



Republic of the Philippines
OFFICE OF THE PRESIDENT
COMMISSION ON HIGHER EDUCATION



CHED MEMORANDUM ORDER

No. 23
Series of 2021

SUBJECT: POLICIES, STANDARDS AND GUIDELINES FOR THE BACHELOR OF SCIENCE IN AGRICULTURE

In accordance with the pertinent provisions of Republic Act (RA) No. 7722, otherwise known as the "*Higher Education Act of 1994*," in pursuance of an outcomes-based quality assurance system as advocated under CMO 46 s. 2012, and by virtue of Commission en banc Resolution No. 085-2018 dated March 6, 2018 and 361-2021 dated June 22, 2021 the following policies, standards and guidelines (PSGs) are hereby adopted and promulgated by the Commission.

**ARTICLE I
INTRODUCTION**

Section 1 Rationale

This PSG is compliant to CMO No. 46, s. 2012 which implements the shift to learning competency-based standards and outcomes-based education. It is a skill-based curriculum where basic technical courses in agriculture are taken during the first two years with minimal relevant General Education (GE) courses.

A certificate of Agricultural Science is awarded at the end of Year 2 (after completing all the prescribed courses during the first two years and 240 hours of practicum). This will qualify the graduates for employment as technicians or engagement in practical agribusiness. It covers the skills and competencies of Diploma in Agricultural Technology (DAT) and Bachelor in Agricultural Technology (BAT) programs. Hence, it supersedes CMO 48, series of 2007 and all issuances related to DAT and BAT.

The PSG also specifies the core competencies expected of BS Agriculture graduates regardless of the type of higher education institution (HEI) they graduate from. However, in recognition of the spirit of outcomes-based education and the typology of HEIs, this PSG also provides ample flexibility for HEIs to innovate the curriculum in line with the assessment of how best to achieve learning outcomes in their particular contexts and respective mission and vision.

Moreover, the PSG addresses the UN Sustainable Development Goal 2 which aims to "end hunger, achieve food security and safety, improve nutrition, and promote sustainable agriculture". Additionally, it will address the current global issues on climate change, environmental degradation, food safety and the growing interest in urban farming, organic agriculture, agricultural entrepreneurship and smart agriculture.

This PSG will transform agricultural education that will produce graduates with regional and global perspectives.

ARTICLE II AUTHORITY TO OPERATE

Section 2 Government Recognition

All private higher education institutions (PHEIs) intending to offer Bachelor of Science in Agriculture must first secure proper authority from the Commission in accordance with this PSG. All PHEIs with an existing Bachelor of Agriculture program are required to shift to an outcomes-based approach based on this PSG. State universities and colleges (SUCs), and local colleges and universities (LCUs) should likewise strictly adhere to the provisions in these policies and standards.

ARTICLE III GENERAL PROVISIONS

Per Section 13 of RA 7722, the higher education institution shall exercise academic freedom in its curricular offerings but must comply with the minimum requirements and the specific professional courses.

Section 3 The Articles that follow give minimum standards and other requirements and prescriptions. The minimum standards are expressed as a minimum set of desired program outcomes which are given in Article IV, Section 6. CHED designed a curriculum to attain such outcomes. This curriculum is shown in Article V of the BS Agriculture curriculum. The number of units of this curriculum is prescribed herein as the "minimum unit requirement" under Section 13 of RA 7722. In designing the curriculum, CHED employed a curriculum map which is shown in Article V, Section 10 of the BS Agriculture curriculum map.

Using a learner-centered/outcomes-based approach, CHED also determined appropriate curriculum delivery methods shown in Article V, Section 11. The sample course syllabi given in Article V, Section 12 show some of these methods.

Based on the curriculum and the means of its delivery, CHED determined the physical resource requirements for the library, laboratories and other facilities, and the human resource requirements in terms of administration and faculty. *See Article VI.*

Section 4 The HEIs are allowed to design curricula suited to their own contexts and missions provided that they can demonstrate that the same leads to the attainment of the required minimum set of outcomes, albeit by a different route. In the same vein, they have latitude in terms of curriculum delivery and in terms of specification and deployment of human and physical resources as long as they can show that the attainment of the program outcomes and satisfaction of program educational objectives can be assured by the alternative/blended/flexible means they propose.

The HEIs can use the **CHED Implementation Handbook for Outcomes-Based Education (OBE)** and the **Institutional Sustainability Assessment**



(ISA) as guides in making their submissions for Sections 18 to 23 of Article VII.

This PSG is based on the new 12-year basic education system and the revised GE curriculum. They reflect the reforms towards outcomes-based education and the K+12 program and are aligned with Republic Act 8435 or Agriculture and Fisheries Modernization Act (AFMA) of 1997.

ARTICLE IV PROGRAM SPECIFICATIONS

Section 5. Program Description

5.1 Degree Name

The degree program shall be called Bachelor of Science in Agriculture (BSA).

5.2 Nature of Field of Study

Agriculture is the science, practice, and business of inclusive production of food, fiber, fuel, and other products. It covers six (6) fields of study, namely: crop science, animal science, soil science, crop protection, agricultural entrepreneurship and enterprise development/economics and marketing, and agricultural extension and communication.

5.3 Program Educational Objectives/Program Goals

The BSA program aims to educate students in the scientific habit of thought and entrepreneurial skills and prepare them to become globally competitive professionals with entry-level competencies in technical agriculture. It emphasizes the processes and techniques of identifying, diagnosing and analyzing problems, and in designing, packaging, and applying technologies needed in the development and conservation of the agriculture and food system resources. The BSA degree is aligned with the Level 6 of the Philippine Qualifications Framework (PQF). *See Annex A.*

5.4 Specific Professions

- a. Research, Teaching, and Extension
- b. Agriculture and Food Technology
- c. Public Administration for Agriculture
- d. Farm Management
- e. Entrepreneurship and Business in Agriculture

5.5 Allied Fields

BSA is closely related but not limited to the fields of agribusiness, agribiotechnology, agroforestry, forestry, and environmental science.



Section 6 Program Outcomes

The minimum standards for the BS Agriculture program are expressed in the following minimum set of program outcomes:

6.1 Common to all programs in all types of schools

- a) Articulate and discuss the latest developments in the specific field of practice (PQF level 6 descriptor);
- b) Effectively communicate orally and in writing using both English and Filipino;
- c) Work effectively and independently in multi-disciplinary and multi-cultural teams (PQF level 6 descriptor);
- d) Act in recognition of professional, social, and ethical responsibilities;
- e) Preserve and promote "*Filipino historical and cultural heritage*" (based on RA 7722);

6.2 Common to the discipline

- f) Generate and share knowledge relevant to specific fields in the study of agriculture;
- g) Formulate and implement agricultural development plans and programs;

6.3 Specific to sub-discipline and a major

- h) Apply the scientific methods in knowledge generation and knowledge application;
- i) Understand the concepts of agricultural productivity and sustainability in the context of national, regional, and global developments;
- j) Engage in agricultural production and post-production activities;
- k) Promote sound agricultural technologies to various clients and in the manpower development for agriculture
- l) Employ relevant tools in information technology in solving agriculture-related problems;

6.4 Common to a horizontal type as defined in CMO 46 s 2012

- m) For professional institutions: a service orientation in one's profession;
- n) For colleges: an ability to participate in various types of employment, development activities, and public discourses particularly in response to the needs of the communities one serves; and
- o) For universities: an ability to participate in the generation of new knowledge or in research and development projects.

Graduates of State Universities and Colleges must, in addition, have the competencies to support "national, regional, and local development plans." (RA 7722)

A PHEI, at its option, may adopt mission-related program outcomes that are not included in the minimum set.



Section 7 Sample Performance Indicators

Performance Indicators are specific, measurable statements identifying the performance(s) required to meet the outcome; confirmable through evidence.

PROGRAM OUTCOME	SAMPLE PERFORMANCE INDICATORS
a. Apply scientific method in the conduct of research activities	<ol style="list-style-type: none"> 1. Write research proposals 2. Conceptualize and implement scientific research
b. Discuss and apply the concepts of agricultural productivity and sustainability in the context of national, regional, and global developments	<ol style="list-style-type: none"> 1. Conduct seminars and workshops on agricultural productivity and sustainability 2. Write articles on agricultural productivity and sustainability 3. Formulate and design agricultural projects capturing national, regional, and global developmental requirements
c. Engage in agricultural production and post production/ postharvest handling activities	<ol style="list-style-type: none"> 1. Demonstrate the application of basic principles in the production of crops and animals 2. Apply basic agricultural management practices 3. Practice sound post production and value-adding strategies
d. Promote sound agricultural technologies to various clients and in the manpower development in agriculture	<ol style="list-style-type: none"> 1. Conduct on-farm trials 2. Act as resource persons and facilitators in the conduct of training programs 3. Serve as role model in the practice of agriculture as a profession
e. Employ relevant tools in information technology in solving agriculture-related problems	<ol style="list-style-type: none"> 1. Use IT tools in instruction, research extension, and project implementation

The program outcomes from (a) to (e) set the minimum requirements for a graduate of the B.S. Agriculture program. PHEIs/LUCs/SUCs may include additional outcomes as necessary and appropriate.

ARTICLE V CURRICULUM

Section 8 Curriculum Description

The BSA curriculum is based on competency standards for agriculture considering the latest development of the Agriculture landscape of the Southeast Asian region and beyond. It emphasizes carrying out the science, art, ethics, management, and entrepreneurial business in the production, processing and marketing of plants, animals and other organisms utilized for food, fiber, recreation, biomedicine, industrial and other purposes within the context of integrated and sustainable agriculture resource systems.



Section 9 Sample Curriculum

9. 1 Components:

a) **General Education Courses- 36 Units**

General Education Courses and legislated courses shall follow the existing requirements of CHED in accordance with CHED Memorandum Order No. 20, series 2013

b) **Core Courses- 65**

c) **Major Courses-27**

d) **Institutions may opt for specialization** – HEIs have the flexibility to pursue specialization. In each identified specialization, 27 units of major courses relevant to the specialization shall be taken in addition to the core courses. However, schools which will opt for specialization should ensure that there is sufficient technical expertise, technologies, and resources available.

e) **Practicum for the Certificate of Agricultural Science, 240 hours of actual skill development to satisfy the required competencies and qualify for TESDA certification (NCIII level) – 3 units**

f) **Thesis or Major Farm Practice - 6 Units**

For major farm practice, this will be equivalent to 480 hours of actual training and exposure to institutional/farm operation in specific field of specialization. Thesis will be an independent research of students in his/her field of specialization.

g) **Apprenticeship (Industry Exposure)/OJT - 3 units**

All BSA students are required to take a minimum of 240 hours of apprenticeship (outside campus, local or abroad) in an agricultural industry or enterprise. This training shall hone the skills and practical perspectives of students prior to graduation. This is intended to give the graduating students a holistic view of agriculture as a business and profession. Schools should have official industry and research institution partners covered by Memorandum of Agreements. An official report of apprenticeship shall be required for both the student and the institution. The institution should attest that the competency requirements are met prior to the issuance of certificate of completion. The student output shall be a business plan or an action plan that should reflect experiences gained and recommendations regarding the apprenticeship. It is recommended that the apprenticeship be done during the Second Semester of Fourth Year. See Annex B.

h) **Sum total of units of the Curriculum**

Components	Units
General Education	36 units
Core Courses	65 units
Major Courses (12 units prescribed, 15 units specialized courses)	27 units
Practicum for Skill development for CAS	3 units

Thesis / Major Farm Practice	6 units
Apprenticeship /OJT (Industry Exposure)	3 units
Physical Education (PE)	8 units
National Service Training Program (NSTP)	6 units
Total	154 units

Components	
General Education Courses	36 Units
GE 1: Understanding the Self/ Pag-unawa Sa Sarili	3
GE 2: Readings in Philippine History/Mga Babasahin hinggil sa Kasaysayan ng Pilipinas	3
GE 3: The Contemporary World/Ang Kasalukuyang Daigdig	3
GE 4: Mathematics in the Modern World/ Matematika sa Makabagong Daigdig	3
GE 5: Purposive Communication/Malayuning Komunikasyon	3
GE 6: Art Appreciation/ Pagpapahalaga sa mga sining sa kasalukuyang lipunan	3
GE 7: Science, Technology, and Society/Agham, Teknolohiya at Lipunan	3
GE 8: Ethics/Etika	3
GE Elective 1	3
GE Elective 2	3
GE Elective 3	3
Mandated Course: Life and Works of Rizal	3
Core Courses	65
Crop Science 1- Principles of Crop Production	3
Crop Science 2- Practices of Crop Science and Management	3
Crop Protection 1- Principles of Crop Protection	3
Crop Protection 2 – Approaches and Practices in Pest Management	3
Soil Science 1 – Principles of Soil Science	3
Soil Science 2 – Soil Fertility, Conservation and Management	3
Animal Science 1- Introduction to Animal Science	3
Animal Science 2 – Introduction to Livestock and Poultry Production	3
Introduction to Organic Agriculture	3
Introduction to Agriculture	3
Principles of Agricultural Extension and Communication	3
Principles of Agricultural Entrepreneurship and Enterprise Development	3
Basic Farm Machineries, Mechanization, and Water Management	3
Principles of Genetics	3
Agricultural Biotechnology	3
Methods of Agricultural Research	3
Organic Chemistry	3
General Biochemistry	3
Natural Resource and Environmental Management	3



Introduction to Agricultural Policy and Development	3
Introduction to Agricultural Commodity Systems	3
Seminar A	1
Seminar B	1
Major Courses	27
*Post-Harvest Handling and Seed Technology	3
*General Physiology and Toxicology	3
*Beneficial Arthropods and Micro-Organism	3
*Slaughter of Animals and Animal Product Processing	3
Major Course 1	3
Major Course 2	3
Major Course 3	3
Major Course 4	3
Major Course 5	3
Practicum for Skills Development	3
Thesis/Major Farm Practice	6
Apprenticeship/OJT (Industry Exposure)	3
Physical Education (PE)	8
National Service Training Program (NSTP)	6
Total	154

**Required courses plus 15 units to be selected from appropriate major courses depending on the availability of expertise and resources of the institutions. However, there is a list of suggested courses for the major. See Annex C.*

** HEIs have the flexibility of developing 15 units of specialized courses for the non-major option to capture their mission and vision.*

Section 9. 2 Sample Program of Study

The institution may enrich the sample/model program of study depending on the needs of the industry, provided that all prescribed courses/competencies required in the curriculum outline are complied with and prerequisites and co-requisites are satisfied.

First Year

First Semester	Units	Lect	Lab	Second Semester	Units	Lect	Lab
Introduction to Agriculture	3			Crop Science 2	3	2	1
GE 1	3	3	0	Introduction to Organic Agriculture	3	3	0
Animal Science 1	3	2	1	Animal Science 2	3	2	1
Soil Science 1	3	2	1	Crop Protection 2	3	2	1
Crop Protection 1	3	2	1	Soil Science 2	3	2	1
Crop Science 1	3	2	1	GE 8	3	3	0
PE 1	2			PE 2	2		
NSTP	3			NSTP	3		
Total	23			Total	23		

Summer

Practicum (Skills Development): 3 units or equivalent to 240 hours



Second Year

First Semester	Units	Lect	Lab	Second Semester	Units	Lect	Lab
GE 4	3	3	0	General Biochemistry	3	3	0
Slaughter of Animals and Animal Products Processing	3	2	1	GE Elective 1	3	3	0
Principles of Genetics	3	2	1	Methods of Agricultural Research	3	3	0
Organic Chemistry	3	2	1	Basic Farm Machineries, Mechanization and Water Management	3	2	1
Principles of Agricultural Extension and Communication	3	3	0	Natural Resource and Environmental Management	3	3	0
GE 7	3			Principles of Agricultural Entrepreneurship and Enterprise Development	3	3	0
Introduction to Agriculture Commodity Systems	3	3	0	PE 4	2		
PE 3	2						
Total	23			Total	20		

All students who satisfactorily completed the first two (2) years shall be awarded the Certificate of Agricultural Science (CAS) which they may use for immediate employment or application for TESDA Skills Certification, subject to the requirement of the specific TESDA Training Regulation (NC III) being applied for.

Third Year

First Semester	Units	Lect.	Lab	Second Semester	Units	Lect.	Lab
GE Elective 2	3	3	0	GE 3	3	2	1
GE 5	3	3	0	Seminar B	1	1	0
Major Course 1	3	2	1	Thesis 2 / Major Farm Practice (Experimental)	2	0	2
General Physiology and Toxicology	3	2	1	Introduction to Agricultural Policy and Development	3	3	0
Major Course 2	3	2	1	Major Course 3	3	2	1
Seminar A	1	1	0	Major Course 4	3	2	1
Thesis 1/ Major Farm Practice (Outline)	2	2	0	GE Elective 3	3		
Agricultural Biotechnology	3	2	1	GE 6	3		
Total	21			Total	21		



Fourth Year

First Semester	Units	Lect.	Lab
Major Course 5	3	2	1
Beneficial Arthropods and Microorganism	3	3	0
Post Harvest Handling and Seed Technology	3	2	1
Life and Works of Rizal	3		
GE 2	3		
Total	15		

Second Semester	Units	Lect.	Lab
Thesis 3 / Major Farm Practice (Manuscript and Defense)	2	2	0
Apprenticeship/ OJT (Industry Exposure) (240 hours)	3		0
Total	5		

Summary: 1 ST Year	1 st Sem	23 units
	2 nd Sem	23 units
<i>Summer :</i>		<i>3 units</i>
	2 nd Year	
1 st Year	1 st Sem	23 units
	2 nd Sem	20 units
3 rd Year	1 st Sem	21 units
	2 nd Sem	21 units
4 th Year	1 st Sem	15 units
	2 nd Sem	5 units
Total:	154 units	

Section 10. Sample Curriculum Map (Please see Annex C)

Section 11. Sample Means of Curriculum Delivery

Sample Means of Curriculum Delivery

The BS Agriculture curriculum adheres to a learner-centered paradigm. It begins with clearly stated competencies that students must acquire and demonstrate at the end of the four-year program. Appropriate teaching-learning strategies facilitate the acquisition of these competencies. Under this paradigm, students are the subject of the learning process enabling them to achieve their full potential. The teaching-learning process is interactive, participatory, collaborative, and experiential. The teacher is a mentor, facilitator, and collaborator.

