Table 4a: Learning outcomes/Modules of courses offered in AMS (M.Ag. SE)

<table>
<tr><td colspan="7">Module/Course Title: Engineering Technology and Climate Change</td></tr>
<tr><td>Module/Course Code
(AMS 801)</td><td>Student work-load
48 hours</td><td>Credits
(ECTS)
(3)</td><td>Semester
(First)</td><td>Frequency
Eg. Each Semester</td><td>Duration
One Semester</td></tr>
<tr><td>1</td><td>Types of courses
a) Lectures</td><td>Contact hours
24 -hours</td><td>Independent Study
4 hours</td><td>Class size
3 students</td><td></td></tr>
<tr><td>2</td><td colspan="5">Prerequisites for participation
Candidate must have completed a 1st degree in engineering discipline. Course is taught in English Language.</td></tr>
<tr><td>3</td><td colspan="5">Learning outcomes After the completion of this course, the Students will understand the roles of crop farming, animal husbandry, fossil burning on climate change.
Measurement of green house gases and mitigation strategies</td></tr>
<tr><td>4</td><td colspan="5">Subject aims/Content: Agricultural activities and anthropogenicglobal warming. Concept of carbon credits. Global energy balance and climate change. Green house gases (GHG) such as CO_2, Methane, Chlorofluorocarbons (CFC's), and Nitrous Oxide associated with crop farming, monoculture, agrochemical, animal husbandry, burning of fossil fuel, deforestation, agricultural wastes, etc. Multi-disciplinary approach of mitigating the effects of Climate Change: Policy, Legal and Economic Approach; Technical Approach; Research Approach; etc. Measurement and quantification of GHGs. Technology for carbon mitigating green house gas effects: Carbon Capture and Sequestration (CSS). Agricultural mechanization practices for mitigating the effects of climate change.</td></tr>
<tr><td>5</td><td colspan="5">Teaching methods
group work, lectures, discussions</td></tr>
<tr><td>6</td><td colspan="5">Assessment methods: Continuous assessment tests and examination</td></tr>
<tr><td>7</td><td colspan="5">This module/course is used in the following degree programme/s as well: None</td></tr>
</table>

8	**Responsibility for module/course:** Course Lecturer – Dr A.A. Adekunle
9	**Other information** e.g. bibliographical references

Table 4b. Learning outcomes/Modules of courses offered in AMS (M.Ag. SE)

<table>
<tr><td colspan="6">Module/Course Title: Engineering Technology for Precision Farming and Conservation Agriculture</td></tr>
<tr><td>Module/Course Code

(AMS 803)</td><td>Student work-load

(36 hours)</td><td>Credits

(ECTS)

3</td><td>Semester

(First)</td><td>Frequency

(Each Semester)</td><td>Duration

(One Semester)</td></tr>
<tr><td>1</td><td>Types of courses

a) Lectures
b) Class discussions</td><td>Contact hours

(36 hours)</td><td>Independent Study

4 hours/ day</td><td colspan="2">Class size

(3 students)</td></tr>
<tr><td>2</td><td colspan="5">Prerequisites for participation:

Candidate must have completed a 1st degree in engineering discipline. Course is taught in English Language.</td></tr>
<tr><td>3</td><td colspan="5">Learning outcomes:

After the completion of this course, the Students will:

• Understand the role of precision farming in mechanized agriculture.
• Understand the impact of environment on soil properties and crop conditions and applications of technological tools for precision farming.
• Understand farm management through application of GPS and GIS
• Understand the role of tools, machines for conservation agriculture</td></tr>
<tr><td>4</td><td colspan="5">Subject aims/Content:

Concepts of precision farming. Farming types, including traditional, organic and mechanized farming methods. Appropriate technology. Soil attributes and crop yield parameters: Soil moisture, crop phrenology, growth, evapotranspiration, nutrient deficiency, crop disease, and weed and insect infestation, etc. Spatial variability of soil fertility and crop conditions. Impact of environment on field crop and soil properties and fertility. Benefits and limitations of precision farming. Site Specific Crop Management (SSCM). The technological tools for precision farming: Global Positioning Systems (GPS), Geographical Information Systems (GIS), yield monitor, variable rate technology, and remote sensing. Applications of GPS and GIS for farm management. Adaptation and implementation of precision farming.

