



Bahir Dar University
College of Agriculture and
Environmental Science

Department of Animal Production and
Technology

Course Catalogue for the Degree of
Master of Science in “Animal Genetics
and Breeding”

May 2009



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Address of the Department

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Department of Animal Production and Technology

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Contents

Contents	iii
1. Background	i
2 Rationale	ii
3 Program objectives.....	ii
4 Staff profile	iii
5 Graduate profiles.....	iii
6. Academic Requirements	iv
6.1 Duration of the study	iv
6.2 Assignment of course codes.....	iv
6.3 Assessment and evaluation	v
6.4 Degree Nomenclature	v
6.5. Admission Requirements	vi
6.6 Graduation Requirements	vi
7 List of Courses	vii
8 Course Break Down.....	viii
9 Course Descriptions	xi

1. Background

Ethiopia has an agriculture-based economy from which close to 85% of the population derives their livelihood; as a result of this, the country follows agriculture led – industrialization. For the achievement of such policy, the role of animals is believed as it takes the major contribution.

Though the country has huge animal genotype in terms of number and type in the continent, it has not attained food self-sufficiency.

Bearing this fact, the department of Animal Production and Technology (the Previous Animal Science and Technology) which is faculty of agriculture and environmental science, Bahir Dar University had been launched in 2005/2006 academic year to produce animal scientist at under graduate level. After two years (in 2007/2008), it started to train students in post graduate program under the specialization of Animal Production. Till then, the department has shown good encouragement by contributing its own share in providing professionals for the country.

One of the critical problem of the country in the un proper utilization of the animal genotype is insufficient number of professional who had been trained (who specialized) in Animal Genetics and breeding. A good indicative for this is, the number of graduates till 2007 at National level was not higher than 30 and out of this 17 of them was graduate at Haromay (the previous Alemaya) university (personal communication Haromaya University Registrar). To maximize the productivity of the livestock, the country needs highly trained manpower which is currently in short supply. The graduates of this program would be absorbed in the general agricultural economy of the country, improve the research capacity of the university and research institutes, and aid the staff development program of institutions. In line of this, the new discipline is believed in solving the problem. It has also a direct impact in fulfilling and achieving vision and mission of the university in particular.

2 Rationale

As it is clearly stated in the background above about the current short supply of trained manpower, this curriculum has been produced for Bahir Dar University after a rigorous review of MSc in Animals Genetics and Breeding programs offered by local, other African and overseas Universities. It has been tailored to suit the particular circumstances and expectations of the stakeholders of Bahir Dar University in the context of its critical importance in the Amhara region. The curriculum is highly purposive, research supported practice oriented and relevant to developmental needs of the country in general and the Amhara region in particular.

3 Program objectives

The main objectives of the program is to produce qualified and competent professionals, well versed in livestock breeding skills so that they can play crucial roles in developing livestock development options, research projects and strategies aimed at solving problems associated with animal breeding thereby to improve the living standard of the rural population.

4 Staff profile

No.	Name	Qualification	Academic rank	Area of research	E-mail Address
1	Zelege Mekuriaw	PhD	Ass.Prof	Reproductive Physiology	zelekemekuriaw@yahoo.co.uk
2	Firew Tegegn	PhD	Ass.Prof	Animal Nutrition	firewtegegne@yahoo.co.uk
3	Mussie H/Meleket	DVM-MSc	Ass.Prof	Tropical Animal Health	musiehailu@yahoo.com
4	Getinet Mekuriaw	MSc	Lecturer	Animal Genetics and Breeding	g_mekuriaw@yahoo.com
5	Assaminew Tassew	MSc	Lecturer	Animal Production	atasew2005@yahoo.com

5 Graduate profiles

One of the major factors which the country is unable to utilize the huge livestock population is the absence or insufficient number of well trained manpower in this area of specialization. As a result of this no more improvement has been observed in the livestock production and productivity and the husbandry practice in general. If one may observe at ranches, farms and other livestock producing areas, the husbandry practice is usually going on by non animal geneticist and breeders. Similarly, researchable issues in regard to livestock genetics and breeding have been tried to address by any livestock production professionals so long. From this, one can imagine that to what extent those research agendas were addressed. Therefore, equipped with the necessary knowledge and skills, the graduates of this program will be engaged in research centers as researchers, able to work as livestock producers, experts at various levels and consultants for various regional and national governmental and non-governmental institutions and private industries involved in the livestock industry. They are also expected to work in

colleges, Universities and/or agriculture curriculum development centers and breeding policy and/or strategy development issues.

