style="list-style-type: none"> ➤ Class room instruction – traditional lectures and guest speakers ➤ Hands-on Workshops and Entrepreneurship seminars ➤ Mentorship programmes ➤ Business incubators 	
Mode of assessment <ul style="list-style-type: none"> ➤ Course work <ul style="list-style-type: none"> • Assignments 10% • Tests 10% • Practical 20% ➤ Final examination 60% ➤ Total 100% 	

References

1. Ssempijja M (2013) new entrepreneurship education for A level and business institutions - revised edition
2. Wasswa Balunywa (2003) Entrepreneurship Development in Uganda

3. Ncdc (2010) Entrepreneurship Education Teachers' Guide for A 'level, book 6
4. Sebunya K (2003) doors of opportunity

DAM 224: Weather and Climate Disaster Risk Management – 45 Hours

Module Code and Name: DAM 224 WEATHER AND CLIMATE DISASTER RISK MANAGEMENT	
Module level: YEAR II, SEMESTER II	
Module Credit: 3 CU	
Module description	
This module introduces the learner to the aspect of weather and climate disasters in agriculture and how the impacts can be reduced.	
Module Objective	
<ul style="list-style-type: none"> • The Learner should be able to understand and apply knowledge of weather and climate in disaster risk management 	
Learning outcomes	
By the end of this module learners should be able to:	
<ul style="list-style-type: none"> • Define key terms related to weather and climate disaster risk management • Describe the different extreme weather and climate events and their impact on agriculture • Apply knowledge of disaster risk management in mitigation and adaptation to weather and climate related disasters. • Apply remote sensing technique to monitor the risk and assess the impact of weather and climate related disasters. weather and climate as a tool to as how remote sensing is used as a mitigation tool in disaster risk management • Understand and apply the knowledge of weather and climate disaster risks in agricultural insurance 	
Indicative content	Duration
1. Introduction: definition of key terms.	2 hours
2. Weather and climate related disasters (drought, floods, tropical cyclones, avalanche, landslides, storms – hailstorms, sandstorms)	8 hours
3. Managing the risk of weather and climate disasters (strategies adopted in areas with high risks): Drought management; Tropical cyclone preparedness in agricultural sector; Mitigation of damage of agricultural sector due to floods and heavy rainfall	15 hours

(land use management practices, the application of nutrients), protection of crops against high winds; protection of crops against dust storms/sandstorms; protection of crops against cold injury and frost; fire prevention measures.	
4. Impacts of disasters in agriculture	2 hours
5. Agricultural strategies for community capacity building	4 hours
6. Diversification of crops according to different planting seasons; Propagation of drought resistant and water tolerant crops; disease resistant crops; Seed banks and nurseries; Post-harvest facilities; Proper land use and management for sustainable agriculture practices; Community participation for traditional rain water harvesting	3 hours
7. Disaster risk reduction through livelihood concerns: Creation of alternate livelihood options; Livelihood strategies in disaster risk management	2 hours
8. Remote sensing as a technique for disaster risk management	2 hours
9. Multi – Hazard Early warning systems	2 hours
10. Agricultural insurance: Crop insurance; animal insurance	2 hours
11. Climate Smart Agriculture (CSA) a) Relevant concepts b) Back ground/introduction of CSA c) Objectives of CSA d) CSA practices e) Food security f) Use of CSM in pest and disease management g) Challenges of CSA implementation in Uganda	7 hours
Mode of delivery: ➤ Lectures ➤ Guest speakers and case studies ➤ Visual aids, videos and multimedia ➤ Field trips, discussion forums and group projects ➤ Government and NGO collaboration	
Mode of assessment ➤ Course work	

<ul style="list-style-type: none"> • Assignments 10% • Tests 10% • Practical 20% ➤ Final examination 60% ➤ Total 100% 	
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References

1. IPCC reports
2. Houghton, D. David., (2002): Introduction to Climate Change, Lecture notes for meteorologists, WMO-No. 926
3. IPCC (2013). Climate Change 2013. The Physical Science Basis -Summary for Policymakers
4. UNEP (2009). Climate Change Science Compendium

DAM 225: Research Project – 75 Hours

Module Code and Name: DAM 225 RESEARCH PROJECT Module level: YEAR II, SEMESTER II Module Credit: 3 CU	
Module Description <p>This module involves writing a scientific research project with research literature and discussion of analyzed results. There are two categories of research that is quantitative and qualitative. Students should choose either qualitative and/or quantitative. Research guidelines are attached to annex.</p>	
Module Objective <ul style="list-style-type: none"> • The student should be able to make new discoveries in the field of agro-meteorology through research. 	
Learning outcomes <p>By the end of this module, learners should be able to;</p> <ul style="list-style-type: none"> • Write research project proposals and scientific reports • Discuss research results. • Present and defend results appropriately. 	
Indicative content	Duration