Concept and philosophy of conservation agriculture. Green house effects in agricultural</td></tr>
</table>

	practices. Conservation agriculture practices in selected West African countries. Tools, machines and machineries for conservation agriculture.
5	**Teaching methods** Includes: lectures, discussions, project work and group work
6	**Assessment methods** **This includes continuous assessment tests and examinations**
7	**This module/course is used in the following degree programme/s as well:** Not applicable
8	**Responsibility for module/course:** Course Lecturer – Dr P.O.O. Dada
9	**Other information** e.g. bibliographical references 1. Precision farming By Anil Kumar Singh. Water Tech. Centre. New Delhi 2. Leiva, F. R., Morris, J. and Blackmore, B. S. 1997. Precision Farming Techniques for Sustainable Agriculture. Proceeding of the 1st European Conference on Precision Agriculture. edited by J. V. Strafford (BIOS Scientific Publishers Oxford, UK).

Table 4c. Learning outcomes/Modules of courses offered in AMS (M.Ag. SE)

<table>
<tr><td colspan="6">Module/Course Title: Entrepreneurship in Mechanized Agri-business</td></tr>
<tr><td>Module/Course Code

(AMS 805)</td><td>Student work-load

45 hours</td><td>Credits

(ECTS)

(3)</td><td>Semester

First</td><td>Frequency

Every 2nd semester with 3hours lecture every week</td><td>Duration

1 semester</td></tr>
<tr><td>1</td><td>Type of Courses:

Theory, Case Studies and Class Presentations</td><td>Contact hours

3 hours/week</td><td>Independent Study: 3 hours per day</td><td colspan="2">Class size

5 - 10 students

(up to 30)</td></tr>
<tr><td>2</td><td colspan="5">Prerequisites for participation: A good first degree in Engineering, Agriculture and Allied Disciplines. Ability to read, speak and write in English Language evidenced by at least O level Credit Pass in English Language.</td></tr>
<tr><td>3</td><td colspan="5">Learning Outcomes:

Upon a successful completion of this course, students should be able to:

a) Understand the concepts, principles and practices of entrepreneurship in agribusiness management;
b) Maintain good records and prepare basic accounts, including budgets, cash-flow statement, balance sheet and profit and loss accounts of an agribusiness;
c) Undertake financial as well as benefit-cost analysis in evaluating feasibility of a project; and

Support/provide leadership in day-to-day management of agribusiness, with emphasis on mechanised agriculture.</td></tr>
<tr><td>4</td><td colspan="5">Subject/aims and Content:</td></tr>
</table>

	This course is aimed at exposing students to entrepreneurship issues in agribusiness, focusing on mechanized agriculture. Couse contents include: Subsistent agriculture and its implications. Mechanized agriculture: its entirety and practices. Upgrading subsistent agriculture into a business. Concept and practices in Agri-business. Entrepreneurship in agriculture. Accounting principles and procedures in agriculture: Record keeping; preparation account statements and balance sheet, etc. Banking principles and banking systems. Interactions with financial organization. Preparation of feasibility studies. Organizational studies and organization goals. Theories of motivation. Principle of team work in organizations.
5	**Teaching methods:** Class lectures, case studies, assigned readings and discussions.
6	**Assessment methods:** Graded assignments (10marks), mid-semester test (20 marks), and final examination (70 marks)
7	**This module/course is used in the following degree programme/s as well** Specially designed for this programme
8	**Responsibility for module/course:** *Course lecturer* (Prof. A.M. Shittu) organizes all class sessions, moderate students' contributions to various class sessions including case studies and presentations, and maintain class discipline. He/she also conducts and assesses students' submissions on assignments, class projects, tests and examination. *Students* have the responsibility to attend/participate in at least 70% of course activities, present themselves for tests/examinations, and submit assignment and class project reports within specified deadlines. Late submissions may attract penalties.
9	**Other information:** ***Recommended Text*** Beierlein, J.G., Schneeberger, K.C., and Osburn, D.D. (2013). *Principles of Agribusiness Management*, Fifth Edition, Waveland Press, Inc. Mellor, R. B., Coulton, G., Chick, A, Bifulcon, A, Mellor, N. and Fisher, A. (2008). *Entrepreneurship for Everyone: A Student Textbook*. SAGE Publications Ltd. Nuthall, P.L. (2016). *Farm Business Management: The Fundamentals of Good Practice*. CABI