6. Academic Requirements

6.1 Duration of the study

The MSc program is a two-year program for regular students and a three-year program for summer students. Regular and summer students will have one year (2 semesters) and two years (two summers), respectively, taught course and one year for a research project in a specific area of specialization.

6.2 Assignment of course codes

The course is coded with four letters. The four letter abbreviation shows the field of specialization /source/ of the courses, the first number shows the year of the study, the second number shows the course type and the third number shows the semester. Even numbers at the end of the course code show second semester course and odd numbers denote courses that are offered in the first semester. The assignment of the numbers to represent course type as follows:

- 0 = Molecular Genetics, Quantitative Genetics
- 1 = Advance Animal Reproductive Physiology, Advanced biochemistry,
Advanced Animal Physiology
- 2 = Advanced Biometrics in Animal Science, Advanced Animal Breeding,
Population Genetics
- 3 = Advanced Meat Production, Advanced Dairy Production, Animal Genetic
Resource and Conservation, and Biotechnology in Animal Breeding.
- 4 = Current Topics in Animal Genetics and Breeding, Seminar in Animal
Genetics and Breeding, and MSc Thesis research.

6.3 Assessment and evaluation

Graduate student progress is assessed regularly and formally by the faculty through assigned department supervisors. The assessments focus on both completion of coursework and the development of professional skills in research, scientific writing and service through the following methods:

- Coursework
 1. Assignments
 2. Tests
 3. Quizzes
 4. Mid-semester examination
 5. Final semester examination
 6. Seminars
- Practical courses
 1. Laboratory reports/field reports
 2. Practical examination
 3. Written examination
- Thesis, seminars and reports presentation
 1. Quality of paper presented
 2. Way of presentation
 3. Defending material presented

6.4 Degree Nomenclature

The degree conferred on successful candidates will be called in English: THE DEGREE OF MASTER OF SCIENCE IN “ANIMAL GENETICS AND BREEDING”; in Amharic: **ፆግስተርስ ት-ፎ በ"እንስሳት ስነ-ፈጠራ እና ዝርያ ማሻሻያ"**

6.5. Admission Requirements

Applicants must have completed the academic requirements for the Bachelor's degree in Animal Science, Biology or other related sciences from accredited higher learning institutions. The candidate must pass qualifying (entrance) examination of the University. He/she must be supported by at least three letters of recommendation preferably from the candidates undergraduate instructors, employers and professional associations. Non-animal Science or non-animal science majors admitted to the program may be required to take some prerequisite courses from the undergraduate program. These courses will be worked out by the department Graduate committee and approved by the graduate faculty based on the BSc. credentials of the student.

6.6 Graduation Requirements

The Master of Science degree program in Animal Genetics and Breeding has a course work requirement of at least 30 credits and six credits of research work on which a thesis must be written and defended successfully. The students must score a minimum CGPA of 3.00 and successfully defend the Thesis. 'F' grade cannot provide a student to graduation.