<p>The following format shall be followed</p> <ol style="list-style-type: none"> 1. Cover page (Title, Student name, student registration number, Name of supervisor, date – month and year) 2. Preliminary information [Declaration, Approval, Dedication, Acknowledgement, Table of contents, List of figures / tables, Acronyms and Abbreviations (optional), Abstract] 3. Chapter one: Introduction (background, problem statement, study objectives – one main objective and two specific objectives, research questions/ hypothesis, significance, scope) 4. Chapter two: Literature review (at least three pages, at least twenty references) 5. Chapter three: Methodology 6. Chapter four: Results and discussion 7. Chapter five: Conclusions and recommendations 8. References 9. Appendices (organization of research report/ conceptual framework) 	
<p>Note: Line spacing -1.5, Font style – Times New Romans, Font size – 12 points, reference style is APA</p>	
<p>Mode of delivery:</p> <ul style="list-style-type: none"> ➤ Oral presentations ➤ Written research reports ➤ Post and visual presentations ➤ Research symposia and seminars ➤ Online resources 	
<p>Mode of Assessment</p> <ul style="list-style-type: none"> • Final mark for the research project shall be cultivated as follows: the research proposal writing and research defense is done and assessed at the institution for 60% and the final research project reports are submitted and assessed by UBTEB for 40%. 	

DAM 226: Agricultural Economics

MODULE CODE AND NAME: DAM 226 AGRICULTURAL ECONOMICS	
LEVEL; DIPLOMA	
CREDIT: 4CU	
Module description The module involves the study of Economics in Agriculture. It focuses on principle of economics, factors of production, production functions, production relationships, costs of production, price theory, market and marketing, risks and uncertainties, farm records and budget.	
Module objective <ul style="list-style-type: none">Learners should be to understand how to use scarce productive resources to produce various agricultural commodities.	
Learning outcomes By the end of the module, the should learners be able to; <ul style="list-style-type: none">Apply the knowledge of economics in producing various agricultural products.The learner should be able to use the factors of production.The learner should be able to make budgets and records for the farm.	
Indicative content	Duration
1. Introduction to agricultural economics <ul style="list-style-type: none">DefinitionTypes of economicsRoles of agriculture in the economic development	3 hours
2. Principles of production <ul style="list-style-type: none">ScarcityChoiceOpportunity cost	5 hours
3. Factors of production <ul style="list-style-type: none">LabourLandCapitalEntrepreneurship / management	6 hours
4. Production factors <ul style="list-style-type: none">Increasing returnsConstant returnsDiminishing / decreasing returns	5 hours
5. Production relationships <ul style="list-style-type: none">Joint productsCompetitive productsSupplementary productsComplementary products	5 hours

6. Cost of production <ul style="list-style-type: none"> • Real costs • Nominal costs • Explicit costs • Fixed costs • Variable costs 	6 hours
7. Price theory <ul style="list-style-type: none"> • Demand • Supply 	4 hours
8. Market and marketing <ul style="list-style-type: none"> • Definition • Marketing functions • Problems of marketing agricultural products • Price fluctuation • Causes of fluctuation • Effects of price fluctuation • Methods of reducing price fluctuation 	8 hours
9. Risks and uncertainties <ul style="list-style-type: none"> • Definitions • Risks • Uncertainties • Methods of reducing risks and uncertainties 	4 hours
10. Farm records and budgeting <ul style="list-style-type: none"> • Definition • Types of records • Types of budgets • Importance of budgeting • Importance of farm recording • Constraints of farm budgeting 	5 hours
Mode of delivery: <ul style="list-style-type: none"> ➤ Interactive lectures ➤ Field trips and workshops ➤ Group projects ➤ Guest speakers 	
Mode of assessment <ul style="list-style-type: none"> ➤ Course work • Assignments 10% 	

- Tests 10%
 - Practical 20%
 - **Final examination 60%**
- Total 100%**

References

4. Principles of Agricultural Economics. Andrew P. Barkley and Paul W W Barkley, 2013.
5. The World of Agricultural Economics: An introduction. Carin Martiin, 2013.
6. A textbook of Agricultural Economics. Dr. C.B. Singh and Dr. R. K. Singh, 2011.

APPENDICES

APPENDIX 1: List of Teaching Staff

[G10]

SNo.	Name	Qualification	Area of specialty	Status
1.	Godwin Ayesiga	PhD Atmosphere, Oceans and Climate, Msc. Applied Met, Bsc.Educ(Maths/Physics)	Applied meteorology	Secondment
2.	Samalie Nanyonjo	Msc. Applied meteorology, MSc, environment science, Bsc,Meteorology,Dip Met,Cert Meteorology	Core meteorology	Secondment
3.	Doreen Nanziri	Bsc. Met(Mak), Dip Met	Core meteorology	Secondment
4.	Yusuf Nsubuga	Bsc. Met(Mak), Dip Met	Core meteorology	Secondment
5.	Kibwika Robert	Msc Meteorology, Bsc.Met, Dip Met	Core meteorology	Secondment
6.	Christopher Sooka	Msc. Information systems, Bsc Educ(Mathematics/Physics)	Physical sciences	Full time
7.	Simon Ageet	MSc Applied Meteorology and Climate with Management, PGD. Meteorology, BSc, Education (Maths/Physics) Dip. Meteorology	Applied meteorology	Full time
8.	Asingwire Alex	BSc Education (Maths/Physics)	Physical sciences	Full time
9.	Hassan Adiga	MSc Climate Change, PGDE, BSc. Meteorology, Dip. Meteorology	Climate science	Full time
10.	Nakiwala Esther Kigongo	MSc. Applied Meteorology, PGD.IT, B. Financial and Investment Analysis, Dip. Meteorology,	Applied meteorology	Full time