Table 4d. Learning outcomes/Modules of courses offered in AMS (M.Ag. SE)

<table>
<tr><td colspan="6">Module/Course Title: Agro-food Process Waste Handling and Management</td></tr>
<tr><td>Module/Course Code
(AMS 807)</td><td>Student work-load
2 hours/ week</td><td>Credits
(ECTS)
(2)</td><td>Semester
First</td><td>Frequency
1st Semester of every Session</td><td>Duration
1st semester only in every session</td></tr>
<tr><td>1</td><td>Types of courses
Lecture based</td><td>Contact hours
2 hours/week</td><td>Independent Study: 4 hours per day</td><td colspan="2">Class size
3 students</td></tr>
<tr><td>2</td><td colspan="5">Prerequisites for Participation:
Candidate must have completed a 1st degree in engineering discipline. Course is taught in English Language.</td></tr>
<tr><td>3</td><td colspan="5">Learning outcomes: After the completion of this course, the Students will:
• Understand agro-food processing technology
• Understand the role of waste generated from agro-food process industries
• Proper handling of agro-food process waste materials and techniques for management.</td></tr>
<tr><td>4</td><td colspan="5">Subject aims/Content:
Activities in agro-food process operations. Nature of waste generated in agro-food process operations. Solid, liquid and gaseous wastes generated by agro-food process industries involved in fruit, vegetable, juice, crop, beverage, meat, dairy production/ products. Waste from food packaging and material handling. Particulate wastes from flour mills. Green house gases (GHGs) emissions from agro-food processing plants. Waste quality parameters and quantification. Collection and handling of agro-food process wastes. Waste management techniques. Waste to wealth approach in handling agro-food process wastes. Biotechnology applications in food waste handling and management.</td></tr>
<tr><td>5</td><td colspan="5">Teaching methods
Group work, lectures and participatory discussions.</td></tr>
</table>

6	**Assessment methods:** Class attendance, continuous assessment test and end of semester examination.
7	**This module/course is used in the following degree programme/s as well**
8	**Responsibility for module/course:** Course Lecturer – Prof B.A. Adewumi
9	**Other information:** Brummer , H. 1989. Grain cooling in steel silo. World Farming 8:30-35, 1983 Cruz, J.P. and A. Diop. Agricultural Engineering in development: Warehouse technique. Henderson, S. M. and Perry, R. C. 1976. Agricultural Process Engineering. 3rd Edition. Avi Textbook Series. NAS. 1998. Post harvest losses in the developing countries Publication of the National Academy of Science, Washington, D.C, U.S. Rudenko. Material Handling Equipment. Peace Publisher, Moscow. Sinha, R.N &Muir. Grain Storage: Part of a System. Avi Publisher.

Table 4e. Learning outcomes/Modules of courses offered in AMS (M.Ag. SE)

<table>
<tr><td colspan="6">Module/Course Title: Soil and Water Engineering for Sustainable Environment</td></tr>
<tr><td>Module/Course Code

(AMS 809)</td><td>Student work-load

24 hours</td><td>Credits

(ECTS)

(2)</td><td>Semester

(First)</td><td>Frequency

(Each Semester)</td><td>Duration

(One Semester)</td></tr>
<tr><td>1</td><td>Types of courses

a) Lecture</td><td>Contact hours

2-hours</td><td>Independent Study

4 hours per day</td><td>Class size

3 students</td><td></td></tr>
<tr><td>2</td><td colspan="5">Prerequisites for participation:

Candidate must have completed a 1st degree in engineering discipline. Course is taught in English Language.</td></tr>
<tr><td>3</td><td colspan="5">Learning outcomes:

After the completion of this course, the Students will:

• Understand the role of hydrology in Engineering

• Understand the design principles of hydraulic structures for on-farm drainage, flood and erosion control.