The following methodologies/strategies may be used (based on the sample means of curriculum delivery):

1. Lecture /Discussion – The teacher serves as mentor facilitator. He introduces the topic with a background lecture then catalyze interactive learning discussion / problem solving as appropriate.
2. Library Research and Term Paper Presentation – A student will pick up a topic related to the subject, research the global development/ global perspectives and present a paper in class to allow intellectual discussion and knowledge sharing.
3. Case Study Research – individual mini research to allow students to generate data as a vehicle for problem solving and critical thinking.



4. Field Tours and Farm Visits – visits to modern farms and specialty farms (organic agriculture and ecotourism farms) to allow better appreciation of principles and concepts discussed in class.
5. Multimedia Instruction – integrating various forms of instruction for better communication of concepts and ideas and to allow students a working experience and be comfortable with various multimedia forms.
6. Thesis or Farm Practice – a mentor-guided research as a requirement for graduation. This part of the program allows students to appreciate, experience, and integrate all concepts and principles learned in class to solve specific problems.
7. Practicum for the CAS requirement is a skill development course for students to acquire the necessary competencies required for TESDA level III certification (NC III).
8. Apprenticeship or industry exposure is required for all graduating students to give them a holistic view of the agribusiness industry.

**Section 12 Sample Course Outlines for Selected Core Agriculture Courses
(Please see Annex D)**

**ARTICLE VI REQUIRED RESOURCES
(Please refer to Annex E)**

Section 13 Administration

Section 13.1 - Program Administration

The minimum qualifications of the head of the unit that implements the degree program are the following:

- a. Dean of the unit/college. The dean of a unit/college must be at least a doctorate degree holder in Agriculture or any of its allied fields as cited in Article IV, Section 5.5 and a holder of a valid professional license.
- b. Chair of the unit/department. The chair of the department must be at least master's degree holder in the discipline for which the unit/department offers a program or a master's degree holder in an allied program identified in the policies and standards, and a holder of a valid professional license. In addition, in case where the department offers a Ph.D. program, then the Chair must be a holder of Ph.D. degree in agriculture.

Section 13.2 - Faculty

a. General Requirements

1. As a rule, a master's degree in the discipline or its equivalent is required for teaching in the tertiary level. Further, he/she must be a holder of a valid professional license.
2. A college offering a BSA program should have at least six (6) regular faculty members representing the following fields: crop science, crop protection, soil science, animal science, agricultural entrepreneurship and enterprise



development/economics and marketing, and agricultural extension and communication; and one agriculture and biosystems engineering /agricultural engineering (may not be a full-time faculty under the college but from other units of the university).

3. All HEIs without specialization must have 100% of the faculty with at least a master's degree in the discipline or its equivalent. For HEIs which will opt for specialization, 75% of the additional faculty must have at least a master's degree in the discipline.

b. Qualification of faculty

In addition to the qualification requirements of faculty in Section 13.2, faculty teaching in a BSA program must have an appropriate master's degree in agriculture or in any allied fields as mentioned in Article IV Section 5.5.

c. Full-time faculty members

The institution shall maintain 70% of the faculty members teaching in the BSA program as full-time.

d. Teaching Load

Teaching load requirements for the BSA program is suggested to be at least as follows:

1. A faculty should not be assigned more than four (4) different courses/subjects within a semester.
2. Teaching hours per day should not exceed 6 hours.

e. Faculty Development

The institution should have a system of faculty development. It should encourage the faculty to:

1. Pursue graduate studies;
2. Attend seminars, symposia, and conferences for continuing education;
3. Undertake research activities and publish their research output; and
4. Give lectures and present papers in national/international conferences, symposia, and seminars.

The institution should also provide opportunities and incentives such as:

1. Tuition subsidy for graduate studies;
2. Study leave with pay;
3. De-loading to finish a thesis or carry out research activities;
4. Travel grants for academic development activities such as special skills training and attendance in national/ international conferences, symposia and seminars; and
5. Awards and recognition.

Section 14 Library

Library personnel, facilities, and holdings should conform to existing CHED requirements for libraries which are embodied in a separate CHED issuance. For the BSA program, the libraries must provide five (5) book titles per professional course found in the curriculum at a ratio of 1 volume per 15 students enrolled in the program. These titles must have been published within the last 10 years.

The library must maintain a collection of updated and appropriate/suitable textbooks and digital references used for the core courses in the curriculum. Library resources should complement curriculum delivery to optimize the achievement of the program outcomes for the BSA program.

The HEI is likewise encouraged to maintain periodicals and other non-print materials relevant to agriculture, business, and economics to aid the faculty and students in their academic work. Digital references should complement a library's book collection but should otherwise not be considered as replacement for the same.

Section 15 Facilities and Equipment

a. Laboratory requirements (See Annex E)

Laboratories should conform to existing requirements as specified by law (RA 6541, "The National Building Code of the Philippines" and Presidential Decree 856, "Code of Sanitation of the Philippines").

b. Classrooms

1. Classrooms should be well-lighted and well-ventilated to comfortably accommodate the students.
2. Laboratory rooms should be provided with the necessary instruments and facilities needed for the courses being taught.
3. Large classes may be allowed as long as the attendant facilities are provided.

c. Educational Technology Centers

The institution should provide facilities to allow preparation, presentation, and viewing of multi-media materials to support instruction.

Section 16 Land

There should be a minimum area of **10 hectares** available/accessed by the agriculture program for instruction and demonstration. Areas for production will depend on the capacity of the institution to engage in income-generating projects.



Section 17 Admission and Retention

The basic requirement for eligibility for admission of a student to any tertiary level degree program shall be graduation from the secondary level recognized by the Department of Education. HEIs must specify admission, retention, and residency requirements. They should ensure that all students are aware of these policies.

ARTICLE VII COMPLIANCE OF HEIs

Using the *CHED Implementation Handbook for OBE and ISA* as reference, an HEI shall develop the following items which will be submitted to CHED when they apply for a permit for a new program:

Section 18 The complete set of program outcomes, including its proposed additional program outcomes.

Section 19 Its proposed curriculum, and its justification including a curriculum map.

Section 20 Proposed performance indicators for each outcome. Proposed measurement system for the level of attainment of each indicator.

Section 21 Proposed outcomes-based syllabus for each course.

Section 22 Proposed system of program assessment and evaluation

Section 23 Proposed system of program Continuous Quality Improvement (CQI).

ARTICLE VIII TRANSITORY, REPEALING and EFFECTIVITY PROVISIONS

Section 24 Transitory Provision

All private HEIs, state universities and colleges (SUCs), and local universities and colleges (LUCs) with existing authorization to operate the Bachelor of Science in Agriculture program are hereby given a period of three (3) years from the effectivity thereof to fully comply with all the requirements in this CMO. However, the prescribed minimum curricular requirements in this CMO shall be implemented starting Academic Year 2021-2022.

Section 25 Repealing Clause

All pertinent rules and regulations or parts thereof that are inconsistent with the provisions of this CMO are hereby repealed including but not limited to the DAT-BAT program CMOs.



Section 26 Effectivity Clause

This CMO shall take effect fifteen (15) days after publication in the Official Gazette or in a newspaper of national circulation. This CMO shall be implemented beginning Academic Year 2021-2022.

Quezon City, Philippines Nov 3, 2021

For the Commission:

J. PROSPERO E. DE VERA III, DPA
Chairperson



Attachments:

- ANNEX A – Duties and Competencies
- ANNEX B – Guidelines for Major Practice or Practicum
- ANNEX C – Suggested Major Courses
- ANNEX D – Sample Curriculum Map
- ANNEX E – Sample Course Syllabi
- ANNEX F – Laboratory Equipment



**ANNEX A MATRIX OF DUTIES AND COMPETENCIES OF AN
AGRICULTURE GRADUATE**

DUTIES	COMPETENCIES			
A. Perform the tasks in the technical and scientific fields with confidence and creativity	1. Apply concepts, principles, and methodologies.	2. Enhance working knowledge through technical and scientific exposures.	3. Conduct innovative research to generate good agricultural practices and desirable products.	
B. Diagnose and analyze strengths and limitations, opportunities, threats in the practice of agriculture profession	1. Keep abreast with developments in agriculture.	2. Analyze, interpret, and utilize technical and socio-economic data to evaluate opportunities and constraints.	3. Recommend appropriate actions and strategies.	
C. Conceptualize and formulate systems-oriented strategic plans and programs for agricultural development	1. Examine the inter and intra dependence of systems within the context of agricultural development	2. Map out strategic plans using technical, scientific, market, and other sources of information.	3. Prepare workable agricultural plans, programs, and feasibility studies.	4. Formulate alternative measures to solve potential problems in implementing agricultural plans and programs.
D. Manage resources effectively and efficiently	1. Conduct resource inventory by employing recent qualitative and quantitative tools.	2. Assess and analyze the enterprise using techniques that will establish strengths, limitations, opportunities, and threats.	3. Develop strategies and alternatives within the context of sustainability.	
	4. Formulate and implement resource management plan for improved and sustained productivity.	5. Assess the overall efficiency and sustainability of agricultural plans and programs.	6. Recommend and disseminate best management practices (BMPs) developed from the enterprise.	
E. Monitor and evaluate plans and programs in agriculture	1. Conduct performance audit to assess the progress and accomplishments of the enterprise and recommend measures to ensure sustained	2. Design benefit monitoring and evaluation system for plans and programs.	3. Formulate verifiable performance indicators of agricultural plans and programs.	4. Take corrective actions promptly.



	use of the resources available in the enterprise.			
F. Advocate agricultural laws, rules, regulations, and related policies	1. Know and analyze existing agricultural laws, rules, regulations, and related policies.	2. Identify policy impacts and gaps, ethical and societal implications	3. Formulate recommendations for policy reforms.	4. Design and implement strategies for advocacy.
G. Practice and promote public safety and natural resource conservation in the use of agricultural technology	1. Apply good management practices in the workplace for safety.	2. Promote consciousness in the application of agricultural technology among workers for public safety, environmental protection, and highest ethical standards.		
H. Implement agricultural development compatible with resource conservation	1. Explain the interrelationship of agriculture and the environment and implication to the community.	2. Identify best management practices and promote their applications in specific sectors of the agriculture industry.	3. Promote resource conservation and sustainable use of natural resources.	
I. Develop communication skills and strategies	1. Convey ideas and information clearly and effectively.	2. Apply the principles and use different forms and types of communication.	3. Develop the ability to access, retrieve, process, and disseminate information.	
	4. Prepare, review, analyze, and evaluate technical and scientific reports, proposals, researches, and concept papers and respond promptly.		5. Update oneself of the recent trends on information and Communication technologies (ICTs).	
J. Develop and cultivate collaborative and productive work attitude towards the agriculture profession	1. Demonstrate the values of self-respect and integrity.	2. Innovate for improvement of the agriculture profession.	3. Develop self-reliance and practice teamwork and networking with high performance and quality.	
K. Provide leadership and vision in identifying, creating, and pursuing opportunities in agricultural development	1. Identify, collect and integrate important data and information on specific agricultural situations.	2. Evaluate data /information using appropriate statistical and decision-making tools.	3. Identify rational alternatives to solve specific problem, close critical gaps, or pursue opportunities.	

	4. Synthesize relevant information to understand the emerging global agricultural scenario.	5. Pursue program of action with enthusiasm and determination.	6. Practice leadership qualities and display social concerns.
L. Practice ethical interpersonal relations with employers, subordinates, peers, clients, and the general public.	1. Observe professional ethics and standards.	2. Respect the rights of others and recognize their accomplishments.	3. Demonstrate emotional intelligence/maturity.
			4. Motivate others to participate actively in PRC-Accredited Professional Organization (APO) and other agriculture-related association activities and comply with their policies and obligations.

Definition:

The Bachelor of Science in Agriculture is a degree program designed to prepare professionals with general competencies in carrying out the science, art, ethics, management and entrepreneurial business in the production, processing and marketing of plants, animals and other organisms utilized for food, fiber, recreation, biomedicine, industrial, and other purposes within the context of integrated and sustainable agriculture resource systems.

An Agriculturist refers to a person who has the competence to scientifically diagnose and pursue opportunities, design and implement appropriate strategies, and manage resources and information for gainful and sustainable development of the agricultural and food system resources. He/ She should also be able to provide scientific, technical, and policy advice in implementing programs that would promote agricultural development.



ANNEX B
GUIDELINES FOR IMPLEMENTATION OF PRACTICUM, MAJOR FARM PRACTICE,
AND APPRENTICESHIP

The practicum subject gives the student an opportunity to observe a farm, plant or laboratory, or other establishments IN or OUTSIDE CAMPUS, which will provide additional practical experience and acquisition of skills to further enhance his capacity to pass the assessment of a particular National Certificate (NC) embedded in the program. The student is exposed to actual conditions which are not normally encountered in the regular courses offered by the university in order to effect an outcomes-based learning. The course is taken during summer of first year with 3 unit credit or minimum of 240 hours.

For the major practice, a student normally registers the major practice subject with a third (3rd) year academic standing. It has a 6-unit equivalent or approximately not less than 480 hours since this activity needs continuous attention. This may be done locally or abroad following the Guidelines of the Student Internship Abroad Program (SIAP). In some instances, a student may enroll the subject during the semester, provided that the required minimum number of hours will be satisfied. Further, the university must have the necessary facilities and equipment for the purpose. The Adviser is responsible in determining the appropriateness of the semestral enrollment subject to approval of the Dean, fully endorsed by the College Major Practice Coordinator.

Finally, the Apprenticeship or Industry exposure program is taken during the second semester of 4th year with a 3 unit credit. It is intended to give the student a holistic overview of agriculture as a business enterprise. A Memorandum of Agreement shall be forged between the university and the host-institution/agency for the implementation of the apprenticeship program.

A. Documentation for Major Farm Practice and Apprenticeship Program for Skills Development

The following items must be included in the preparation of a major practice or outline:

1. Cover Form. This form lists the course number, degree program, title of major practice or practicum, name of students, signature of adviser, unit head, college secretary, and probable date of graduation.
2. Title of Major Practice. The title should include the place of major practice and date when it will be conducted.
3. Name of Student
4. Introduction. This will include the rationale / importance of the practicum.
5. Objectives
6. Expected Output
7. Review of Related Literature
8. Description and Schedule of Activities. This will include the time and place of practicum as well as the specific activities to be performed in various units of the farm, or place of the practicum.
9. Literature cited

The adviser should require the major practice student to present the proposed major practice outline for checking his/her understanding and knowledge of the work activities and schedule before registration and fielding. The adviser and unit head prior to registration must approve the major practice.



B. Conduct of Major Farm Practice and Practicum for Skills Development

1. The appropriate forms must be properly submitted prior to the start of the conduct of the major practice or practicum. These forms will include: consent of parent or guardian (notarized), memorandum of understanding between the university/college and host establishment, and student's pledge.
2. It may be conducted on-campus, if facilities are available. Major practice or practicum may be conducted as a farm, plant, or laboratory practice, or a combination thereof.
3. The student shall render at least one full summer work, or its equivalent if the major practice is conducted on semestral basis.
4. The adviser should take effort to make periodic visits to assess the student's performance.
5. An evaluation form shall be given to the manager/owner of the farm/plant at the start of the practice. A copy of the evaluation form should be sent by the farm manager/owner directly to the adviser. The evaluation report will form part of the final grade of the student.

C. Practicum and Major Farm Practice Manuscript Preparation

1. A Panel of Faculty from the commodity division/unit concerned on the practicum subject matter shall be constituted to evaluate the presentation of the draft major practice or practicum manuscript and the student's acquired experience and knowledge.
2. The major practice or practicum adviser shall review and approve the final copy of the major practice manuscript report based on the itemized content as follows:
 - i. Cover Form. This form lists the degree, title of practicum, student name, signatures of the adviser, unit head, college dean, and date of graduation.
 - ii. Title Page. This includes the practicum title, student name, degree, and date of graduation.
 - iii. Biographical Sketch of the Student. This should not be more than one page, double-spaced. The student should sign at the bottom of the page.
 - iv. Acknowledgment. This should not be more than one page, double-spaced.
 - v. Table of Contents
 - vi. List of Tables
 - vii. List of Figures (if any)
 - viii. List of Appendices
 - ix. Body of Text (See Next Page)



Title of Major Practice
Student Name
Introduction
Objectives
Expected Output
Review of Related Literature
Description and Schedule Of Activities
Description of the Farm / Plant
Technical Analysis of the Enterprise
Benefit-Cost Analysis (If Permissible)
Problems Encountered
Lessons Learned
Recommendations
Literature Cited

D. For the Apprenticeship program, a narrative report of accomplishments and a business plan are submitted at the end of the program.