7 List of Courses

Course Code	Course Title	Credit Hours	Remark
Angb601	Molecular Genetics	4	
Angb611	Advanced Animal Reproductive Physiology	3	
Anpt611	Advanced Animal Physiology	3	
Angb621	Advanced Biometrics in Animal Science	4	
Angb624	Population Genetics	2	
Angb622	Advanced Animal Breeding	3	
Angb602	Quantitative Genetics	3	
Angb636	Biotechnology in Animal Breeding	2	
Angb638	Animal Genetic Resource and Conservation	2	
Angb741	Current topics in Animal Genetics and Breeding	1	
Angb742	Seminar in Animal Genetics and Breeding	1	
Angb743	MSc Thesis Research	6	
Total		34	

Elective Courses

Angb636	Advanced Meat Production (E)	2	
Anpt638	Advanced Dairy production (E)	2	

8 Course Break Down

A. Regular program

Year I: Semester I

Course Code	Course Title	Credit Hours	Remark
Angb601	Molecular Genetics	4	
Angb611	Advanced Animal Reproductive Physiology	3	
Anpt611	Advanced Animal Physiology	3	
Angb621	Advanced Biometrics in Animal Science	4	
Total		14	

Year I: Semester II

Course Code	Course Title	Credit Hours	Remark
Angb622	Advanced Animal Breeding	3	
Anpt636	Advanced Meat Production (E)	2	
Anpt638	Advanced Dairy production (E)	2	
Angb602	Quantitative Genetics	3	
Angb636	Biotechnology in Animal Breeding	2	
Angb638	Animal Genetic Resource and Conservation	2	
Angb624	Population Genetics	2	
Total		14	

Year II: Semester I

Course Code	Course Title	Credit Hours	Remark
Angb741	Current topics in Animal Genetics and Breeding	1	
Angb743*	MSc Thesis Research	6	
Total		7	

Key: *= Students should register this course in the second semester too.

Year II: Semester II

Course Code	Course Title	Credit Hours	Remark
Angb742	Seminar in Animal Genetics and Breeding	1	
Angb743	MSc Thesis Research	6	
Total		7	

B. Summer Program**Year I: Summer I**

Course Code	Course Title	Credit Hours	Remark
Angb601	Molecular Genetics	4	
Anpt611	Advanced Animal Physiology	3	
Angb621	Advanced Biometrics in Animal Science	4	
Total		11	

Year I: Distance I

Course Code	Course Title	Credit Hours	Remark
Anpt636 or Anpt638	Advanced Meat Production (E) or Advanced Dairy production (E)	2	
Angb638	Animal Genetic Resource and Conservation	2	
Angb624	Population Genetics	2	
Total		6	

Year I: Summer II

Course Code	Course Title	Credit Hours	Remark
Angb622	Advanced Animal Breeding	3	
Angb611	Advanced Animal Reproductive Physiology	3	
Angb602	Quantitative Genetics	3	
Angb636	Biotechnology in Animal Breeding	2	
Total		11	

Year II: Distance II

Course Code	Course Title	Credit Hours	Remark
Angb741	Current topics in Animal Genetics and Breeding	1	
Angb742	Seminar in Animal Genetics and Breeding	1	
Angb743	MSc Thesis Research	6	
Total		8	

Year III: Summer III

Course Code	Course Title	Credit Hours	Remark
Angb743	MSc Thesis Research	6	
Total		6	

9 Course Descriptions

Course Title: Molecular Genetics

Course Code: Angb 601

Credit Hour: 4

Course description: DNA structure and analysis. Structure of RNA molecule. Genes and biological information: Organization of genes on DNA molecules. DNA replication. Eukaryotic DNA synthesis. Genetic code: characteristics and nature of genetic code, RNA polymerase, transcription in Eukaryotes, translation and protein synthesis, translation in Eukaryotes. Regulation of gene expression: Genetic regulation in Prokaryotes, regulation of lactose in E-coli, genetic regulation in Eukaryotes. Gene mutation: classification of mutation, molecular basis of mutation. DNA amplification, DNA repairing, transposable genetic elements. Genome: genome analysis, anatomy of prokaryotic and eukaryotic genomes, genome evolution, multi-gene families. Gene mapping and sequencing, molecular markers. Genetic disorder. Genetic basis of cancer: The cell cycle and cancer, tumor suppressor genes, Oncogenes, genetic model of cancer. Introduction to bioinformatics.