• Understand the engineering principles involved in reclamation of degraded agricultural soils.</td></tr>
<tr><td>4</td><td colspan="5">Subject aims/Content:

Landscapes and water sheds in West Africa. Review of fluid dynamics. Hydrology in engineering. Soil and water as essential agricultural resources. Design of drainage and erosion control hydraulics structures for towns and cities. Flood prevention. Flood disaster management. Waterway engineering. Reclamation of waste agricultural soils. Soil-machinery interactions. Case studies on the impact of dams on selected cities and nations in West Africa</td></tr>
<tr><td>5</td><td colspan="5">Teaching methods

project work, group work, lectures and class discussions</td></tr>
</table>

6	**Assessment methods:** Continuous Assessment Tests and Examinations
7	**This module/course is used in the following degree programme/s as well:** Specially designed for this programme
8	**Responsibility for module/course: Course Lecturer – Prof. J.K. Adewumi/ Dr P.O.O. Dada**
9	**Other information** e.g. bibliographical references 1. Soil erosion and Conservation by Morgan R.P.C. Third Edition Blackwell Publishing Ltd. pp 316. 2. Hydrology By Bernard Shaw.

Table 4f. Learning outcomes/Modules of courses offered in AMS (M.Ag. SE)

<table>
<tr><td colspan="6">Module/Course Title: Farm Power and Machinery for Sustainable Environment</td></tr>
<tr><td>Module/Course Code

(AMS 811)</td><td>Student work-load

24 hours</td><td>Credits

(ECTS)

(2)</td><td>Semester

(First)</td><td>Frequency

Each Semester</td><td>Duration

One Semester</td></tr>
<tr><td>1</td><td>Types of courses

a) Lectures
b) Practicals</td><td>Contact hours

2 hours/week</td><td>Independent Study

4 hours</td><td>Class size

3 students</td><td></td></tr>
<tr><td>2</td><td colspan="5">Prerequisites for participation:

Candidate must have completed a 1st degree in engineering discipline. Course is taught in English Language.</td></tr>
<tr><td>3</td><td colspan="5">Learning outcomes:

After the completion of this course, the Students will:

Understand the role of tillage and tillage systems in agricultural development

Understand the influence of soil degradation on sustainable agriculture

Understand the role of farm machinery in conservation techniques</td></tr>
<tr><td>4</td><td colspan="5">Subject aims/Content:

Review of soil tillage operations and conventional tillage equipment. Interactions between soil tillage and environment. Soil degradation, environmental pollutions and green house gases (GHGs) emissions associated with land clearing, deforestation and farm operations (in crop and animal farms). Farm machineries for environmental conservation in land clearing, chemical application</td></tr>
<tr><td>5</td><td colspan="5">Teaching methods

project work, case studies, group work, lectures, class discussions</td></tr>
<tr><td>6</td><td colspan="5">Assessment methods: Assessment tests, practicals and examination</td></tr>
<tr><td>7</td><td colspan="5">This module/course is used in the following degree programme/s as well

Agricultural Engineering</td></tr>
</table>

8	**Responsibility for module/course:** Course Lecturer Dr A.F. Adisa/Dr I.A. Ola
9	**Other information** e.g. bibliographical references

Table 4g. Learning outcomes/Modules of courses offered in AMS (M.Ag. SE)

<table>
<tr><td colspan="6">Module/Course Title: Farm Implement & Operations and Tractor Operation</td></tr>
<tr><td>Module/Course Code

(AMS 800)</td><td>Student work-load

48 hours</td><td>Credits

(ECTS)