ANNEX C
SUGGESTED COURSES FOR MAJORS

CROP PROTECTION

COURSES	UNITS	DESCRIPTION
Laboratory and Field Techniques in Crop Protection	3	Basic field and laboratory techniques in collection, mass rearing/culture or propagation and preservation of pest species including basic photography and how to do illustration and drawing of basic parts of a specimen.
Taxonomy of Pests Species	3	Identification and classification of pests and methods of preservation and curation of specimens
Crop Protection Entomology	3	Identification and bionomic studies of major insect pests of agricultural crops, prevention, and population regulation methods including recent trend in pest management such as but not limited to the use of sterile male technique and genetically modified plants
Insect Ecology	3	Understanding insect population dynamics, diversity, dispersal and migration including population estimation, methods of sampling, forecasting, and simulation
Plant Nematology	3	Classification of plant parasitic nematodes, biology, epidemiology, and host interaction
Fundamentals of Mycology	3	Biology, classification, diversity, reproduction, and disease cycle of various fungal groups and its allies
Introduction to Plant Virology and Bacteriology	3	Classification, structure and genomic organization of plant viruses and viroids, including epidemiology and management of virus diseases; taxonomy and ecology of plant associated bacteria and other eukaryotes transmission, survival and dissemination
Plant Disease Diagnosis	3	Study of field and laboratory procedures for diagnosis of plant diseases
Principles of Plant Disease Management	3	Principles of plant disease management, methods of plant disease control including current trends in disease management using biotech products and integrated approach to manage plant diseases

SOIL SCIENCE

COURSES	UNITS	DESCRIPTION
Soil Chemistry	3	Study of the nature and composition of soils, physico-chemical properties and reactions, chemical processes including ionic equilibria
Soil Physics	3	Physical properties of the soil, measurement, and analysis and its relation to agricultural, hydrological and environmental concerns and problems
Soil Survey, Classification and Land Use	3	Survey and classification of soils based on their morphology, genesis and properties; land resources data and information, their interpretation and application for land use design and planning and environmental assessment of land uses



Soil Biology	3	Introduction to soil organisms; interaction between organisms, their processes and metabolism. Functions of soil organisms and their importance to soil health. Techniques for the identification and monitoring of soil biological health and management of soil organisms for sustainable land management
Soil Conservation and Management	3	Study on the principles of soil conservation and management; soil erosion research and their control; proper land classification and land use

ANIMAL SCIENCE

COURSES	UNITS	DESCRIPTION
Animal Nutrition	3	Chemical composition and feeding value of common feedstuff, nutrient requirements of farm animals, feed formulation and feeding practices for livestock and poultry
Animal Breeding	3	Genetics as basis of breeding, selection, breeding systems and strategies, mating systems and assisted reproductive technologies
Poultry Production	3	Feeding, housing, disease prevention and control, processing, marketing and farm management of poultry species
Swine Production	3	Breeding, feeding, housing, disease prevention and control, processing, marketing and farm management of swine
Ruminant Production	3	Breeding, feeding, housing, disease prevention and control, processing, marketing and farm management of ruminant animals (goat, sheep, cattle, carabao)
Large Ruminant Production	3	Breeding, feeding, housing, disease prevention and control, processing, marketing and farm management of large ruminants (cattle and carabao)
Small Ruminant Production	3	Breeding, feeding, housing, disease prevention and control, processing, marketing and farm management of small ruminants (goat and sheep)
Dairy Cattle Production	3	Lactation, management and nutrition for efficient milk production; dairy cattle breeding and selection, care of dairy equipment and dairy cattle records
Animal Health and Farm Sanitation	3	Improved practices of sound animal health and farm sanitation; biosecurity
Marketing of Animal Products and by-Products	3	Marketing of animal products and byproducts, approaches, marketing costs and margins and marketing channels
Farm Planning and Management	3	Preparation of project feasibility study, farm planning and management
Climatology and Animal Behavior	3	Mechanics of thermoregulation and animal adaptation, thermal stress, productive and reproductive behavior of animals in relation to climate
Anatomy and Physiology of Farm Animals	3	Structures and functions of the body systems and organs of domestic animals
Nutritional Diseases of Farm Animals	3	Diseases of farm animals related to nutrient deficiencies and toxicities



CROP SCIENCE

COURSES	UNITS	DESCRIPTION
Plant Growth and Development	3	Morphology and physiological changes in crops in relation to growth and development, and as influenced by environment (with emphasis on plant growth regulator) and heredity
Crop Physiology	3	Plant processes affecting growth and development; plant and environment interaction; plant growth regulators; and plant growth response to stimuli
Introduction to Ecological Agriculture	3	Principles and practices of ecological agriculture
Plant Breeding	3	Principles and practices underlying the development, evaluation, and maintenance of improved crop plants
Plant Genetic Resources Conservation and Management	3	Concepts, principles and strategies and policies for formal and informal PGR conservation, utilization, and management
Plant Propagation and Nursery Management	3	Principles and practices underlying the plant propagation and management of horticultural crops
Legumes and Root Crop Production	3	Cultural management practices of legumes and root crops and crop processing
Farming Systems	3	Principles and determinants of farming systems; procedures of designing and evaluation of location-specific farming systems
Field Crop Production and Processing	3	Cultural management practices of field crops and processing including cereal crops, legumes, and root crops
Annual Industrial Crops Production	3	Cultural management practices of selected industrial field crops with emphasis on tobacco, cotton, and sugarcane
Weeds and their Control	3	Theories and practices of weed control
Cereal Crop Production	3	Cultural management practices of cereal and crop processing
Vegetable Crops Production	3	Production practices of lowland and upland vegetable
Perennial and Industrial Crops Production	3	Production practices and processing of perennial and industrial crops
Ornamentals and Landscape Horticulture	3	Cultural management practices of ornamental and basic principles and practices of conventional and edible landscaping
Statistical Tools in Plant Breeding	3	Analytic mathematical operations that aide in the evaluation, selection and testing governing the transfer of traits in breeding activities
Methods of Plant Breeding	3	Conventional and non-conventional methods for the improvement of plant's traits and protocols for varietal release

AGRICULTURAL ECONOMICS

COURSES	UNITS	DESCRIPTION
Microeconomics	3	Analysis of microeconomic principles relating to aggregate income and employment, product and money markets
Macroeconomics	3	Analysis of macroeconomic principles relating to aggregate income and employment, product and money markets
International Trade And Policies	3	Principles and concepts in trade, national and international policies related to development



Microfinance Theory And Practice	3	Theory and practice of microfinance, its achievements and current challenges; basic skills needed to management microfinance institutions; the future of microfinance and of financing for development
Supply/Value Chain Management	3	Investigates theory and practice of supply chain formation, management and performance in enhancing competitiveness
Farm Management Economics	3	Application of economic principles for farm business operation. Focuses upon agricultural production management decision making tools .

**ANNEX D
SAMPLE CURRICULUM MAP**

I. Sample Curriculum Map

Curriculum map is “a matrix relating all the courses listed in the program curriculum with one or more of the declared program outcomes.”

The HEIs/LUCs/SUCs shall create a complete curriculum map of their current existing BS Agriculture Curriculum. Refer to Annex B for a sample curriculum map that relates all the courses in the sample curriculum with the minimum set of program outcomes.

The graduate of the BS Agriculture program should have developed the ability to:

- a. Articulate and discuss the latest developments in the specific field of practice (PQF level 6 descriptor);
- b. Effectively communicate orally and in writing using both English and Filipino;
- c. Work effectively and independently in multi-disciplinary and multi-cultural teams (PQF level 6 descriptor);
- d. Act in recognition of professional, social, and ethical responsibilities;
- e. Preserve and promote “*Filipino historical and cultural heritage*” (based on RA 722);
- f. Generate and share knowledge relevant to specific fields in the study of agriculture;
- g. Participate in the formulation and implementation of agricultural developments plans and programs;
- h. Apply scientific method in the conduct of research activities;
- i. Discuss the concepts of agricultural productivity and sustainability in the context of national, regional, and global developments;
- j. Engage in agricultural production and post-production activities;
- k. Promote sound agricultural technologies to various clients and in the manpower development for agriculture; and
- l. Employ relevant tools in information technology in solving agriculture-related problems.

Core Courses

COURSE	RELATIONSHIP TO PROGRAM OUTCOME											
	a	b	c	d	e	f	g	h	i	J	k	l
Crop Science 1 – Principles of Crop Production								P	I	P	I	I
Crop Science 2 – Practices of Crop Science and Management								P	P	P	P	P
Crop Protection- Principles and Practices in Crop Protection	I			I		I	P	D	D	D		D
Animal Science 1 – Introduction to Animal Science								I	I	P	I	I



Animal Science 2 – Introduction to Livestock and Poultry Production Management									P	P	D	P	P
Principles of Agricultural Entrepreneurship and Enterprise Development									-	P	P	P	P
Introduction to Agricultural Commodity Systems										P	I	I	P
Principles of Soil Science, Conservation and Fertility Management	I			I		P	D	D	D	D	D	P	D
Principles of Agricultural Extension and Communication										I		I	
Basic Farm Machineries, Mechanization and Water Management	-	-	-	-	I	I	I	I	I	I	I	-	I
Principles of Genetics									I	-	-	-	I
Agricultural Biotechnology									P	P	-	P	P
Methods of Agricultural Research									D	-	-	-	-
Seminar A									P	D	-	-	D
Seminar B									D	D	D	D	D

Major Courses

Courses	a	b	c	d	e	f	g	h	i	j	k	l
Post Harvest Handling and Seed Technology								P	P	P	P	I
General Physiology and Toxicology								I	-	I	-	I
Slaughter of Animals and Animal Products Processing								-	P	-	I	-
Beneficial Arthropods and Other Microorganisms								-	P	-	I	I
Practicum/Thesis								D	D	D	D	D
Apprenticeship/OJT	I	P	P	-	-	P	I	D	D	-	-	D



**ANNEX E
SAMPLE COURSE OUTLINE**

COURSE TITLE	PRINCIPLES OF SOIL SCIENCE			
COURSE NO.	Soil Science 1			
COURSE DESCRIPTION	Nature and properties of soils; soil nutrient elements, their availability, measurements and evaluation; maintenance and improvement of soil fertility and productivity			
COURSE CREDIT	3 units			
CONTACT HRS/WK	2 hours lecture and 3 hours laboratory			
PREREQUISITES	None			
COURSE OUTCOME	TOPIC	TEACHING AND LEARNING ACTIVITIES	RESOURCES	ASSESSMENT TASKS
Demonstrate a unified view of the soil as a natural resource and an important medium for plant growth	1. Soil as a natural resource and a medium for plant growth and development	Lecture with discussion; laboratory exposure, film showing	LCD/TV monitor, laptop, lab manuals and equipment and soil profile/pit	Quiz, graded recitation, home-work/term paper
	2. Soil, its composition, formation and development			
	3. Soil-forming minerals and rocks and their weathering			
	4. The soil profile and its description			
Acquire skills in the basic analysis of soil physical, chemical and biological properties	5. The Physical Properties of Soils <ul style="list-style-type: none"> • Soil texture and structure • Soil densities • Soil Water • Soil Consistency and Color 	Lecture with discussion; laboratory exposure, problem solving	LCD/TV monitor, laptop, lab manuals and equipment and soil samples	Quiz, graded recitation, home-work/term paper, term examination
	6. The Chemical Properties of Soils <ul style="list-style-type: none"> • Soil colloids and silicate clays • Cation and Anion Exchange Capacities of Soils • Soil pH and Liming Salinity and Sodicity 	Lecture with discussion; laboratory exposure/analysis, problem solving	LCD/TV monitor, laptop, lab manuals and equipment and soil samples	Quiz, graded recitation, home-work/term paper, term examination
	7. Soil Organisms, their role in organic material decomposition and			



	nutrient cycling			
Articulate the importance of soil fertility to the field of agriculture and in the promotion of organic agriculture	8. Soil fertility and its decline/deterioration	Lecture with discussion; laboratory exposure/analysis, problem solving activity	LCD/TV monitor, laptop, lab manuals and equipment and soil samples	Quiz, graded recitation, home-work/term paper, term examination
	9. Essential elements and their distribution in the profile			
	10. Biochemical classification of nutrients and their roles in plant nutrition			
	11. Availability of nutrients and nutrient uptake mechanism			
Apply the theories of nutrient availability, mobility, and exchange in soils and between soil and plants	12. Relationship between soil nutrient supply and plant uptake	Lecture with discussion; laboratory exposure/analysis, problem solving activity	LCD/TV monitor, laptop, lab manuals and equipment and soil samples	Quiz, graded recitation, home-work/term paper, term examination
	13. Soil Fertility Models <ul style="list-style-type: none"> • Linear Response Plateau Model • Liebig's Law of the Minimum • Mitscherlich's Equation • Fertility Capability Classification 			
	14. N, P, K and S Economy of Soils			
	15. The Soil Micronutrients			
Explain the diagnostic procedures for soil fertility assessment	16. Procedures for Determining the Amounts of Nutrients <ul style="list-style-type: none"> • Microbial methods • Pot Culture • Field Fertilizer Trials 	Lecture with discussion; laboratory exposure/analysis, problem solving	LCD/TV monitor, laptop, lab manuals and equipment and soil samples/field for fertility trials	Quiz, graded recitation, home-work/term paper, term examination
Identify appropriate practices and methods of erosion control and in the reclamation and management of problem soils	17. Soil erosion process and mechanics	Lecture with discussion; laboratory exposure/analysis, problem solving	LCD/TV monitor, laptop, lab manuals and equipment and field demo plot	Quiz, graded recitation, home-work/term paper, final examination
	18. Soil and water conservation and management			
	19. Formation, characteristics and management of problem soils <ul style="list-style-type: none"> • Acidic Soils • Saline and Sodic soils • Zinc Deficient Soils 			
	20. Growth of Plants in Halomorphobic Soils			



SUGGESTED REFERENCES:

Soil Fertility and Fertilizers. Havlin, J.L. Beaton, S.L. Tisdela and W.L. Nelson

Basic Soil Fertility. 1990. Nartea R.N. UP Printery

The Philippine Recommends for Soil Fertility Management. PCAARRD

Nature and Properties of Soil (N.C. Brady)

Fundamentals of Soil Science (Foth H.D. and L.M. Turk)

Soil and Soil Management (Sopher and Baird)

COURSE TITLE				
SOIL FERTILITY, CONSERVATION AND MANAGEMENT				
COURSE NO.				
Soil Science 2				
COURSE DESCRIPTION				
Soil nutrient elements, their availability, measurement and evaluation; soil erosion and its control, and maintenance and improvement of soil fertility and productivity.				
COURSE CREDIT				
3 units				
CONTACT HOURS/WK				
2 hours lecture and 3 hours laboratory				
PREREQUISITE				
Principles of Soil Science				
COURSE OUTCOME	TOPIC	TEACHING AND LEARNING ACTIVITIES	RESOURCES	ASSESSMENT TASKS
Explain the role of soil fertility in sustainable production.	1. Soil Fertility Management 1. Introduction <ul style="list-style-type: none"> • Historical background of soil fertility • Soil fertility defined • Causes of the decline in soil fertility • Importance of soil fertility 	Lecture with discussion Assignment on nutrient removal of different crops	Laptop and projector/TV monitor, Lab manual	Quiz, submission of assignment
Relate soil properties on the behavior of nutrients and crop performance. Explain the theories of nutrient availability,	2. Soil- Plant Relationship <ul style="list-style-type: none"> • Essential elements and their functions • Nutrient deficiency symptoms in plants • Profile distribution of elements 	Video/power point presentation of nutritional disorder in plants Homework on the computation of relative yield using	Laptop and projector/TV monitor, Lab manual	Quiz Submission of homework

mobility and exchange in soils and between soil and plant	<ul style="list-style-type: none"> • Relationship between soil nutrient supply and plant growth • Linear response plateau model • Law of the Minimum • Mitcherlich's equation • Nitrogen Economy of Soils • P and K economy of soils • Micronutrients 	Mitcherlich's equation Lecture with discussion		
Evaluate soil fertility using different diagnostic procedures.	3. Evaluation of Soil Fertility <ul style="list-style-type: none"> • Diagnostic Procedures • Procedures for determining amounts of nutrients needed • Microbiological method • Pot method 	Laboratory exercises on the different methods of evaluating soil fertility Lecture with discussion	Laboratory manuals, soil test kit, leaf color chart, land area	Submission of laboratory reports
Identify appropriate management practices for problem soils.	4. Problem Soils <ul style="list-style-type: none"> • Acidic soil • Saline soil • Sodic soil • Low organic matter • Management of acidic, saline, low organic matter and sodic soil 	Video/power point presentation of problem soils Laboratory exercises on assessing problem soils Lecture with discussion	Laptop and projector/TV monitor, laboratory manual	Submission of laboratory report
Relate several factors that influence the rate of soil erosion.	ii. Soil Conservation and Management 1. Erosion Process and Mechanics <ul style="list-style-type: none"> • Factors that influence the rate of erosion • Process and energy available for soil erosion • Action of various 	Video presentation and lecture with discussion	Laptop and projector	Quiz