Course Title: Advanced Animal Reproductive Physiology

Course Code: Angb 611

Credit Hour: 3

Course description: Reproductive system: Male and female reproductive physiology and systems of farm animals. Hormone control of reproductive process-estrus cycle Oogenesis, spermatogenesis, fertilization, implantation, pregnancy, gestation and parturition. Artificial insemination: semen collection and processing, evaluation of male based on semen quality. Altering the reproductive process: Synchronization, super ovulation and embryo transfer technology. Estrus control and controlled breeding. Reproductive failure: genetic, anatomical and physiological causes. Reproductive efficiency.

Course Title: Advanced Animal Physiology

Course Code: Anpt 611

Credit Hour: 3

Course description: Physiology of circulatory, digestive, respiratory, urinary, neuromuscular, and reproductive systems of important domestic animals. The direct and indirect effects of physical factors on physiological process and productivity of animals. Bioclimatic effect on growth, production and reproduction of livestock. Fluid and electrolyte balance, acid-base balance. Thermoregulation, acclimation and acclimatization to different environmental conditions. Analysis of mechanisms of adaptation to direct and indirect environmental conditions. Analysis of mechanisms of adaptation to direct and indirect environmental stress of animals.

Course Title: Advanced Biometrics in Animal Science

Course Code: Angb621

Credit Hour: 4 (3+3)

Course description: Probability and probability distribution. Sampling and sampling distribution, testing of hypothesis based on z, t and chi-square and F -distribution. Models and analysis of variance, assumptions of analysis of variance and their tests, alternatives in case of failures of assumptions. Correlation, linear regression and related tests. Rank and intra-class correlation, partial correlation, multiple regression and associated test. Non linear regression. Principles of field experimentation, CRD, RCBD, Split plot, Latin square designs, Switch over design, incomplete block designs. Factorial experiment. Confounding and transformation. Different animal models used in analysis of variance. BLUP Animal Model, Analysis of non orthogonal animal data, planning of animal experiments. Matrix and generalized inverse of matrices. Regression models, variance component estimation, illustrative examples from animal science experiments. Introduction to multivariate analysis: PCA, discriminate analysis, factorial analysis. Vectors: Vectors in R^n , vector algebra, Norm of vector, orthogonal projections, cross and triple products and their applications. Matrices: definition of matrices, types of matrices (square, identity, triangular); transpose of matrix, symmetric and skewed symmetric matrices; algebra of matrices, inverse of matrix. Polynomial of matrices and linear maps, diagonalization

of matrices. Algebraic transformation. All models and designs should be supported with appropriate statistical soft wares as practical.

Course Title: Population Genetics

Course Code:-Angb624

Credit Hour: 2

Course description: Populations and genetic pools, Theory of probabilities, Allelic frequencies, Hardy-Weinberg law and its extensions, Changes in gene frequencies, gene frequencies of sex linked genes, Factors affecting gene frequencies, in a population: Natural selection, migration, genetic drift, non-random mating. Population values and means.

Course Title: Advanced Animal Breeding

Course Code: Angb622

Credit Hour: 3

Course description: Constraints in livestock breeding in the tropics, reproduction fertility, sterility and their genetic basis. Sources of variation: Genetic variation, environmental variation, interaction and correlation between genetic with environment. Growth, milk, meat and egg production and their genetic basis. Performance evaluation of indigenous and exotic breeds and their crosses, genetic improvement tools: selection and mating systems, prediction and measurement of genetic gain, selection index theory. Field and modern recording systems for growth, egg, milk, meat production and their application. Native breed performance, scope and methods of improvement. Introduction of improved exotic breeds-choice of breed, selection criteria, interpretation of performance records of different countries. Precautions and procedure of importation. Breeding plans for the tropics-production environment, objective, traits, structure, organization, people's participation and constraints. Village breeding scheme. Group breeding program. Nucleus herd breeding. New breed formation. Hereditary defects. Breeding for disease resistance, heat tolerance and adaptation.