(2)</td><td>Semester

(Second)</td><td>Frequency

Each Session</td><td>Duration

One Semester</td></tr>
<tr><td>1</td><td>Types of courses

a) Lectures
b) Practicals</td><td>Contact hours

24 hours</td><td>Independent Study

3 hours</td><td>Class size

3 students</td><td></td></tr>
<tr><td>2</td><td colspan="5">Prerequisites for participation:

Candidate must have completed a 1st degree in engineering discipline. Course is taught in English Language.</td></tr>
<tr><td>3</td><td colspan="5">Learning outcomes:

After the completion of this course, the Students will:

• Understand the different implements/equipment used for farm operations such as land clearing, tillage, planting etc

• Understand the different makes/ brands and power ratings of tractor and farm implements

• Understand the repair and maintenance of tractor

• Be able to drive tractor and operate it on the field</td></tr>
<tr><td>4</td><td colspan="5">Subject aims/Content:

Land clearing and Tillage

• Land clearing and equipment used for land clearing
• Tillage and objectives of tillage
• Primary tillage and its equipment
• Secondary tillage and its equipment
• Repair and maintenance of land clearing and tillage equipment

Farm tractor

• Types and classifications of farm tractors
• Service and maintenance of farm tractor
• Tractor hydraulic, PTO and braking systems</td></tr>
</table>

	• Coupling of implements to tractor **Tractor driving** • Tractor driving practical • Operation of tractor with implements on the field
5	**Teaching methods** project work, group work, lectures, class discussions and field demonstrations
6	**Assessment methods:** Practical and examination
7	**This module/course is used in the following degree programme/s as well:** Agricultural and Bioresources Engineering
8	**Responsibility for module/course:** Course Lecturer – Dr I.A. Ola/Dr A.A. Aderinlewo
9	**Other information** Relevant Books 1. T. P. Ojha and A.M. Michael: Principles of Agricultural Engineering 2. Any relevant textbook on farm machinery and equipment

Table 4h. Learning outcomes/Modules of courses offered in AMS (M.Ag. SE)

Course Code: AMS 802	**Course Title: Biofuels and Environment**				
Credit Units:	Student work-load 24 hours	Credits (ECTS) (2)	Semester: Second	Frequency: Each Session	Duration: One Semester
1	Types of courses a) Lectures	Contact hours: 2hours/week	Independent Study: 4 hours		Class Size: 3

	b) Practicals			
2	**Prerequisites for participation:** Candidate must have completed a 1st degree in engineering discipline. Course is taught in English Language.			
3	Learning Outcomes: After the completion of this course, the Students will: • Understand Bio-fuel and Environment Concepts • Understand field practices and applications of Bio-fuel and Environment principles • Understand design and Operations of Bio-fuel and Environment Systems • Manage Bio-fuel and Environment Systems			
4	**Subject aims/content:** ➢ Types/ classification of bio-fuel by state/ phase (solid or liquid) ➢ origin (animal or crop); etc ➢ Sources of bio-fuel wood/ forest materials, oil crop, cassava, sugar cane, animal waste, etc. ➢ Oil seed classifications ➢ Bio gas production from animal waste ➢ Production of briquettes from crop residues and solid agro-wastes ➢ Thermodynamic properties of bio-fuels ➢ Pollution characteristics and green house gas (GHG) emissions from bio-fuels. ➢ Handling wastes and pollution associated with bio-fuel utilization. ➢ Special case study on environmental impacts on bio-fuel utilization on selected West African countries.			
5	**Teaching methods** project work, group work, lectures, discussions and field demonstrations			
6	**Assessment methods:** Practical and examination			
7	**This module/course is used in the following degree programme/s as well:** Agricultural and Bioresources Engineering			
8	**Responsibility for module/course:** Course Lecturer – Dr O.U. Dairo/ Dr O.J. Adeosun			
9	**Other Information:** The student is expected to know how to develop environmental friendly Bio-fuel production. Assessment: Coursework 10%; Course tests 10%; Practical 10% Examination70% References: 1. Anju Dahiya: Bioenergy: Biomass to Energy, the new introductory			

	textbook 2. Vikash Babu, Ashish Thapliyai and Girijesh Kumar Biofuels Production