	<p>detaching and transporting agents</p> <ul style="list-style-type: none"> • Factors influencing soil erosion 			
Assess and measure soil loss.	<p>2. Assessment of Erosion Hazard and Erosion Modelling</p> <ul style="list-style-type: none"> • Methods of general assessment • Land capability classification • Crop suitability evaluation • Universal Soil Loss Equation 	<p>Lecture with discussion, laboratory and field exposure/ analysis problem solving</p> <p>Worksheet on predicting soil loss using USLE</p>	LCD/TV monitor, laptop/ lab manuals and equipment, field demo plot	Quiz, graded recitation, Submission worksheet and laboratory report
	<p>3. Soil Erosion Measurement</p> <ul style="list-style-type: none"> • Field experiments • Run-off plots 	<p>Laboratory exercise on soil erosion measurement</p> <p>Lecture with discussion</p>	LCD/TV monitor, laptop/ lab manuals and equipment, field demo plot	Quiz Submission of laboratory report
Develop/design soil and water conservation management for specific land uses.	<p>4. Soil and Water Conservation and Management Strategies</p> <ul style="list-style-type: none"> • Soil conservation strategies – including but not limited to addition of organic amendments 	<p>Field survey to different conservation and management practices in sloping areas</p> <p>Video/power point presentation</p> <p>Lecture with discussion</p>	LCD/TV monitor, laptop	Submission of field survey report
Relate impacts of climate change to soil fertility.	<p>III. Current trends in soil fertility, conservation and management</p> <ul style="list-style-type: none"> • Climate change and its impact on soil fertility (organic matter decomposition), conservation and management • Pollution 	<p>Video/power point presentation</p> <p>Lecture with discussion</p>	LCD/TV monitor, laptop	Quiz

	<ul style="list-style-type: none"> • Urbanization • Land Use Policy 			
SUGGESTED REFERENCES				
Soil Fertility and Fertilizers. Havlin, J.L. Beaton, S.L. Tisdela and W.L. Nelson				
Basic Soil Fertility, 1990. Nartea R.N. UP Printery				
The Philippine Recommends for Soil Fertility Management. PCAARRD				

COURSE TITLE	PRINCIPLES OF CROP PROTECTION			
COURSE NO.	Crop Protection 1			
COURSE DESCRIPTION	Identification, biology and ecology of pests including invasive species and their natural enemies and introduction to pest population management			
COURSE CREDIT	3 units			
CONTACT HRS/WK	2 hours lecture and 3 hours laboratory			
PREREQUISITE	None			
COURSE OUTCOME	TOPIC	TEACHING AND LEARNING ACTIVITIES	RESOURCES	ASSESSMENT TASKS
Explain the relationship of world population and food supply	<ol style="list-style-type: none"> 1. The world population and food supply 2. Role of crop protection in increasing food supply 	Lecture with facilitated group discussion; film showing and reading assignments	LCD/ or TV monitor, laptop, lecture manual/ or syllabus and appropriate Crop Protection Journals	Quiz, graded recitation, and reports and term paper
Discuss the concept of pest and its economic importance	<ol style="list-style-type: none"> 1. Definition of pest(s) 2. Economic importance of pests 3. Various disciplines involved in Crop Protection 	Lecture with facilitated group discussion; laboratory and farm exposure, film showing and reading assignments	-do-	-do-
Distinguish the characteristics of the Major Pest Groups	<ol style="list-style-type: none"> 1. Plant Pathogens 1. Plant Pathology (defined) 2. Economic Importance of Plant Diseases 3. Concepts of Plant Diseases 4. Causes of Plant Diseases 5. Disease Cycle 6. Plant Disease 	Lecture with facilitated group discussion; laboratory and farm exposure, film showing and reading assignments	Slides and videos of live and preserved specimens	-do-



	<p>Epidemiology (The elements of an epidemic)</p> <p>7. Variability in Plant Pathogens</p>			
	<p>II. Arthropods and Vertebrate Pests and Natural Enemies</p> <p>A. Arthropod Pests</p> <ol style="list-style-type: none"> 1. Entomology defined 2. Recognizing an insect and a mite 3. Characteristics of insects that make them a successful group of arthropods 4. How insects affect man as a consequence of varied habits and behavior 5. Recognizing Insect Orders 6. Representative insect pests and important considerations to make in the formulation of strategies/programs for their management <p>B. Important Vertebrate Pests – birds and rodents</p> <p>C. Common natural enemies of insects and vertebrate pests</p>	<p>Lecture with facilitated group discussion; laboratory and farm exposure, film showing and reading assignments</p>	-do-	-do-
	<p>III. Weeds</p> <ol style="list-style-type: none"> 1. Weed Science (defined), Concept of a Weed 2. Characteristics of Weeds, Crops and Other Pests 3. Classification of Weeds 4. Effect of weeds on Human Affairs 5. Reproduction and Establishment of Weeds 6. Crop-Weed Competition 7. Change in Weed Populations 	<p>Lecture with facilitated group discussion; laboratory and farm exposure, film showing and reading assignments</p>	-do-	-do-



Explain the development of invasive species	<ol style="list-style-type: none"> 1. Definition of invasive species 2. Examples of invasive species in Philippine agriculture (snails scale insects) 	Lecture and facilitated group discussion, video or film showing		
Apply the concept, strategies and practices of Integrated Pests Management in response to pest attack	<ol style="list-style-type: none"> 1. Pest Problem Diagnosis 2. Determination of component factors causing the pest problem in the field 3. The Pest Management Concept <ol style="list-style-type: none"> a. Definition of terms b. Factors that led to the development of the pest management concept 4. General Considerations in Planning Pest Management Programs <ol style="list-style-type: none"> a. Conservation of the environment b. Health implication of pest control intervention c. Profitability of the pest management strategy 	Lecture with facilitated group discussion; laboratory exposure, film showing and reading assignments		

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COURSE TITLE				
APPROACHES AND PRACTICES IN PEST MANAGEMENT				
COURSE NO.				
Crop Protection 2				
COURSE DESCRIPTION				
Philosophies, Strategies, and Methods in Pest and Disease Management, including current trends in pest population regulation				
COURSE CREDIT				
3 units				
CONTACT HRS/WK				
2 hours lecture 3 hours laboratory				
PREREQUISITE				
Crop Protection 1				
COURSE OUTCOME	TOPIC	TEACHING AND LEARNING ACTIVITIES	RESOURCES	ASSESSMENT TASKS
Discuss the objectives, scope and requirements of the course	Course Overview and Introduction A. Aims and scope of the course B. Course Requirements	Lecture/discussion	LCD/ or TV monitor, laptop, lecture	Quiz / discussion reports
Explain the concept of Integrated Pest Management (IPM)	I. The current concept of IPM 1. Goals and scope 2. Management strategies II. Historical Trends in IPM/PM 1. Pre-IPM era 2. Emergence of the early concepts of IPM 3. The "ETL-Based" IPM 4. Management of Invasive Species 5. Emerging IPM/PM Concept/trends (use of biorationals and GMO in PM)	Lecture with facilitated group discussion; film showing and reading assignments	LCD/ or TV monitor, laptop, lecture manual/ or syllabus and appropriate Crop Protection Journals	Quiz, graded reports and reading assignments, term paper/reaction paper
Describe the	III. Ecological and	Lecture with	LCD/ or TV	Quiz /



economic and ecological factors affecting IPM as a strategy to manage pest situations	Economic concepts in relation to management decisions	facilitated group discussion	monitor, laptop, lecture manual/ or syllabus and appropriate Crop Protection Journals	discussion reports
Articulate the impact of human behavior on Pest Management Decision Making process	IV. Human Behavior and Decision-Making Concepts <ul style="list-style-type: none"> • Community Impact Assessment • Responsible care programs 	Lecture with facilitated group discussion	LCD/ or TV monitor, laptop, lecture manual/ or syllabus and appropriate Crop Protection Journals	Quiz / discussion reports
Illustrate the various component strategies to control pests and explain their specific application	a. Regulatory Control b. Genetic Manipulation of crops (host plant resistance) and of pest (sterile male technique) c. Cultural Control and habitat manipulation d. Behavioral Control e. Mechanical and physical control f. Biological Control g. Chemical Control and Bio-Pesticides	Lecture with facilitated group discussion; laboratory exposure (visits to specialty labs), film showing and reading assignments	LCD/ or TV monitor, laptop, lecture manual/ or syllabus and appropriate Crop Protection Journals	Quiz, discussion reports and reports on farm / laboratory visits
Analyze selected cases of IPM programs and Identify application in other crops/ pest systems as appropriate	Selected Cases of IPM/PM Programs in the Philippines A. IPM in Rice 1. IIRRI IPM Farmer Participatory Research a. IIRRI Farmer Participatory IPM b. Farmer Field School B. IPM in Vegetables C. IPM in Corn D. IPM in Selected Fruits (Mango, Citrus and Banana) E. IPM in Mixed	Lecture with facilitated group discussion; laboratory exposure (visits to specific farms and labs), film showing and reading assignments	LCD/ or TV monitor, laptop, lecture manual/ or syllabus and appropriate Crop Protection Journals	Quiz and discussion reports



	Cropping and in Urban Gardens			
Utilize and relate basic knowledge on current trends in crop production	<p>Current Trends and Future Trends</p> <ol style="list-style-type: none"> 1. Biotechnology and other recent advances in crop protection <ol style="list-style-type: none"> a. GM crops and BT Technology b. Management of Resistance 2. Climate Smart Agriculture and Pest Management 3. Application of Artificial Intelligence in Crop Protection 4. Applicable pest management option for urban farming 			

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COURSE TITLE	INTRODUCTION TO ANIMAL SCIENCE			
COURSE NO.	Animal Science 1			
COURSE DESCRIPTION	Significance and economic importance of animal science in the field of agriculture. Principles of breeding, physiology and nutrition in relation to production, processing and marketing of animal products.			
COURSE CREDIT	3 units			
CONTACT HRS/WK	2 hours lecture and 3 hours laboratory			
PREREQUISITE	None			
COURSE OUTCOMES	TOPICS	TEACHING AND LEARNING ACTIVITIES	RESOURCES	ASSESSMENT TASKS
Explain the significance of animal science as a field in agriculture (AFFECTIVE)	<ol style="list-style-type: none"> 1. Animals in the ecological systems 2. Animals and their economic importance 3. The Animal industry 	Lecture with facilitated group discussion; film showing and reading assignments	LCD/ or TV monitor, laptop, lecture manual/ or syllabus; Animal Farm visit	Quiz 1 (Identification) Lab report
Describe the basic concepts and principles of animal physiology, breeding, nutrition, slaughtering, processing and marketing of animal products as they relate to animal productivity (COGNITIVE)	Role of the following animal organs in optimizing livestock and poultry productivity <ol style="list-style-type: none"> 1. The Nervous System 2. The Endocrine System 3. The Cardiovascular System 4. The Respiratory System Laboratory Exercise (1): Measurements of the Pulse Rate, respiration Rate, and Body Temperature of Some Farm Animals	Lecture with facilitated group discussion; film showing and reading assignments - Farm tour and measurement of the pulse rate, respiration rate and body temperature of some farm animals	LCD/ or TV monitor, laptop, lecture manual/ or syllabus; Specimens of the different organs of livestock and poultry	Quiz 2 (Blood circulation) Lab. Quiz No 1. (Identification) Laboratory Exercise No. 2 output

	based on Records			report on classification of traits and computation of genetic gain
Describe the basic concepts and principles of animal physiology, breeding, nutrition, slaughtering, processing and marketing of animal products as they relate to animal productivity (COGNITIVE)	A. Animal Breeding B. Reproduction and Genetic Improvement of Animals Laboratory Exercise No. 6: Systems of Breeding of Farm Animals	Lecture with facilitated group discussion; film showing and reading assignments	LCD/ or TV monitor, laptop, lecture manual/ or syllabus;	Laboratory report No. 5. Quality of report Lab Quiz No. 3(Identification and Computation)
				Written Exam No. 2
Describe the basic concepts and principles of animal physiology, breeding, nutrition, slaughtering, processing and marketing of animal products as they relate to animal productivity (COGNITIVE) Demonstrate basic skills in formulating simple animal rations, slaughtering animals and processing of products (PSYCHOMOTOR)	a. Animal nutrition definition of terms b. Classes of Nutrients, Functions and Deficiency Symptoms c. Digestion, Absorption and Metabolism d. Nutrient Digestion Laboratory Exercise No. 7 : Nutrient Sources: Roughages, Concentrates and Supplements	Lecture with facilitated group discussion; film showing and reading assignments-	LCD/ or TV monitor, laptop, lecture manual/ or syllabus; Specimens of the different feedstuff for livestock and poultry	Quiz No. 6 (Definition of terms) Lab report No. 6. Quality of report about different nutrient sources Lab Quiz No. 4 (Identification and Classification of nutrient sources)
Describe the basic concepts and principles of animal physiology, breeding, nutrition, slaughtering, processing and marketing of animal products as they relate to animal productivity	d. General Symptoms Indicative of Marginal or Advanced Vitamin Deficiencies in Poultry, Pigs and Ruminants e. Macrominerals f. Microminerals	Lecture with facilitated group discussion; film showing and reading assignments-	LCD/ or TV monitor, laptop, lecture manual/ or syllabus; Pictures of the signs and symptoms of mineral and vitamin deficiency in	Quiz No. 7 (Enumeration of Essential Amino Acids)



<p>(COGNITIVE)</p> <p>Demonstrate basic skills in formulating simple animal rations, slaughtering animals and processing of products</p> <p>(PSYCHOMOTOR)</p>	<p>Laboratory Exercise No. 8: Methods of Feed Evaluation and Quality Control</p>		<p>farm animals</p>	<p>Lab report No. 7: Quality of report on the description of feed ingredients under the stereomicroscope</p>
<p>Describe the basic concepts and principles of animal physiology, breeding, nutrition, slaughtering, processing and marketing of animal products as they relate to animal productivity</p> <p>(COGNITIVE)</p> <p>Demonstrate basic skills in formulating simple animal rations, slaughtering animals and processing of products</p> <p>(PSYCHOMOTOR)</p>	<p>1. Maintenance</p> <p>Laboratory Exercise No. 9: Evaluation of Rations for Livestock and Poultry</p>	<p>Lecture with facilitated group discussion; film showing and reading assignments-</p>	<p>LCD/ or TV monitor, laptop, lecture manual/ or syllabus;</p>	<p>Quiz No. 8 (Identification)</p> <p>Lab report No. 8. Quality of report on feed formulation</p>
				<p>Written Exam 3 Practical Exam No. 2</p>
<p>Describe the basic concepts and principles of animal physiology, breeding, nutrition, slaughtering, processing and marketing of animal products as they relate to animal productivity</p> <p>(COGNITIVE)</p> <p>Demonstrate basic skills in formulating simple animal rations, slaughtering</p>	<p>2. Slaughtering, Processing and Marketing of Farm Animals: Definition of Terms</p> <p>3. Dressing Yield of Common Livestock and Poultry</p> <p>4. Proximate Composition of Meat from Different Species</p> <p>Laboratory Exercise No. 10: Livestock Slaughtering and Meat</p>	<p>Lecture with facilitated group discussion; film showing and reading assignments-</p>	<p>LCD/ or TV monitor, laptop, lecture manual/ or syllabus; Live animals for demonstration of poultry dressing and large animal slaughtering</p>	<p>-Quality of the dressed carcass</p>

animals and processing of products (PSYCHOMOTOR)	Handling			
Describe the basic concepts and principles of animal physiology, breeding, nutrition, slaughtering, processing and marketing of animal products as they relate to animal productivity (COGNITIVE) Demonstrate basic skills in formulating simple animal rations, slaughtering animals and processing of products (PSYCHOMOTOR)	5. Proximate Composition of Eggs 6. Methods of Marketing Livestock and Poultry 7. Problems Commonly Encountered in Marketing Livestock 8. Meat and Meat Products 9. Types of Meat Markets Laboratory Exercise No. 11: Processing of Meat Products	Lecture with facilitated group discussion; film showing and reading assignments-	LCD/ or TV monitor, laptop, lecture manual/ or syllabus; Fresh meat and food ingredients for meat processing	Quality of the Tocino manufactured
Describe the basic concepts and principles of animal physiology, breeding, nutrition, slaughtering, processing and marketing of animal products as they relate to animal productivity (COGNITIVE) Demonstrate basic skills in formulating simple animal rations, slaughtering animals and processing of products (PSYCHOMOTOR)	a. Milk Laboratory Exercise No. 12: Processing of Milk Products	Lecture with facilitated group discussion; film showing and reading assignments-	LCD/ or TV monitor, laptop, lecture manual/ or syllabus; Fresh milk for cheese/ice cream making	Quality of the processed milk product
				Written Exam No. 4

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COURSE TITLE	INTRODUCTION TO LIVESTOCK AND POULTRY PRODUCTION			
COURSE NO.	Animal Science 2			
COURSE DESCRIPTION	The management of farm animals for the efficient production of meat, milk, eggs, and other animal products.			
COURSE CREDIT	3 units			
CONTACT HRS/WK	2 hours lecture and 3 hours laboratory			
PREREQUISITE	Animal Science 1			
COURSE OUTCOMES	TOPICS	TEACHING AND LEARNING ACTIVITIES	RESOURCES	ASSESSMENT TASKS
Discuss the common management practices in livestock and poultry production	SWINE PRODUCTION: 1. Overview of the swine industry	Lecture with facilitated group discussion; film showing and reading assignments-	LCD/ or TV monitor, laptop, lecture manual/ or syllabus; Swine Farm visit	
Differentiate an economical livestock and poultry production	2. Breeds of swine			Quiz 1
	Lab exercise 1: Swine production systems			Accomplished exercise sheets