11.	Annet Lyaka	Msc. Applied Meteorology, BSc Meteorology, Dip. Meteorology	Earth systems science	Full time
12.	Paul Kato	BA. Information Technology	Computer applications	Full time
13.	Moses David Tumusiime	Msc. Climate Change, PGD Water resources, DPAM, PGD Met.	Earth systems science	Secondment

APPENDIX 2: Teaching Facilities-Lecture Rooms

SNO.	ROOM	APPROXIMATE AREA (SQUARE METRE)
1.	Dam1	60
2.	Dam2	60
3.	Dm1	84
4.	Dm2	81
5.	Cm1	50
6.	Cm2	49
7.	Reading Room1	80
8.	Reading Room 2	80
9.	Reading Room 3	64

APPENDIX 3: Other Facilities

SNO.	FACILITY	APPROXIMATE AREA (SQUARE METRE)
1	Weather station	100
3	Library	25
4	Weather instrument museum	49
5	Conference room	24
6	Computer laboratory	49

APPENDIX 4: List of Trainees

LIST OF TRAINEES	
Centre Number:.....	
Paper code & Name:.....	
Programme/ Module:.....	
Year of study:	
Academic year:	

	1. Did the learner provide weekly summary of the work performed?	2		
	2. How did the learner describe the tasks performed?	4		
	3. How was the learner able to explain why tasks were being done in a particular way?	3		
	4. How did the learner explain the problems experienced when carrying out the work and how they were solved?	3		
	5. How did the learner describe the new knowledge and skills gained?	2		
	6. How did the learner explain the knowledge and skills acquired at college that enable him to perform?	3		
	7. How did the learner explain his relationship with his co-workers and supervisors and how he/she plans to improve or maintain it?	2		
	8. How did the learner relate industrial training tasks to his/her training as a weather observer?	2		
C	General remarks (Other assessments at the discretion of the supervisor)	4		
	TOTAL	30		

APPENDIX 6: Industrial Training Assessment Form for Field or Onsite Supervisor

Name of institution:				
Name of industry:				
Name of student:			Signature:	
Registration No.:				
Programme & Year of study:				
Name of supervisor:			Signature:	
	AREA OF ASSESSMENT	MARKS	SCORE	AREA OF IMPROVEMENT
A	Attendace (%of days and times within the days present)	5		
B	Work performance involvement	35		
	1. Ability to communicate effectively	5		
	2. Cooperation with other staff	5		

	3. General ability to use various equipment, machines or plant in industry	10		
	4. Flexibility, willingness to learn from various sections in the industry	7		
	5. Job planning	8		
C	Innitiative or innovations	15		
	1. Problem solving	8		
	2. New ideas on improvement for efficiency of performance or operations	7		
D	Time management	5		
	1. Reporting time	1		
	2. Leaving at specified time	1		
	3. Meeting deadlines on assignments given by supervisors or instructors.	3		
E	Discipline and safety observations	15		
	1. Use of right equipment for right job	7		
	2. Obeying instructions given and carrying them out	8		
	TOTAL	80		

APPENDIX 7: Industrial Training Log Book

INDUSTRIAL TRAINING LOG BOOK	
1. Name of student	
2. Registration No.	
3. Programme/ Module & Year of study	
4. Name of institution	
5. Telephone contact	
6. Industry/ Organisation	

7. Physical Address	
8. Name of Field officer	
9. Telephone contact	
10. Date of commencement of industrial training	
11. Date of completion of industrial training	

APPENDIX 8: Daily Records of Progress

DAILY RECORDS OF PROGRESS			
Training week:Day/Date:			
Activities done	Lessons learnt	Challenges faced	Reccomendations
I here by declare that all information provided above is true.			
.....
Signed by trainee	Date	Signed by supervisor	Date

APPENDIX 9: Guide on Marking of Industrial Training Report

The report shall be written in good english and assessed as follows

SNO.	CONTENT	MAXIMUM SCORE
1	Cover page <ul style="list-style-type: none"> Name of institution Name of learner and year Place of industrial training Period of training ie june2023 Signature of field and academic supervisors 	1
2	Acknowledgement	0.5
3	Abstract	0.5
4	Table of contents	0.5
5	List of tables	0.5
6	List of figures	0.5

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