Course Title: Quantitative Genetics

Course Code: Angb602

Credit Hour: 3

Course description: Quantitative variables, Quantitative inheritance: Multiple alleles inheritance, calculating numbers of genes, significance of polygenic inheritance. Threshold traits, Analysis of polygenic traits: Mean, standard deviation, standard error, residual effect, regression, correlation. Analysis of quantitative characters, Genetic progress: Heritability, selection differential and selection intensity, genetic gain, breeding value, Most probable production Ability (MPPA). Repeatability, Heterosis, Coefficient of inbreeding, coefficient of relationship. Variance component and estimation and various models, analysis of breeding data, introduction to Bayesian statistics.

Course Title: Biotechnology in Animal Breeding

Course Code: Angb 636

Credit Hour: 2

Course description: Introduction: The basic tools for genome analysis. Molecular technology. Methods of gene isolation. Genetic engineering: insertion of foreign DNA and, gene transfer. Evaluation and dissemination of transgenic in animal production. Biochemical and DNA polymorphism. QTLs (Quantitative Trait Loci), Marker genes and gene mapping. Marker assisted selection in animal breeding. PCR; Embryo manipulation. Embryonic stem cells and its application in animal breeding.

Course Title: Animal Genetic Resource and Conservation

Course Code: Angb 638

Credit Hour: 2

Course description: Evolution and history of domestic livestock. Diversity of livestock (Genetic resources diversity). Livestock evolution and development trend in Africa and the world. History of development of some breeds: Holstein-Friesian, Boar goat, Merino sheep etc. Indigenous animal genetic resources of Ethiopia. Necessity and principles of characterizing, documenting and assessing of livestock diversity. Techniques for analysis and characterization. Genetic effects of decreasing population size. Genetic erosion. Conservation of animal genetic resources: In situ and Ex situ conservation, cryopreservation. Proper utilization of animal genetic resources. International and national patenting laws.

Course Title: Advanced Meat Production (E)

Course Code: Anpt 636

Credit Hour: 2

Course description: Diversity of meat sources and consumption; description and evaluation of various meat production systems. Constraints for improvement of meat production in the tropics; improvement through range, feedlot, nutrition, management and breeding of cattle, sheep and goat. Physical evaluation of slaughter animals. Carcass and meat characteristics and quality evaluation. Meat as a product and factors affecting meat. Live animals, meat and meat product trade and marketing.

Course title: Advanced Dairy production (E)

Course Code: Anpt 638

Credit Hour: 2

Course description: Milk production national and international situation. Role of cattle, camel, goat and sheep in milk production. Milk production systems in the tropics. Recent practices of optimization immune-competency of young stock, growth rate and puberty. Pre and post parturition practices to maximize reproduction and milk production. Principles of replacement and culling. Housing, equipment and management in warm climates. Modern milking management- milking methods, milk quality, handling and marketing. Maintenance of herd health and productivity. Small and large scale commercial dairying project proposal, establishment and expansion. Administration- technical and financial records. Efficiency utilization of land, labor, feed and fodder. Technical and financial evaluation of dairy enterprise.

Course Title: Current Topics in Animal Genetics and Breeding

Course Code: Angb741

Credit Hour: 1

Course description: Supervised study on advanced topics of current importance in animal genetics and breeding or related topics that are not discussed in the program and which must be approved by the DGC. Students present seminars based on literature review research so that they

will be exposed to the methodology of the preparation and presentation of scientific papers and be acquainted with ongoing issues of animal genetic resource conservation and sustainable uses.

Course Title: Seminar in Animal Genetics and Breeding

Course Code: Angb742

Credit Hour: 1

Course description: Progress report on thesis research will be presented in the form of seminar.

Course Title: MSc. Thesis research

Course Code: Angb743

Credit Hour: 6

Course description: The graduate student undertakes an independent original research on a topic relevant to Ethiopian animal breeding system under the supervision of a major advisor in the field of study. The topic and plan of study is to be determined by the student and his advisor, but it should be in the area of courses which they took during their course work and the research is designed to include thesis presentation and open defense as partial requirement for the MSc. Degree.