<p>Compute important parameters in measuring animal productivity</p>				
<p>Discuss the common management practices in livestock and poultry production</p> <p>Demonstrate important skills in livestock and poultry production</p> <p>Judge an ideal breeder swine, layer chicken and milking cow</p>	<p>SWINE PRODUCTION:</p> <p>3. Management of the boars</p> <p>4. Care and management of sows and gilts</p> <p>Lab exercise 2: Judging swine breeders</p>	<p>Lecture with facilitated group discussion; film showing and reading assignments-</p>	<p>Lecture: Discuss management practices for boars (feeding, health, breeding, etc.)</p> <p>LCD/ or TV monitor, laptop, lecture manual/ or syllabus; Live pigs for external anatomy</p>	<p>Quiz 2</p> <p>Quiz 3</p> <p>Accomplished exercise sheets with individual assessment of the gilts given at the University Animal Farm.</p>
<p>Discuss the common management practices in livestock and poultry production</p> <p>Demonstrate important skills in livestock and poultry production</p>	<p>SWINE PRODUCTION:</p> <p>5. Care and management of baby pigs from birth to weaning</p> <p>Lab exercise 3: Body condition score</p>	<p>Lecture with facilitated group discussion; film showing and reading assignments-</p>	<p>LCD/ or TV monitor, laptop, lecture manual/ or syllabus; Visit to swine farm</p>	<p>Quiz 4</p> <p>Accomplished exercise sheets with the individual scoring of the sows provided in the University Animal Farm.</p>
<p>Discuss the common management practices in livestock and poultry production</p> <p>Differentiate an economical</p>	<p>SWINE PRODUCTION:</p> <p>6. Care and management of growing-finishing pig</p> <p>1st One-Hour Long Exam</p> <p>Lab exercise 4: Evaluation of swine</p>	<p>Lecture with facilitated group discussion; film showing and reading assignments</p>	<p>LCD/ or TV monitor, laptop, lecture manual/ or syllabus; Swine productivity records</p>	<p>Quiz 5</p> <p>1-hour long exam (covers both lecture and laboratory of swine production)</p>

livestock and poultry production Design a good farm layout	farms			Group reporting regarding the case that will be given (oral and written report)
Discuss the common management practices in livestock and poultry production Differentiate an economical livestock and poultry production Judge an ideal breeder swine, layer chicken, and milking cow	POULTRY PRODUCTION: 1. The poultry industry 2. Poultry species and their classification Lab exercise 5: External and internal structures of the chicken and duck	Lecture with facilitated group discussion; film showing and reading assignments	LCD/ or TV monitor, laptop, lecture manual/ or syllabus; Specimens of the different species of poultry	Quiz 6 Quiz 7 Accomplished laboratory report
Discuss the common management practices in livestock and poultry production Discuss the common management practices in livestock and poultry production Demonstrate important skills in livestock and poultry production	POULTRY PRODUCTION: 3. Breeds and breeding 4. Hatchery management Lab exercise 6: Poultry breeding and hatchery management	Lecture with facilitated group discussion; film showing and reading assignments	LCD/ or TV monitor, laptop, lecture manual/ or syllabus; Visit to hatchery	Quiz 8 Quiz 9 Accomplished laboratory report
Discuss the common management	POULTRY PRODUCTION: 5. Phases of	Lecture with facilitated group discussion; film	LCD/ or TV monitor, laptop,	Quiz 10

practices in livestock and poultry production	growth	showing and reading assignments	lecture manual/ or syllabus; Specimens of live layers. Visit to poultry farm	Quiz 11 Accomplished laboratory report
Design a good farm layout	6. Layer-breeder management Lab exercise 7: Poultry housing and equipment			
Discuss the common management practices in livestock and poultry production	POULTRY PRODUCTION: 7. Broiler production	Lecture with facilitated group discussion; film showing and reading assignments	LCD/ or TV monitor, laptop, lecture manual/ or syllabus; Visit to broiler farm.	Quiz 12
Discuss the common management practices in livestock and poultry production	2 nd One-Hour Long Exam Lab exercise 8: Management skills in poultry production			1-hour long exam (covers both lecture and laboratory of poultry production) Accomplished laboratory report
Compute important parameters in measuring animal productivity				
Demonstrate important skills in livestock and poultry production				
Judge an ideal breeder swine, layer chicken and milking cow				
Discuss the common management practices in livestock and poultry production	DAIRY CATTLE PRODUCTION: 1. Overview of dairy production 2. Breeds of	Lecture with facilitated group discussion; film showing and reading assignments	LCD/ or TV monitor, laptop, lecture manual/ or syllabus; Visit to dairy farm.	Quiz 13



Differentiate an economical livestock and poultry production	dairy animals				Accomplished exercise sheets
Design a good farm layout	Lab exercise 9: Dairy farm requirements and the milk supply chain				
Discuss the common management practices in livestock and poultry production	DAIRY CATTLE PRODUCTION: 3. Dairy cattle production	Lecture with facilitated group discussion; film showing and reading assignments	LCD/ or TV monitor, laptop, lecture manual/ or syllabus;	Quiz 14	
Compute important parameters in measuring animal productivity	4. General dairy herd management			Quiz 15	
Demonstrate important skills in livestock and poultry production	Lab exercise 10: Identifying a good dairy cow				Accomplished exercise sheets
Judge an ideal breeder swine, layer chicken and milking cow					
Discuss the common management practices in livestock and poultry production	DAIRY CATTLE PRODUCTION: 5. General dairy herd management	Lecture with facilitated group discussion; film showing and reading assignments	LCD/ or TV monitor, laptop, lecture manual/ or syllabus; Visit to pastureland	Quiz 16	
Compute important parameters in measuring animal productivity	6. Pasture management			Quiz 17	
	Lab exercise 11: Simple ration formulation for				Accomplished exercise sheets



Demonstrate important skills in livestock and poultry production	lactating cows			
Discuss the common management practices in livestock and poultry production	<p>DAIRY CATTLE PRODUCTION:</p> <p>7. Forage preservation</p> <p>3rd One-Hour Long Exam</p> <p>Lab exercise 12: Hand and machine milking dairy cows</p>		<p>LCD/ or TV monitor, laptop, lecture manual/ or syllabus; Visit to dairy processing plant.</p>	<p>Quiz 18</p> <p>1-hour long exam (covers both lecture and laboratory of dairy production)</p> <p>Individual hand-milking of cows at the ADSC Dairy Farm</p>
Discuss the common management practices in livestock and poultry production				
Demonstrate important skills in livestock and poultry production				
Discuss the common management practices in livestock and poultry production	<p>BEEF CATTLE PRODUCTION:</p> <p>1. Overview of the beef cattle industry</p> <p>2. Beef production systems in the Philippines</p> <p>Lab exercise 13: Beef cattle production systems and supply chain</p>	Lecture with facilitated group discussion; film showing and reading assignments-	<p>LCD/ or TV monitor, laptop, lecture manual/ or syllabus; Specimens/pictures of the different breeds of beef cattle. of livestock and poultry</p>	<p>Quiz 19 on terminologies</p> <p>Quiz 20 Enumeration of beef cattle production systems</p> <p>Laboratory report: List of inventory of animals, farm structure and tools together with farm use.</p>
Differentiate an economical livestock and poultry production				
Discuss the common management practices in livestock and poultry production				

Differentiate an economical livestock and poultry production				
Discuss the common management practices in livestock and poultry production	BEEF CATTLE PRODUCTION: 3. Beef cattle breeds, breeding and reproduction	Lecture with facilitated group discussion; film showing and reading assignments-	LCD/ or TV monitor, laptop, lecture manual/ or syllabus;	Quiz 21. On reproductive phenomena
Compute important parameters measuring animal productivity in	4. Nutrition			Quiz 22. Identification of nutrient considered in cattle nutrition
Discuss the common management practices in livestock and poultry production	Lab exercise 14: Beef cattle breeds, breeding and reproduction			Laboratory report on expected performance of crossbred calculation
Discuss the common management practices in livestock and poultry production	BEEF CATTLE PRODUCTION: 5. Herd management	Lecture with facilitated group discussion; film showing and reading assignments-	LCD/ or TV monitor, laptop, lecture manual/ or syllabus; Visit to beef cattle farm	Quiz 23. Enumeration of herd divisions
Demonstrate important skills in livestock and poultry production	6. General management practices Lab exercise 15: Beef cattle feeds and feeding			Quiz 24. Enumeration of general management practices Laboratory report: Submission of forage samples (per group) with proper labels and stocking rate calculation
Discuss the common management	BEEF CATTLE PRODUCTION: 7. Animal health	Lecture with facilitated group discussion; film	LCD/ or TV monitor, laptop,	



practices in livestock and poultry production	program	showing and reading assignments-	lecture manual/ or syllabus;	
Discuss the common management practices in livestock and poultry production	Lab exercise 16: Rope exercises and cattle handling			1-hour long exam (covers both lecture and laboratory of beef production)
Demonstrate important skills in livestock and poultry production				Practical evaluation: Demonstration of rope throwing and casting down

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COURSE TITLE	PRINCIPLES OF CROP SCIENCE			
COURSE NO.	Crop Science 1			
COURSE DESCRIPTION	Basic concepts, principles, and current trends in crop science			
COURSE CREDIT	3 units			
CONTACT HRS/WK	2 hours lecture and 3 hours laboratory			
PREREQUISITE	NONE			
COURSE OUTCOME	TOPIC	TEACHING AND LEARNING ACTIVITIES	RESOURCES	ASSESSMENT TASKS
Discuss the importance of	I. Nature and Importance of Agriculture			



agricultural challenges and their role in the local, regional and global context	<ol style="list-style-type: none"> 1. Data and Facts about Philippine Agriculture (PSA) and other countries with emphasis in ASEAN region 2. Problems, Status, and Prospects of Philippine Agriculture (AFMA, WTO, GATT, Biotechnology) 3. The Nature and Features of Philippine Agricultural Systems 4. The Nature of Agriculture as a Field of Study 5. Agricultural Development Origin, Domestication and History of Some Important Crops 6. World Food Situation and Centers of Production Philippine Agriculture 7. Major Crops of the and its Geographic Distribution 8. Meaning and Scope of Crop Science 	<p>Orientation the content, scope and guidelines in finishing the course.</p> <p>Lecture with facilitated group discussion</p> <p>Power point presentation</p>	<p>LCD/ or TV monitor, laptop</p> <p>Lecture manual/for syllabus and appropriate Crop Science Journals</p>	<p>Quiz, graded reports and reading assignment</p>
Identify and classify crops	<p>II. Nature, Composition and Classification of Crop Plants</p> <p>A. Nature and Composition of Crop Plants</p> <ol style="list-style-type: none"> 1. Plant Cell (Parts and Functions) 2. The Anatomical Regions of the Plant Body 3. The Plant Organs <p>B. Classification of Crop Plants</p> <ol style="list-style-type: none"> 1. Botanical System of Classification 2. Agronomic Classification 3. Horticultural Classification 4. Descriptive Classification 5. Ecological Classification 	<p>Lecture with facilitated group discussion</p> <p>Field exposure with Laboratory activities</p> <p>Visit to special projects, Training centers, farms</p> <p>Power point presentation</p>	<p>LCD/ or TV monitor, laptop</p> <p>Lecture manual</p> <p>Microscope</p> <p>Prepared slides</p> <p>Actual specimens</p>	<p>Practical exam/ Quizzes</p> <p>Graded reports/seat work</p> <p>Laboratory activity reports</p> <p>Collection of Crop species</p>
Explain how the physiological processes affect crop production	<p>III. Physiological Processes Affecting Crop Production</p> <ol style="list-style-type: none"> A. Concepts of Growth and Development B. Phases of Plant Growth and Development C. Plant Movements/ Crop 	<p>Lecture with facilitated group discussion</p> <p>Class reporting with follow up activities</p>	<p>LCD/ or TV monitor, laptop</p> <p>Lecture manual</p> <p>Experiment area</p>	<p>Quizzes, graded reports</p> <p>Seat work or Laboratory activity report</p>



	<p>Adaptation</p> <p>D. Other Concepts Related to Plant Growth</p> <ol style="list-style-type: none"> 1. The Law of Minimum 2. The Law of Optima & Limiting Factors 3. The Law of Diminishing Returns <p>E. Plant Life Processes:</p> <ol style="list-style-type: none"> 1. Photosynthesis 2. Respiration 3. Transpiration 4. Translocation and partitioning of Assimilates 5. Mineral Nutrition <p>F. Plant Reproduction</p> <ol style="list-style-type: none"> 1. Sexual Reproduction 2. Asexual Reproduction 	<p>Laboratory activities</p> <p>Field Trip</p> <p>Power point presentation</p>	<p>Farm tools, equipment and supplies</p>	<p>Laboratory Exercise/s</p> <p>Group Research</p>
Describe the different factors affecting growth and development of crops	<p>IV. Factors Affecting Growth and Development of Crop</p> <p>A. Environmental Factors</p> <p>B. Genetic Factors</p> <ol style="list-style-type: none"> 1. Genotypes (definition and highly recommended varieties/cultivars) 2. Selection Indices of Major Crops (rice, corn, coconut, banana, sugarcane, mango, durian, mungbean, vegetables & etc) 3. GMO (definition, concepts of recent developments (Bt corn, tomato, soybean, cotton, sweet potato & etc) <p>C. Human Factors (Preferences & Capability of Farmers, cultural practices</p>	<p>Lecture with class discussion</p> <p>Class reporting with follow up activities</p> <p>Group work and report</p> <p>Field trip</p> <p>Power point presentation</p>	<p>LCD/ or TV monitor, laptop</p> <p>Lecture manual</p> <p>Agro-climatic data and other resources</p> <p>Crop suitability maps</p>	<p>Quizzes/practical exams</p> <p>Group Report</p> <p>Oral recitation</p>
Apply the current concepts and trends of crop production in	<p>V. Sustainable Crop Production</p> <p>A. Man and crops in an</p>	<p>Lecture with</p>	<p>LCD/ or TV</p>	<p>Quizzes/practical</p>



sustainable manner	ecosystems 1. Definition of Ecosystems/Agroecosystem 2. The flow of energy 3. The cycling of nutrients 4. Pollution B. Production systems and crop management 1. lowland 2. upland C. Features of sustainable crop production 1. Sustainable Agriculture Concept 2. Diversification 3. Resource conservation and regeneration 4. Productivity and stability of production systems D. Current and future trends 1. Biotechnology and other recent advances in crop production system 2. WTO (World Trade Organization) and Conservation on Crop Biodiversity (CBD) 3. Patents and farmer's rights 4. Government programs on agriculture 5. Climate Smart Agriculture 6. Application of Artificial Intelligence in Crop Production 7. Value-adding 8. Urban farming	class discussion Class reporting with follow up activities Group work and report Field trips/visitations Power point presentation	monitor and Laptop Farm tools equipment Video clips	al exams Group Report Oral recitation
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COURSE TITLE				
PRACTICES OF CROP SCIENCE AND MANAGEMENT				
COURSE NO.				
Crop Science 2				
COURSE DESCRIPTION				
Basic concepts and practices in crop production applicable for annual and perennial crops from land preparation to postharvest operations and farming systems including current trends				
COURSE CREDIT				
3 units				
CONTACT HRS/WK				
2 hours lecture and 3 hours laboratory				
PREREQUISITE				
Crop Science 1				
COURSE OUTCOME	TOPIC	TEACHING AND LEARNING ACTIVITIES	RESOURCES	ASSESSMENT TASKS
Examine and apply or utilize current agriculture statistics, issues and their implications in crop production/enterprise	I. Introduction (Issues in crop production and development)	Orientation on the scope of the course Lecture with class discussion	Laptop and projector Powerpoint presentation	Quizzes and assignment
	II. Crop Production, Agriculture and Trade (food chain, food utilization, nutrition, research, education, distribution, marketing, etc.)	Lecture with class discussion Review statistical data on crop production,	Laptop and projector Powerpoint presentation	Quizzes and assignment Research output
Evaluate site characteristics and recommend crops ideal for production	III. Site Characterization for Crop Production (Biophysical, Associative Economics, Socio-cultural and Political Determinants)	Lecture with class discussion Laboratory activity	Laptop and projector Powerpoint presentation Crop production area	Quizzes and assignment Practicum Laboratory report
Apply appropriate /sound production practices in growing crops	IV. Production Practices 1. Land preparation for annual and perennial crops (conventional vs. improved tillage methods; practices for erosion control) 2. Planting Material Selection and	Lecture with class discussion Video showing Laboratory activity Demonstrate problem-solving	Laptop and projector Powerpoint presentation Crop production area	Quizzes and assignment Practicum Laboratory report



	<p>Preparation</p> <p>3. Planting Methods</p> <p>4. Water supply and management (Irrigation practices; effects on aquatic environment, farmland water collection and impounding/watershed)</p> <p>5. Soil nutrient management (Sources of plant nutrients, environmental effects of various nutrients sources, other nutrient management practices, integrated nutrient cycling)</p> <p>6. Pest Management (Use of pesticides, alternatives to pesticides)</p> <p>7. Specialized management practices (Wind breaks/shelter belts, physical and chemical control of growth and development, shading, other treatments)</p> <p>8. Specialized production systems (Landscape, ornamentals, plantations)</p> <p>9. Harvesting and post production technology (Harvesting methods, primary and secondary processing , and storage)</p> <p>10. Farming Systems (Monocropping, multi-storey system, diversified and integrated system, conversion to low-external input system)</p>	exercises	Farm tools, machineries and equipment	
Utilize and relate basic knowledge on current trends in crop production	<p>V. Current Trends in Crop Production</p> <p>1. Use of New Plant Types</p> <p>2. Use of Biostimulants</p> <p>3. Protected Crop Cultivation</p> <p>4. Urban Farming</p>	<p>Lecture with class discussion</p> <p>Laboratory activity</p> <p>Field exposure</p>	<p>Laptop and projector</p> <p>Powerpoint presentation</p> <p>Farm tools and equipment</p>	<p>Quizzes and assignment</p> <p>Practicum</p> <p>Laboratory report</p>
	<p>Laboratory Exercises:</p> <p>1. Land preparation and</p>			

	Planting practices 2.Field Practices for Lowland Crops 3.Nursery Practices and Plant Propagation 4.Special Practices in Crop Production 5.Bio-Intensive Approach to Food Production 6.Crop Nutrition 7.Integrated Pest Management 8.Post Production Practices 9.Site Evaluation for Farm Planning 10.Farm Entrepreneurship 11.Tropical Landscaping			
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COURSE TITLE	PRINCIPLES OF AGRICULTURAL EXTENSION AND COMMUNICATION			
COURSE NO.	Ag Ex 1			
COURSE DESCRIPTION	Principles, methods and trends in extension and communication for rural development			
COURSE CREDIT	Three (3) units			
CONTACT HRS/WK	3 hours			
PREREQUISITE	None			
COURSE OUTCOME	TOPIC	TEACHING AND LEARNING ACTIVITIES	RESOURCES	ASSESSMENT TASKS
Explain the concept and challenges of agricultural extension	Introduction to the Course a. General Overview of Agricultural Extension b. Fundamentals of Extension c. Challenges for Agricultural Extension Practice	•Overview Discussion •Lecture-Discussion •Current Reality Dialogue	ICT	• Quiz • Narrative Report
Discuss the development of agricultural extension in the Philippines	Historical antecedents of extension a. Early beginnings: - in the UK - in the US - in selected countries b. Extension in the Philippines - Spanish Era - American Regime - Japanese Occupation - Post-war Period Legal Mandates: LGC, AFMA, Fisheries Code Laws and Agenda - Republic Acts - Sustainable Development Goals (i.e. SDG 17 and mandate of the SUC/HEI) - Gender and	•Lecture-Discussion •Video Showing •Reading Assignments •Concept Mapping	ICT	• Quiz • Reaction Paper on Reading Assignment • Recitation



	<p>Development (i.e. GAD PA 21)</p> <p>c. Initiatives and Trends in Extension</p> <ul style="list-style-type: none"> - DA-assisted (i.e. ATI, BAR) - DOST-assisted - CHED-assisted - SUCs - LGUs - NGOs - other private institutions 			
<p>Explain the theory, principles and practices of agricultural extension and communication.</p>	<p>Philosophy, principles and practice of agricultural extension</p> <ol style="list-style-type: none"> a. Philosophy and Principles of Extension b. Goals and Objectives of Extension c. Actors and agents and their roles d. Conditions for extension to evolve 	<ul style="list-style-type: none"> •Lecture-Discussion •Video showing •Reading Assignments •Focus Group Discussion on Success Stories 	<p>ICT</p>	<ul style="list-style-type: none"> •Quiz • Reaction Paper on Reading Assignment •Video Stories • Long Examination
<p>Utilize the extension and communication strategies for technology transfer for rural development.</p>	<p>Communication in Extension</p> <ol style="list-style-type: none"> a. Definition of Communication b. Nature, Importance and Purpose of Communication c. Elements of the Communication Process d. Types and Levels of Communication e. Factors of Effective Communication f. Technology Transfer Models g. Extension Delivery Systems 	<ul style="list-style-type: none"> •Lecture-Discussion •Reading Assignments 	<p>ICT</p>	<ul style="list-style-type: none"> •Quiz • Reaction Paper on Reading Assignment



Describe the extension and communication strategies for technology transfer and adoption.	Technology Diffusion and Adoption Process <ol style="list-style-type: none"> Concepts and Types of Technologies Technology Development Process Types and characteristics of Innovation Elements of Diffusion Diffusion-Adoption Process Characteristics and Categories of Adopters 	<ul style="list-style-type: none"> Lecture-Discussion Reading Assignments 	ICT	<ul style="list-style-type: none"> Quiz Reaction Paper on Reading Assignment Long Examination
Design and utilize extension and communication models for stakeholders	Adult Teaching and Learning <ol style="list-style-type: none"> Pedagogy (method and practice of teaching children) Andragogy (method and practice of teaching adult learners) Teaching-learning models for adults 	<ul style="list-style-type: none"> Lecture-Discussion Reading Assignments 	ICT	<ul style="list-style-type: none"> Quiz Reaction Paper on Reading Assignment
	Approaches in Extension <ol style="list-style-type: none"> Concepts of Extension Approach Factors in Selecting Extension Approach Types of Extension Approaches 	<ul style="list-style-type: none"> Lecture-Discussion Reading Assignments 	ICT	<ul style="list-style-type: none"> Quiz Reaction Paper on Reading Assignment
	Extension Teaching Methods <ol style="list-style-type: none"> Importance and Steps in Extension Teaching Classifications of Extension 	<ul style="list-style-type: none"> Lecture-Discussion Reading Assignments 	ICT	<ul style="list-style-type: none"> Quiz Commentary Paper on Reading Assignment



	Teaching Methods			
Design and utilize extension and communication strategies for technology transfer	Program Planning, Monitoring and Evaluation a. Definition and Characteristics of Program Plan b. Stages in Program Planning c. Monitoring and Evaluation of Extension Programs	•Lecture-Discussion • Reading Assignments	ICT	• Quiz • Reaction Paper on Reading Assignment • Long Examination
Identify prospects and opportunities in agricultural extension	Prospects and Opportunities in Agricultural Extension	Focus Group Discussion on Success Stories Case Study	ICT	Reaction Paper/Video Stories

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RA 8435. 1997. An Act Prescribing Urgent Related Measure to Modernize the Agriculture and Fisheries Sectors of the Country In Order to Enhance their Profitability and Prepare said Sectors for the Challenges of Globalization Through



COURSE TITLE		AGRICULTURAL BIOTECHNOLOGY		
COURSE NO.				
COURSE DESCRIPTION		Basic concepts in traditional and modern biotechnology and its application to agriculture including techniques, biosafety, product labeling, intellectual property rights and international and local regulations affecting biotechnology.		
COURSE CREDIT		3 units		
CONTACT HRS/WK		2 hours lecture and 3 hours laboratory		
PRE-REQUISITES				
COURSE OUTCOME	TOPIC	TEACHING AND LEARNING ACTIVITIES	RESOURCES	ASSESSMENT TASKS
Explain the importance of biotechnology in agriculture and the environment.	I. INTRODUCTION A. Importance of biotechnology B. Development of biotechnology in the Philippines C. Review of products currently used	Orientation the content, scope and guidelines in finishing the course. Lecture with facilitated group discussion Power point presentation Students can bring examples of traditional biotech products and for discussion	LCD/ or TV monitor, laptop Lecture manual/or syllabus and appropriate Biotechnology Journals	Quiz, graded reports and reading assignment
Explain the concepts of genetic modification Apply some techniques of biotechnology.	II. TECHNIQUES IN BIOTECHNOLOGY A. Fermentation B. Tissue culture C. DNA extraction D. DNA cloning E. Gene coding F. Gene gun and alternative techniques G. Cloning H. DNA Sequencing I. Genetic Modification	Lecture with facilitated group discussion Field exposure with Laboratory activities	LCD/ or TV monitor, laptop Lecture manual Video clips	Practical exam/ Quizzes Graded reports/seat work Laboratory activity reports
Discuss the concept of GMO and understand its impact to health and environment as well as food safety and	III. GENETICALLY MODIFIED MICROORGANISM A. Definition of GMO B. Impacts on food quality and quantity C. Impacts on health	Lecture with facilitated group discussion	LCD/ or TV monitor, laptop Lecture manual	Practical exam/Quizzes Graded



availability	and medicine D. Impacts on the environment E. Impacts on economy	Laboratory activities Power point presentation		reports/seat work, Laboratory activity report
Analyze controversies and issues in biotechnology.	<p>IV. CONTROVERSIES AND ISSUES IN BIOTECHNOLOGY</p> <p>A. Controversies in Biotechnology</p> <ol style="list-style-type: none"> 1. Monarch butterfly 2. Starlink corn 3. Poisonous potato controversy 4. The Mexican corn gene escape <p>B. Issues in Biotechnology</p> <ol style="list-style-type: none"> 1. Banning and moratorium 2. Labelling 3. Intellectual property 4. Germ line therapy 5. Gene therapy 6. Cloning) 7. Status of local biotechnology <ol style="list-style-type: none"> a. (BioN, Agrivam, EM vs. IMO) 8. Biocon agents (compost activators/fermentation agents) 9. Biopharming 10. Phyto (Bio) remediation 11. Fake seeds (sigue2x) 12. Vaccines 13. AI/MOET 14. Probiotics 15. Future of Biotechnology <ol style="list-style-type: none"> a. Biotech Products Nearing Commercialization b. Biotechnology in a Sustainable Future 	<p>Lecture with class discussion</p> <p>Class reporting with follow up activities</p> <p>Power point presentation</p>	<p>LCD/ or TV monitor, laptop</p> <p>Lecture manual</p>	<p>Quizzes/practical exams</p> <p>Group Report</p> <p>Oral recitation</p>
Explain laws and	V. LAWS AND			



regulations affecting biotechnology adoption	REGULATIONS ON BIOTECHNOLOGY A. International conventions affecting biotechnology B. Local regulations and biosafety C. Principles behind laws and regulations D. Role of institutions E. Alternatives in biotechnology	Lecture with class discussion Class reporting with follow up activities Group work and report	LCD/ or TV monitor and Laptop	Quizzes Group Report Oral recitation
Laboratory Exercises/Activities: 1. Fermentation activities <ol style="list-style-type: none"> a. Wine Making b. Silage c. Composting with Fungus activators d. Fermented Extracts and Concoctions 2. Probiotics in Animals 3. Biofertilizer for Crops 4. Reaction papers on selected controversies, issues and laws and regulations on biotechnology				
SUGGESTED REFERENCES: Amano, Noel. 2009. The UPLB Genetics and Cell Biological Societies: Sharing Biotech Information to Students. In <i>Communicating Crop Biotechnology: Stories from Stakeholders</i> . ISAAA Brief 40. Edited by M. Navarro. ISAAA: Ithaca, New York. pp. 143-146. Bonnen, J. J. 1983. Historical sources of U.S. agricultural productivity: implications for R&D policy and social science research. <i>Am. J. Agric. Eco.</i> 65:958–966 Baria, Arthur. 2009. <i>Communicating Biotechnology: The Bt Corn Experience in the Philippines</i> . In <i>Modern Biotechnology and Agriculture</i> . STRIVE (Society Towards Inherent Viability for Enrichment) Foundation. Los Baños, Laguna, Philippines. pp. 55-68. Cariño, Florida. 2009. After MON 810: The Expanded Toolbox. In <i>Modern Biotechnology and Agriculture</i> . STRIVE (Society Towards Inherent Viability for Enrichment) Foundation, Los Baños, Laguna, Philippines. pp. 55-68. Evenson, R. E., P. E. Waggoner, and V. W. Ruttan. 1979. Economic benefits from research: an example from agriculture. <i>Science</i> 205:1101–1107. Hautea, Randy and Margarita Escaler. 2004. Plant Biotechnology in Asia. <i>Agbio- Forum</i> . Vol. 7, No. 1&2: 2-8.- International Service for the Acquisition of Agri-biotech Applications (ISAAA). 2004. <i>Asia's First: The Bt Corn Story in the Philippines</i> . ISAAA Resources: Biotechnology Videos.				



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Navarro, Mariechel, Jenny Panopio, Donna Bae Malayang, and Noel Amano Jr. 2010. *Print Media Reportage of Agricultural Biotechnology in the Philippines: A Decade's (1999-2009) Analysis of News Coverage and Framing*. International Service for the Acquisition of Agri-biotech Applications, Los Baños, Laguna, Philippines.

Norton, George and Desiree Hautea. 2009. *Projected Impacts of Agricultural Biotechnologies for Fruits and Vegetables in the Philippines and Indonesia*. International Service for the Acquisition of Agri-biotech Applications (ISAAA) and the SEAMEO Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA). Los Baños, Laguna, Philippines. 184 pp.

Padolina, W.G. 2001. *Agricultural Biotechnology: Opportunities and Challenges for the Philippines*. *Phil Jour of Development*. Vol 28(51)

Panopio, Jenny and Rochella Lapitan. 2009b. *Edita Burgos: Revolutionizing Media's Role in Biotech Advocacy*. In *Communicating Crop Biotechnology: Stories from Stakeholders*. ISAAA Brief No. 40. Edited by M. Navarro. ISAAA: Ithaca, New York. pp. 39-44.

Peczon, Benigno. 2009. *National Biotechnology Policies and Realism: Overcoming Challenges in Implementation*. *Asian Biotechnology and Development Review*. Volume 11. Number 2: 45-53.

Ramirez, Dolores. 2009. *The R&D to Commercialization Continuum: Biosafety Risk Assessment of Bt Corn (MON 810)*. In *Modern Biotechnology and Agriculture*. STRIVE (Society Towards Inherent Viability for Enrichment) Foundation. Los Baños, Laguna, Philippines. pp. 1-20.

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Solidarity Philippines Australia Network (SPAN). 2003. *Anti-GMO/Bt Corn Protesters End Hunger Strike*. *KASAMA* Vol. 17, No. 2. April-May-June 2003. [http://cpcbrisbane.org/Kasama/2003/V17n2/Anti GMO](http://cpcbrisbane.org/Kasama/2003/V17n2/Anti%20GMO)



COURSE TITLE		INTRODUCTION TO AGRICULTURE		
COURSE NO.				
COURSE DESCRIPTION		Overview of Philippine agriculture with emphasis on recent and emerging fields in agriculture		
COURSE CREDIT		3 units		
CONTACT HRS/WK		3 hours lecture		
PREREQUISITES		NONE		
COURSE OUTCOME	TOPIC	TEACHING AND LEARNING ACTIVITIES	RESOURCES	ASSESSMENT TASKS
Discuss the growth and development of agriculture from a global to Philippine perspectives	I. GROWTH AND DEVELOPMENT AGRICULTURE A. Brief historical development of world agriculture and Philippine agriculture B. Agriculture as an economic factor in capitalist and non-capitalist societies C. Agriculture as an industry, a science and a profession	Orientation the content, scope and guidelines in finishing the course. Lecture with facilitated group discussion Power point presentation	LCD/ or TV monitor, laptop Lecture manual/or syllabus and appropriate Agriculture Journals	Quiz, graded reports and reading assignment
	II. INTRODUCTION TO AGRICULTURE AND THE ECOSYSTEM A. Agriculture and the Environment – balancing productivity and sustainability B. Agriculture and Society 1. Analysis of food production and population growth in developing and underdeveloped countries 2. Food production in the context of food security, affordability and availability	Lecture with facilitated group discussion and follow-up seat work Power point presentation	LCD/ or TV monitor, laptop Lecture manual	Quizzes Graded reports/seat work
Discuss the relationship of agriculture, environment and society. Compare food production and population growth in developed and developing countries and their implications to food security of the nation	DEVELOPING COUNTRIES	Lecture with facilitated group discussion	LCD/ or TV monitor, laptop	Quizzes



Describe and characterize Philippine Agriculture and the Filipino farmer in the context of resources, production systems, socio-cultural and economic parameters and in uplifting rural lives through the opportunities in agribusiness.	III. OVERVIEW OF PHILIPPINE AGRICULTURE A. Resources – land, water and capital B. Production Systems C. Characteristics of Small-hold farming D. Agribusiness – concept and opportunities for the Filipino farmers. E. . Need for balance d agro- industrial growth-in and agricultural production	Lecture with facilitated group discussion Class reporting with follow up activities Power point presentation	LCD/ or TV monitor, laptop Lecture manual	Quizzes Oral Recitation
	Discuss government institutions and programs helping farmers benefit from technologies and programs	IV. PROFILE OF THE FILIPINO FARMER A. The Filipino Farmer in the context of socio-cultural and economic status; needs and aspirations B. Institutions and support systems for the Filipino farmers	Lecture with class discussion Power point presentation	LCD/ or TV monitor, laptop
Analyze agriculture and rural poverty in developing and underdeveloped countries.	V. AGRICULTURE AND DEVELOPMENT A. Agriculture and rural poverty in developing countries and underdeveloped countries B. The Philippine development goals and strategies C. Organization for Agriculture: functions models of operations and institutional linkages D. Assessment of some development programs of DA and related agencies	Lecture with class discussion Class reporting with follow up activities Power point presentation	LCD/ or TV monitor and Laptop	Quizzes/practical exams Group Report Oral recitation
Discuss the Philippine Midterm Development Goals and Plan (MDGPs) related to agriculture	VI. DIRECTION FOR GROWTH – migrating from traditional to modern agriculture A. Drivers for growth and the need to modernize Philippine agriculture	Class reporting with follow up activities	LCD/ or TV monitor and Laptop	Group Report
Analyze some government programs for production and agribusiness support.				
Discuss opportunities for modern agriculture				



<p>and present technologies and production systems appropriate for specific needs like urban communities and organic agriculture practitioners.</p>	<p>B.- Modern production technologies and production systems</p> <ol style="list-style-type: none"> 1.The GM technology and the gains in Bt corn 2.The Organic Agriculture Act of 2010 3. Technologies for urban agriculture – concept, practices and technologies <ol style="list-style-type: none"> (a.) Container gardening (b.) Hydroponic / Aquaponics (c.) Vertical gardening (d.) Urban community gardens <p>VII. Challenges for Philippine Agriculture in the context of emerging global order and insuring local food security and food availability</p> <ol style="list-style-type: none"> 1.The rice tariffication law and food security 2. Global situation and food security <ol style="list-style-type: none"> (a) The Asian Bird Flu (b) The African Swine fever (c) The Covid -19 pandemic <p>Where do we go from here – relating current government programs to the global issues above.</p>			
<p>SUGGESTED REFERENCES:</p> <p>Balisacan, A., 1993. "Agricultural Growth and Rural Performance: A Philippine Perspective." Journal of Philippine Development 20(2):289-317</p>				



Bresciani F. and A. Valdes. 2007. Beyond food production : the role of agriculture in poverty reduction. 232 p.