BAHIR DAR UNIVERSITY

Master of Science in Agriculture (Animal Production)



Bahir Dar University
Faculty of Agriculture and Environmental Sciences
Department of Animal Science and Technology

January, 2008

Table of Content

1	Background	
2	Rationale	
3	Program Objectives	
4	Staff Profile	
5	Graduate Profile	
6	Academic Requirements	
6.1	Admission Requirements	
6.2	Duration of Study	
6.3	Assignment of Course Code	
6.4	Assessment and Evaluation	
6.5	Graduate Requirement	
6.6	Degree Nomenclature	
7	List of Courses	
8	Course Break Down	
9	Course Description	

Background

Ethiopia has an agriculture-based economy from which close to 85% of the population derive their livelihood. However, the Country has not attained food self-sufficiency despite having the highest number of cattle on the African Continent. The Country is also blessed with various species of livestock whose productivity are regarded as low.

The Amhara region in which Bahir Dar University is situated has one of the largest animal population. Livestock production, however, is done with only traditional practices and is impeded with many constraints.

To maximise the productivity of the livestock, the country needs trained Manpower which is currently in short. Bahir Dar University there fore intends to do its part in reducing the critical shortage of manpower by introducing the Master of Science Degree in Animal Production. The graduates of this program would be absorbed in the general agricultural economy of the country, improve the research capacity of the university and aid the staff development program of institutions

2. Rationale

After a rigorous review of MSc in Animal Production Programs offered by local, Other African and overseas Universities, this MSc animal Production program has been produced for Bahir Dar University. The curriculum has been tailored to suit the particular circumstances and expectations of the stakeholders of Bahir Dar University in the context of its critical importance in the Amhara region. The curriculum is highly purposive, research supported, practice oriented and relevant to the developmental needs of the country in general and the Amhara region in particular.

The areas of specialization would include animal nutrition (covering all farm animal species), animal breeding and reproduction and general animal production focused on smallholder agriculture. The topics to be chosen by the students will be related to their own interest, regional and national agenda but the academic supervisor(s) would be consulted throughout the study to ensure the required quality is attained.

3 Programme Objectives

The main objective of the program is to produce qualified and competent professionals well versed in livestock management skills so that they can ply crucial roles in developing livestock development options and research projects and strategies aimed at solving problems associated with animal products and productivity thereby to improve the living standard of the rural population.

4. Staff Profile

S. No	Name	Rank	Qualification	Area of Research
1	Zelege Mekuriaw	Ass. professor	BSc MSc PhD	Animal Science Animal Production Reproductive Physiology
2	Mussie Hailemekot	Ass. professor	DVM MSc	Veterinary Medicine Tropical Vet. Medicine
3	Firew Tegegne	Ass. Professor	BSc MSc PhD	Applied Biology World Animal Production Animal Nutrition
4	Raubel Moya Ricardo	Ass. Professor	BSc MSc	Animal Nutrition
5	Yshanbel Mekuriaw	Lecturer	BSc MSc	Animal Science Animal Production
6	Kefyalew Alemayehu	Lecturer	Msc	Animal Nutrition

5 Graduate Profile

Equipped with the necessary knowledge and skills, the graduates of this program will be able to work as livestock producers, experts, researchers and consultants for various regional and national governmental and nongovernmental institutions and private industries involved in the livestock industry. They are also expected to work in Colleges, Universities and/or agriculture curriculum development centres.

6. Academic requirements

6.1 Admission requirements

Applicants must have completed the academic requirements for the Bachelor's degree in Animal Science, Biology or other related sciences from accredited higher learning institutions.

The candidate must pass qualifying (entrance) examination of the University. The candidate must be supported by at least three letters of recommendation preferably from the candidate under graduate instructors, employers and professional associations.

Non-animal science majors admitted to the programme may be required to take some prerequisite courses from the undergraduate program. These courses will be worked out by the department Graduate committee and approved by the graduate faculty based on the BSc. Credentials of the student

6.2 Duration of the study

The MSc program is a **two-year** program for regular students and a **Four-year** program for summer students. Regular and summer students will have one year (**2 semesters**) and three years (**3 summers**), respectively, taught course and one year for a research project in a specific area of specialization.