Chen, Z S and C. Bejosano- Gloria (Eds) .2005. Compost production : a manual for Asian farmers. 73 p.

Evenson, R E, P E Waggoner and PR Bloom. THE AGRICULTURAL RESEARCH SYSTEM OF THE PHILIPPINES: A RECONNAISSANCE REPORT. ECONOMIC DEVELOPMENT CENTER, Department of Agricultural and Applied Economics, Univ of Minnesota, Minneapolis

Habito, C F and Roehlano M. Briones' Philippine Agriculture over the Years: Performance, Policies and Pitfalls. 38 p

Habito, C. F. and C. Bautista. 2005. "Making SMEs Work, Making SMEs Create Work Job Creation Through Small and Medium Enterprise Development." A joint study by the Financial Executives Institute of the Philippines (FINEX) and the Ateneo Center for Economic Research and Development (ACERD).

Mundlak, Y., D. Larson, and R. Butzer. 2004. "Agricultural dynamics in Thailand, Indonesia, and the Philippines." *Australian Journal of Agricultural and Resource Economics* 48(1):95-126.

Organization for Economic Cooperation and Development. 1997. The Uruguay Round Agreement on Agriculture and Processed Agricultural Products. Paris: Organization for Economic Cooperation and Development

Organization for Economic Cooperation and Development. 1999. OECD Agricultural Outlook 1999-2004. Paris: Organization for Economic Cooperation and Development.

Pardey, P.G., J. Roseboom and J.R. Anderson (eds.). 1991. *Agricultural Research Policy: International Quantitative Perspective*. Cambridge, UK: Cambridge University Press.

Rosegrant, M., and P. Hazell. 2000. *Transforming the Rural Asian Economy: the Unfinished Revolution*. Oxford University Press, New York.

RA 8435. 1997. An Act Prescribing Urgent Related Measure to Modernize the Agriculture and Fisheries Sectors of the Country In Order to Enhance their Profitability and Prepare said Sectors for the Challenges of Globalization.

Suh, J. 2015. 'An institutional and policy framework to foster integrated rice–duck farming in Asian developing countries', *International Journal of Agricultural Sustainability*, Vol 13, No 4, pp 294–307.

Tolentino, B., C. David, A. Balisacan, and P. Intal. 2001. "Strategic Actions to Rapidly Ensure Food Security and Rural Growth in the Philippines." In *Yellow Paper II: The Post-Erap Reform Agenda*.

UNSD – United Nations Division for Sustainable Development (1992), Agenda 21: Programme of Action for Sustainable Development, UNSD, New York.

Vista, B.M., Nel, E., Binns, T. 2012. 'Land, landlords and sustainable livelihoods: The impact of agrarian reform on a coconut hacienda in the Philippines', *Land Use Policy, Outlook on Agriculture*.Vol 29, pp 154–164.

COURSE TITLE	INTRODUCTION TO ORGANIC AGRICULTURE			
COURSE NO.				
COURSE DESCRIPTION	Concepts, scope, quality standards and certification systems for organic agriculture.			
COURSE CREDIT	3 units			
CONTACT HRS/WK	3 hours lecture			
PREREQUISITES	NONE			
COURSE OUTCOME	TOPIC	TEACHING AND LEARNING ACTIVITIES	RESOURCES	ASSESSMENT TASKS
Describe the development of organic agriculture and its challenges Explain the principle and concepts of organic agriculture	I. Introduction 1. Historical trends in the development of organic agriculture in the Philippines 2. The Organic Agriculture Act 3. Issues and concerns in organic agriculture	Orientation the content, scope and guidelines in finishing the course. Lecture with facilitated group discussion	LCD/ or TV monitor, laptop Lecture manual/or syllabus	Quiz, graded reports and reading assignment
	II. Concepts of Organic Agriculture 1. Definition of terms Organic Agriculture Traditional Agriculture Sustainable Agriculture Conventional Agriculture Biodynamic Agriculture 2. Concepts of Organic Agriculture 3. Principles of Organic Agriculture (as per IFOAM) 4. Goals of Organic Agriculture (as per IFOAM)	Lecture with facilitated group discussion and follow-up seat work	LCD/ or TV monitor, laptop Lecture manual	Quizzes Graded reports/seat work
	III. Scope of Organic Agriculture	Lecture with facilitated group discussion	LCD/ or TV monitor, laptop	Quizzes

	<ol style="list-style-type: none"> 1. Organic Crop Production 2. Organic Animal Production 3. Organic Aquaculture 4. Organic Food Processing 5. Wild Collections 6. Special Food Products 7. Non-Food Products 8. Production of Organic Inputs 			
Identify and compare local and international standards for , certification and labeling processes	IV. Organic Food Quality <ol style="list-style-type: none"> 1. Chemical food contaminant 2. Microbial food contaminant 3. Food irradiation 	<p>Lecture with facilitated group discussion</p> <p>Class reporting with follow up activities</p>	<p>LCD/ or TV monitor, laptop</p> <p>Lecture manual</p>	Quizzes
	V. Quality Control Standards <ol style="list-style-type: none"> 1. International Federation of Organic Agriculture Movement (IFOAM) Basic standards 2. International standards 3. Philippine National Standards/BAFS Certification 	<p>Lecture with class discussion</p>	<p>LCD/ or TV monitor, laptop</p>	Quizzes
Apply the current concepts and trends of organic agriculture production in sustainable manner	VI. Current and Future Trends in Sustainable Organic Farming <ol style="list-style-type: none"> A. Organic Agriculture Product Value Chain (product recall) B. Product pricing 	<p>Lecture with class discussion</p> <p>Class reporting with follow up activities</p>	<p>LCD/ or TV monitor and Laptop</p>	<p>Quizzes/practical exams</p> <p>Group Report</p>

SUGGESTED REFERENCES:

BAFPS – Bureau of Agriculture and Fisheries Product Standards (2012), The National Organic Agriculture Program 2012–2016, BAFPS, Quezon City

Cunningham, M. 2015. *What is Green Revolution? - Definition, Benefits, and Issues*. Retrieved from



Study.com: <http://study.com/academy/lesson/what-is-the-green-revolution-definition-benefits-and-issues.html>

Delmo, G. 2012. 'Organic farming: The future of Philippine agriculture', *Far Eastern Agriculture*, Vol 29, No 3, pp 27–28.

FEA. 8 May 2012. *Organic Farming: The Future of Philippine Agriculture*. Retrieved from Far Eastern Agriculture: <http://www.fareasternagriculture.com/crops/agriculture/organic-farming-the-future-of-Philippine-agriculture>

Latin, M. M. 1994. The National IPM Program and Government Policies on Pesticide Importation. *Phil. Journal of Crop Science*, 19(2), 57-60.

Mendoza, T.C. 2002. Comparative productivity, profitability and energy use in Organic, LEISA and Conventional rice production in the Philippines. In *Livestock Research for Rural Development* 14(6):50-69.

Mendoza, T. C. and P. M. Villegas. 2015. *The Opportunities and Challenges of GREEN Agriculture in the ASEAN: Focus on the Philippines*. Bangkok: Chulalongkorn University Press

PCARRD. 22 April 2015. *Historical Profile of Organic Certification in the Philippines*. Retrieved from Philippine Organic Agriculture Information Network: <http://www.pcaarrd.dost.gov.ph/home>

Pretty, J. 2002. *Agri-Culture: Reconnecting People, Land and Nature*, Earthscan, London.

Pulhin, J.M., Inoue, M., Enters, T. 2007. 'Three decades of community-based forest management in the Philippines: Emerging lessons for sustainable and equitable forest management', *International Forestry Review*, Vol 9, No 4, pp 865–883.

Republic Act No. 10068 s 2010. An act providing for the development and promotion of Organic Agriculture in the Philippines.

Salazar, R.C. 2014. 'Going organic in the Philippines: Social and institutional features', *Agroecology and Sustainable Food Systems*, Vol 38, pp 199–229.

Suñer, A C, E M. Libetario , M O. Olanday , and T C.Mendoza. 2016. *Mainstreaming Organic Agriculture in the Philippines: Challenges and Opportunities*

Willer, H., Kilcher, L., eds. 2012. *The World of Organic Agriculture: Statistics and Emerging Trends 2012*, FiBL and IFOAM, Bonn.

COURSE TITLE	PRINCIPLES OF AGRICULTURAL ENTREPRENEURSHIP AND ENTERPRISE DEVELOPMENT
COURSE NO.:	
COURSE DESCRIPTION	Basic concepts related to starting and managing agricultural enterprises with focus on farming as business and the role of farmers as entrepreneur; to include planning a business and preparing business plan
COURSE CREDIT	3 units
CONTACT HOURS/WEEK	3 hours lecture per week



PREREQUISITES				
- Entrepreneurial Mind - Farm bookkeeping and accounting				
COURSE OUTCOME	TOPICS	TEACHING AND LEARNING ACTIVITIES	RESOURCES	ASSESSMENT TASKS
<p>Explain the concept of entrepreneurship and its relation to economic growth, advantage of being an entrepreneur, its function and characteristics</p> <p>Identify the different sectors that support the agricultural community and farming as a business</p>	<p>I. Introductory Concepts</p> <p>A. Entrepreneurship</p> <ol style="list-style-type: none"> 1. What does it mean? 2. Why engage in entrepreneurship? 3. Types of entrepreneurs 4. Characteristics of an entrepreneur 5. Entrepreneurs guide to success <p>B. Farming as a business</p> <ol style="list-style-type: none"> 1. Agricultural entrepreneurship 2. Characteristics of agricultural related enterprise that differentiate it from industrial /manufacturing enterprises <p>C. Functional areas of management and managerial roles of agri-preneur</p> <p>D. Some government programs and interventions to promote agricultural entrepreneurship</p>	Lecture with discussion; Class participation	Laptop, LCD/TV	Quiz, graded recitation, home-work
		Lecture with discussion; Class participation	Laptop, LCD/TV	Quiz, graded recitation, homework
Examine the orientation and arrangement of different business organizations	<p>II. Preparing for Business</p> <ol style="list-style-type: none"> A. Forms of business organizations B. Kind and size of business C. Organizational business arrangements 	Lecture with discussion; Class participation	Laptop, LCD/TV	Quiz, graded recitation, homework



<p>Emphasize the approaches to create income - generating activities</p>	<p>D. Enterprise growth and expansion strategies E. Conceptualization of the process and plan when starting a business F. Steps and processes in establishing an enterprise G. Entrepreneurial opportunity and feasibility study H. Sources of capitalization for agricultural entrepreneurs A.</p>			
First Term Examination				
<p>Explain the basic concepts and procedures of establishing and planning a business</p>	<p>III. Planning a Business A. Government requirements to establish a business B. Factors to consider in choosing and starting an enterprise C. Guidelines in risk-taking of having a business D. The 4 P's in business: Product, price, place & promotion</p>	<p>Lecture with discussion; Class participation; Visits to government offices issuing business related permits</p>	<p>Laptop, LCD/TV, Service Vehicles</p>	<p>Quiz, graded recitation, homework, term papers</p>
<p>Organize, prepare, and develop a business plan</p> <hr/> <p>Prepare financial statement and assess financial viability measures of business plan</p>	<p>IV. Preparing a Business Plan A. What is a business plan? B. Purpose and uses of business plan C. Guidelines in the preparation of business plan D. Format of business plans E. Prepare financial statement a) Income/cash flow statement b) Balance sheet statement F. Financial investment analysis a) Benefit cost analysis i. Benefit cost ratio ii. Net present</p>	<p>Lecture with discussion; Class participation;</p>	<p>Laptop, LCD/TV, Business papers/documents (Journal, ledger, etc)</p>	<p>Quiz, graded recitation, homework</p>



	<ul style="list-style-type: none"> value iii. Internal rate of return b) Financial ratio analysis <ul style="list-style-type: none"> i. Net profit margin ii. Return on working capital iii. Return on investment iv. Solvency v. Liquidity 			
Second Term Examination				
Apply case study approach and analyze sample case study	V. Business Study <ul style="list-style-type: none"> A. Definition of Case Study B. Classification of Case Study <ul style="list-style-type: none"> a) Issue case b) Appraisal case C. Sample Case Studies D. SAPADAPPA Approach of Case Study Analysis <ul style="list-style-type: none"> c) Situational analysis (SA) d) Problem analysis (PA) e) Decision analysis (DA) f) Potential problem analysis (PPA) 	Lecture with discussion; Class participation; Site Visit Student reporting	Laptop, LCD/TV, Service vehicle, documentation equipment, Samples of case studies	Quiz, graded recitation, reporting
Validate concepts on agricultural entrepreneurship through interactions with entrepreneurs	VI. Individual/Group visit to some existing agricultural enterprise <ul style="list-style-type: none"> A. Meeting and interacting with graduates of agriculture who are engaged in agricultural-based/related enterprise B. Validating concepts of agricultural entrepreneurship through exposure to actual operations of a business enterprise 	Lecture with discussion; Site visit and interview with the entrepreneur; Student reporting	Laptop, LCD/TV, Service vehicle, documentation equipment	Quiz, graded recitation, reporting
Final Term Examination				



SUGGESTED REFERENCES:

Chatterjee, S. 2013. Simple rules for designing business models. *California Management Review*, 55(2), 97-124.

CLSU - Syllabus for the INTRODUCTION TO AGRICULTURAL ENTREPRENEURSHIP AND ENTERPRISE DEVELOPMENT

CMO # 14 series 2008 - Introduction to Enterprise and Entrepreneurship Central Bicol State University, Central Philippine University

Hindle, K., & Mainprize, B. 2006. A systematic approach to writing and rating entrepreneurial business plans. *The Jour Private Equity*, 9(3): 7-23.

Magretta, J. 2002. Why business models matter. *Harvard Business Review*,80(5): 86-92.

Porter, M. E. 1996. What is Strategy? *Harvard Business Review*. 74(6): 61-78.

Ries, E. 2011. *The lean startup: How todays' entrepreneurs use continuous innovation to create radically successful businesses*. New York: Crown Business.

Velasco, C.V. & Rafael, P.J. 2017. *Introduction to Agricultural Entrepreneurship and Enterprise Development*. Nueva Ecija: CLSU Printing Press

COURSE TITLE	INTRODUCTION TO AGRICULTURAL POLICY AND DEVELOPMENT			
COURSE NO.:				
COURSE DESCRIPTION	Formulation and evaluation of policies, the policy making process, description and analysis of policies and programs affecting agriculture and development and the political aspects of agricultural decisions			
COURSE CREDIT				
CONTACT HOURS/WEEK	3 hours lecture			
PREREQUISITES	GE 7 - Science, Technology and Society			
COURSE OUTCOME	TOPICS	TEACHING AND LEARNING ACTIVITIES	RESOURCES	ASSESSMENT TASKS
Explain the basic concepts of public policy and agricultural development	I. Basic Concepts of Public Policy and Development a. Definition of terms 1. Policy, public policy, agricultural policy 2. Development, sustainable economic development b. Sustainable development perspectives c. Problem arising from agricultural production	Lecture with discussion; Class participation; Student reporting	Laptop, LCD/TV	Quiz, graded recitation, reaction paper



	<ul style="list-style-type: none"> 1. Role of agriculture in economic development 2. The interrelationship of agriculture, development and environment d. Critical issues that need to be addressed 			
Analyze the evolution and formulation of policies, policy making process and advocacy	<ul style="list-style-type: none"> II. The Policy Making Process a. Policy formulation b. Policy making process and practice <ul style="list-style-type: none"> 1. Characteristics of policy making process 2. Dimension of policy making process c. Institutions/sectors involved in the policy making process d. The role of economist in the policy making process e. Policy advocacy 	Lecture with discussion; Class participation; Student reporting	Laptop, LCD/TV	Quiz, graded recitation, reaction paper

Explain the extent of government interventions affecting agricultural development	III. Agricultural Incentives and Protection <ol style="list-style-type: none"> a. Price interventions and protectionist policies b. Empirical measures of protection c. Consequences of agricultural incentives and protection 	Lecture with discussion; Class participation; Student reporting	Laptop, LCD/TV	Quiz, graded recitation, reaction paper
Analyze the agricultural policies and programs in the Philippines	IV. Agricultural Policies and Programs in the Philippines <ol style="list-style-type: none"> a. Agrarian reform b. Credit and financial policies c. Pricing, marketing, and post-harvest d. Research and development e. Cooperative development program f. Biotechnology g. AFMA h. Trade: GATT-UR-WTO i. Other related recent policies and programs 	Lecture with discussion; Class participation; Student reporting	Laptop, LCD/TV	Quiz, graded recitation, reaction paper
Evaluate the political aspects of agricultural policies	V. The Political Aspects of Agriculture Policy <ol style="list-style-type: none"> a. The political market for policies b. Demand and supply side explanation for weak agricultural policies in developing countries c. Reasons for strong agricultural protection in developed countries 	Lecture with discussion; Class participation; Student reporting	Laptop, LCD/TV	Quiz, graded recitation, reaction paper

SUGGESTED REFERENCES:

CMO # 14 series 2008 - Agricultural Policy and Development Central Luzon State University, Central Philippine University

Ellis, F. 1992. Agricultural Policies in Developing Countries (Wye Studies in Agricultural and Rural Development) 1st Ed. 372 pages. Cambridge Univ Press. ISBN-10: 0521395844.

Handbook of Research on Agricultural Policy, Rural Development, and Entrepreneurship in Contemporary Economies. www.researchgate.net. Publication no 337 869 033

Norton, R.D. 2004. Agricultural Development Policy: Concepts and Experiences. UN Food and Agriculture



Organization, Rome Italy. 528 pages.

Pabuayon, I, S.P. Catelo, A.C. Rola and T.B.Paris, Jr. 2017. Agricultural Policy: perspectives from the Philippines and other developing countries. UP Press.

Tweeten, L. and D.D. Badger. 1989.Agricultural Policy Analysis Tools For Economic Development (Westview Studies in Agriculture Science and Policy) 1st Ed, Westview Press. ISBN-13: 978-0813377469

Vasile Andrei, J,J. Subic, A. Grubor and. Privitera. 2019. Handbook of Research on Agricultural Policy, Rural Development, and Entrepreneurship in Contemporary Economies. 420 pages. Business Science Reference, ISBN 1522598391

COURSE TITLE				
COURSE NO.:				
COURSE DESCRIPTION				
Interactions of all activities and factors affecting the sourcing of inputs, production activities for farm commodities and other products derived from them, and their distribution in the global market considering the socio-cultural, political, economic, environment, and development landscape of the country.				
COURSE CREDIT				
3 units				
CONTACT HOURS/WEEK				
3 hours lecture per week				
PREREQUISITES				
- Entrepreneurial Mind - Principles of Agricultural Entrepreneurship and Enterprise Development				
COURSE OUTCOME	TOPICS	TEACHING AND LEARNING ACTIVITIES	RESOURCES	ASSESSMENT TASKS
Analyze the role of agribusiness in the development of an agricultural commodities	I. Agribusiness in Retrospect a. The growth and development of Agribusiness b. The agribusiness system concepts c. The agribusiness enterprise development d. Growth trends and prospects in the food sector	Lecture with discussion; Class participation; Student reporting	Laptop, LCD/TV	Quiz, graded recitation, reaction paper
Evaluate and analyze the interrelationship of the different segments of a commodity system affecting the overall operations of agricultural enterprises	II. Commodity System Analysis (Supply Chain Analysis) a. The input sub-system b. Production sub-system c. Processing sub-system d. Marketing sub-system e. Support sub-system	Lecture with discussion; Class participation; Student reporting	Laptop, LCD/TV	Quiz, graded recitation, reaction paper
Establish and assess commodity / industry	III. Industry Situationer/Industry Case Studies	Lecture with discussion; Class	Laptop, LCD/TV, samples of	Quiz, graded recitation, reaction



situationer case approach	thru study	a. Guidelines in conducting a case study analysis b. Presentation of sample commodity/ industry case analysis c. Analysis of commodity/industry case study	participation; Student reporting	industry/commo dity case studies	paper
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SUGGESTED REFERENCES:

CMO # 14 series 2008 - Agribusiness Commodity System

Dy, Rolando T. et al. 2003. Agribusiness Management: Approach. SEAMEO SEARCA

Dy, Rolando T. 2012. The Business of Agribusiness, University of Asia and the Pacific

Dy, Rolando T. 1990. Agribusiness Concept and Dimension: An Agribusiness Seminar Paper

Bockel, L. and Tallec, F. 2005. Commodity Chain Analysis (Constructing the Commodity Chain Functional Analysis and Flow Charts. Food and Agriculture Organization of the United Nations, FAO

Phillips, John C. and Peterson, Christopher H. 2004. Product Differentiation and Target Marketing by Agriculture Producers. Journal of the ASFRMA.



OTHER REQUIRED COURSES

COURSE TITLE	NATURAL RESOURCES AND ENVIRONMENTAL MANAGEMENT			
COURSE NO.				
COURSE DESCRIPTION	Sustainable management of natural resources and the environment with focus on land and water for the production of agricultural crops and raising of animals for food security.			
COURSE CREDIT	Three (3) units			
CONTACT HRS/WK	3hrs/week			
PREREQUISITES	Soil Science 1, Crop Science 1, and Animal Science 1			
COURSE OUTCOME	TOPIC	TEACHING AND LEARNING ACTIVITIES	RESOURCES	ASSESSMENT TASKS
	MODULE 1- PRINCIPLES AND CONCEPTS OF ENVIRONMENTAL SCIENCE AND ECOLOGY	Lecture with discussion using powerpoint	LCD/TV monitor, laptop	Homework/term paper
Define and explain the basic terms related to natural resources management	1.1 Definition of terms <ul style="list-style-type: none"> • Natural resources • Environmental Science • Environmental Management • Natural Resource Management (NRM) • Integrated Natural Resources Management • Integrated Watershed Management • Community-based NRM 			
Understand the various ecological concepts and principles of environmental science	1.2 Ecological principles and concepts 1.3 Principles of environmental science 1.4 Relationships between the different components of the environment and the ecosystem			



	MODULE 2 – ECOSYSTEMS GOODS AND SERVICES	Lecture with discussion; field exposure for agroecosystem analysis	LCD/TV monitor, laptop Field	Quiz and report on a case study about agro-ecosystem; AESA report
Classify and compare agroecosystems, and identify goods and services provided by the ecosystems Conduct an agroecosystem analysis (AESA) for the development of a sustainable agroecosystem	2.1 The Agro-ecosystem and other related Ecosystems 2.2 Goods from the ecosystem 2.3 Services provided by the ecosystem 2.4 Agro-ecosystems Analysis (AESA) 2.5 Developing a sustainable agro-ecosystem			
	MODULE 3 – MANAGEMENT OF LAND AND WATER RESOURCES:	Lecture with discussion using powerpoint; field exposure to various soil health problems; determination of water quality	LCD/TV monitor, laptop,	Home-work/term paper, Long examination
Design land and water resources management plan using a case study with focus on the following: - soil health enhancement -water conservation measures Evaluate various aspects of watershed management plan using a case study with emphasis on soil and water conservation	3.1 Land and soil resources management • Good land husbandry • Soil health management 3.2 Water resources management • Threats to water resources • Water quality enhancement 3.3 Watershed management: The 3Rs (Resistance, Resiliency and Restoration)			
	MODULE 4 – MANAGEMENT OF PLANT AND ANIMAL RESOURCES			
Assess an existing	4.1 Biodiversity and plant	Lecture with		

biodiversity conservation and management plan to identify best management practices adaptable to the province/ country	resources management 4.2 Biodiversity loss and conservation 4.3 Plant resources management 4.4 Animal resources management	discussion using powerpoint; field exposure to conduct vegetation inventory and assessment;		
	MODULE 5 – SUSTAINABLE DEVELOPMENT AND NATURAL RESOURCES MANAGEMENT	Lecture with discussion using powerpoint; reflection on sustainable development papers	LCD/TV monitor, laptop,	
Apply scientific and technical information in the preparation of a sustainable agriculture and development plan of a community	4.1 Pillars of sustainable development 4.2 Measures of sustainable development			
	4.3 Sustainable agriculture and rural development (SARD)		LCD/TV monitor, laptop	Quiz, graded recitation, home-work/term paper, term examination
	4.4 Reporting of formulated plans			NRM Management Plan

SUGGESTED REFERENCES:

- Blokdajh and Gerardus. 2017. Environmental Management System, A Complete Guidebook. ebay. UK.
- CRS and MEAS. 2015. Managing Natural Resources; A Smart Skills Manual. Catholic Relief Services, Baltimore, MD.
- Krishna, I.V.M. and V. Manickam. 2017. Environmental Management, Service and Engineering for Industry. Butterworth-Heinemann, USA.
- Russo, M.V. 2008. Environmental Management Readings and Cases, 2nd ed. SAGE Publication.
- Theodore, M.K. and L. Theodore. 2009. Introduction to Environmental Management. CRC Press.
- USIP. 2007. Natural Resources, Conflict and Conflict Resolution. Washington D.C. UNEP. 2014. Towards Integrated Water Resources Management International experiment in development of river basin organizations.
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COURSE TITLE	BENEFICIAL ARTHROPODS AND MICROORGANISMS			
COURSE NO.				
COURSE DESCRIPTION	Concept agro-ecosystem and the natural balancing mechanism as affected by beneficial arthropods and microorganism. Biology and ecology important biological control species and methods of mass production and field releases			
COURSE CREDIT				
CONTACT HRS/WK	3hrs/week			
PREREQUISITES				
COURSE OUTCOME	TOPIC	TEACHING AND LEARNING ACTIVITIES	RESOURCES	ASSESSMENT TASKS
Describe the biological world and its balancing mechanism of an agro ecosystem	I. Introduction A. The biological world and its balancing mechanism B. Review of the agro-ecosystem concepts C. Review basic definition of pests and their characteristics. Factors that determine the existence of an organism in an agro-ecosystem	Lecture and power point presentation Exposure to agro-ecosystem situation	LCD and desktops / laptops Electronic copy of lecture	Quizzes / examination
Describe and characterize the groupings of biological control agents of important pest groups	I. Nature of Biological Control Agents A. Parasitoids, Pathogens and Predators of Insects and Vertebrate Pests B. Antagonist of Pathogens C. Biological control agents of weeds	Lecture with power point presentations Visit to museums (optional but will be helpful)	LCDs, desktops/ laptops Electronic copy of lecture Printed pictures and manuals	Quizzes and examinations
Describe and apply the concept of biological control	II. Concept of Biological Control of Agricultural Pests A. Definition and concept of biological control B. Unique characteristics of pests as it affects biological control strategies C. The host plant as important component of	Lecture with power point presentation		

	biological control - types of host plant resistance affecting pests			
Describe and utilize assessment methods of establishing efficacy for biological control	III. Assessment, mass production and field releases A. Assessment of parasitism B. Nutrition and mass production of biological control agents	Lecture and power point presentation Visit of HEIs biocontrol facility	LCD AND LAPTOP, copy of lectures	Quizzes and examinations
Evaluate nutritional requirements of biological control agents and formulate appropriate culture medium				
Describe and apply methods and approaches in biological control	IV. Methods and approaches in biological control A. Quarantine B. Enhancing natural population thru habitat modification C. Exclusion Field release of laboratory reared biocon agents	Lecture and power point presentation (farm visits maybe done if schedules and resources will allow)	LCD, LAPTOPS AND ECOPY OF LECTURE HEIs biological control facility if available optional farms with successful mass rearing and field releases of natural enemies	Quizzes, report on farm visit (optional) Examination

SUGGESTED REFERENCES:

Debach, P. H and D Rosen. 1991. Biological Control and Natural Enemies. 2nd Ed, London and New York Cambridge Univ Press. 440 p

Koni, K. L, L. Deogracias and J Ameno. 1993. Mass rearing and utilisation of diadem semiclausum. RP German Biological Plant Protection Project, Bu of Plant Industry 18p.

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Shepard, B. M, A.T. Barron and J A Litsinger. 1987. Friends of Rice Farmers : Helpful Insects, Spiders and Pathogens. International Rice Research Institute, College Laguna. 127 p.

COURSE TITLE		GENERAL PHYSIOLOGY AND TOXICOLOGY		
COURSE NO.				
COURSE DESCRIPTION		Comparative physiology and biology of pests groups, classification of pesticides, chemical and physical properties of pesticides and its appropriate use and management		
COURSE CREDIT		3 units		
CONTACT HRS/WK		3 lectures and 1 lab		
PREREQUISITES		Crop Protection 1 and 2		
COURSE OUTCOME	TOPIC	TEACHING AND LEARNING ACTIVITIES	RESOURCES	ASSESSMENT TASKS
Review of the basic concept of physiology and toxicology and the history of pesticide use	I. Introduction A. Definition of terms B. Concept of insect physiology and toxicology C. History of pesticide use - the pre and post <i>Silent Spring</i>	Lecture with power point presentation	LCD and desktops / laptops Electronic copy of lecture	Quizzes / examination
Discuss the various physiological processes affecting insects	II. Insect Physiology A. Insect growth, development and reproduction B. Metabolic systems of Insects C. Insect coordination and integration	Lecture with power point presentation reading assignments on some topics	LCDs, desktops/ laptops Electronic copy of lecture printed pictures and manuals	Quizzes and examinations
Describe, analyze and evaluate the pesticide R/D process in relation to product development	III. Pesticide Research, Development and Bioassay techniques A. The pesticide R/D process B. Data generation	Lecture and power point presentation and reading assignments on some topics	LCDs, desktops/ laptops Electronic copy of lecture Printed pictures	Quizzes, graded homework and laboratory visits



<p>Analyze the various types of pesticide bioassay techniques and apply these in product efficacy testing</p> <p>Explain profit analysis as an important tool in toxicological assay</p>	<p>and biosafety consideration</p> <p>C. Economic, environmental and legal aspects of pesticide use</p> <p>D. Types of pesticide assays and factors affecting effective bio efficacy testing</p> <p>E. The profit analysis</p>	<p>Optional is visit to HEIs pesticide laboratory if available</p> <p>Lecture with power point presentation and homework analysis of sample data</p>	<p>and manuals</p>	<p>Graded observation reports</p> <p>Graded homework</p> <p>Final examination</p>
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Gupta, P.K. 2016. Fundamentals of Toxicology. Essential Concepts and Applications 1st Ed., Elsevier publication. 422 pages. **Paperback ISBN: 9780128054260**

Gupta, P.K. 2018. Toxicology of Fungicides. *In: Veterinary Toxicology : Basic and Clinical Principles 3rd Ed, 569- 580 pp.*

Klaassen, C D. 2019. Casarett & Doull's Toxicology: The Basic Science of Poisons, 9th edition. New York : McGraw-Hill Education. ISBN 978-1-259-86374-5

Krieger, R. I. and W.C.Krieger (eds) 2001. Handbook of Pesticide Toxicology: Principles. 2nd Ed. Elsevier Inc, 1908 pages. ISBN 978-0-12-426260-7

Liu. N. 2008. Recent Advances In Insect Physiology, Toxicology And Molecular Biology. CRC Press. 208 pages, ISBN 8130802422, 9788130802428

Nation, J.L. 2015. Insect Physiology and Biochemistry. 3rd Ed, CRC Press. 690 pages. ISBN 9781482247589

Stenersen, J. 2004. Chemical Pesticides Mode of Action and Toxicology. 1st Ed, CRC Press. 296 pages, ISBN 9780748409105



ANNEX F

MINIMUM FIELD/PHYSICAL FACILITIES AND EQUIPMENT FOR BS AGRICULTURE

(with minimum of 50 students and increment pro-rated according to the number of students)

A. College Facilities and Equipment

1. Experiment farm (Lowland and Upland minimum of 6 ha)
2. Orchard 3 ha
3. Fruit crop nursery 1 ha
4. Working sheds
5. Green houses / screen houses (one each for Crop Science, Soil Science and Crop Protection; area requirement will come from the 6 ha experimental farm)
6. Buildings for poultry, swine and ruminants
7. Tool / Equipment room
8. Internet facility, multi-media equipment and computers that will support basics computer science courses (at least 1 computer per 5 students)
9. Analytical Laboratory depending on specialization
10. Basic agromet facility (rain gauge, wet and dry bulb, and min-max thermometer) or Automatic Weather Station (AWS) to be solicited from local PAG-ASA station

B. Laboratory facilities

1. Crop science – garden tools, sprayers, wheelbarrow, meter sticks, pruning shears, budding knives,
2. Crop protection - sprayer, triple beam balance, meter stick, nematode collecting funnel, test tubes, pipettes and automatic pippetor and Petri plates for isolation exercises, graduated cylinders
3. Animal science - weighing scale, holding pens, measuring tapes, caponizing set, egg color fan, yolk height meter, ropes
4. Soil science – weighing scale, drying oven, hydrometer, min max thermometer, pipettes, Petri dishes, graduated cylinders

C. General laboratory equipment/facilities (numbers of units depending on class size of the laboratory)

1. Microscopes
2. Photographic equipment
3. Soil Auger
4. Fume hood
5. Isolation chamber

D. Field equipment

1. Four-wheel tractor
2. Hand tractor (for small operations)
3. Power tiller
4. Native plough and harrow (optional)
5. Thresher motor-driven, 0.75 Hp 1
6. Seed blower motor-driven, 0.5 Hp 2
(locally-manufactured)



7. Sprayer knapsack type, 16 liters capacity	4
8. Shovel, spade, hoe and rake	10 each/section
9. Wheel barrow	3/section
10. Pruning saw and shear	10 each/section
11. Budding knife	10/section
12. Steel tape 150 m long, metric scale	3/section
13. Spring balance 25 and 50 kg capacity	1/section
14. Weighing scale 20-30 kg capacity, top loading	1/section
15. Water sprinkler 8-10 l capacity, plastic or Galvanized	10/section
16. Draft animal with sled carabao and/or cattle	1

E. Entrepreneurial Demonstration Facilities for Practicum

1. Minimum of 1 ha for crops
2. 1,000 heads of poultry
3. 10 sow level
4. 10 does
5. 10 cows