6.3 Assignment of course codes

The course is coded with four letters. The four letter abbreviation shows the department, the first number shows the year of the study, the second letter shows the course type and the third number shows the semester. The assignment of the numbers to represent course type as follows:

0 = Advance Animal Nutrition and Advanced Forage Production and Range Management

1= Advanced Animal Physiology, Advanced Biochemistry and farm Animal Diseases and Management

2 =Advanced Biometrics Advanced Animal Breeding,

3 = Advanced Meat Production, Advanced Processing of Animal Products and

Advanced Apiculture, Advanced Dairy Production.

4 = Current Topics in Animal Production, Seminar in Animal Production and Thesis.

The even number at the end of the course code shows second semester course and the odd number denotes course that are offered in the first semester.

6.4 Assessment and evaluation

Graduate student progress is assessed regularly and formally by the faculty through assigned department supervisors. The assessments focus on both completion of coursework and the development of professional skills in research, scientific writing and service through the following methods:

- Coursework

1. Assignments
2. Tests
3. Quizzes
4. Mid-semester examination
5. Final semester examination
6. Seminars

- Practical courses

1. Laboratory reports/field reports
2. Practical examination
3. Written examination

- Thesis, seminars and reports presentation

1. Quality of paper presented
2. Way of presentation
3. Defending material presented

6.5 Graduation Requirements

The Master of Science degree program in Animal Production has a course work requirement of at least 31 credits and six credits of research work on which a Thesis must be written and

defended successfully. The students must score a minimum CGPA of 3.00 and successfully defend the Thesis.

6.4 Degree Nomenclature

The degree conferred on successful candidates will be called in English: THE DEGREE OF MASTER OF SCIENCE IN AGRICULTURE (ANIMAL PRODUCTION); in Amharic: "ግላዎች ስርዓት ለግብርና ሣይንስ (በእንስሳት ስርዓት)".

7. List of Course

Course code	Course Title	Credit Hours
Anst 601	Advanced Animal Nutrition	3
Anst 603	Advanced forage Production & Range Management	3
Anst 611	Advanced Animal Physiology	3
Anst 613	Advanced Biochemistry	3
Anst 615	Farm Animal Diseases and Management (E)	3
Anst 621	Advanced Biometrics	3
Anst 622	Advanced Animal Breeding	3
Anst 632	Advanced Processing of Animal Products	2
Anst 634	Advanced Apiculture (E)	2
Anst 636	Advanced Meat Production	2
Anst 638	Advanced Dairy Production	3
Anst 640	Current Topics in Animal Production	1
Anst 741	Seminarr in Animal Production	1
Anst 763	Thesis	6
Total		33 (38)

8. Course Breakdown

8.2 Regular Program

Year I; Semester I

Course Code	Course Title	Credit Hours
Anst 601	Advanced Animal Nutrition	3
Anst 603	Advanced forage Production & Range Management	3
Anst 611	Advanced Animal Physiology	3
Anst 613	Advanced Biochemistry	3
Anst 615	Farm Animal Diseases and Management (E)	3
Plsc 621	Advanced Biometrics	3
Total		15 (18)

Year I; Semester II

Course Code	Course Title	Credit Hours
Anst 622	Advanced Animal Breeding	3
Anst 632	Advanced Processing of Animal Product	3
Anst 634	Advanced Apiculture (E)	3
Anst 636	Advanced Meat Production	3
Anst 638	Advanced Dairy Production	3
Anst 640	Current Topics in Animal Production	1
Total		13 (15)

Year II; Semester I

Course Code	Course Title	Credit Hours
Anst 741	Seminar in Animal Production	1
Anst 743	Thesis	6

Year II; Semester II

Course Code	Course Title	Credit Hours
Anst 743	Thesis	6

8.3 Summer Program

Summer I

Course Code	Course Title	Credit Hours
Anst 601	Advanced Animal Nutrition	3
Anst 613	Advanced Biochemistry	3
Anst 615	Farm Animal Diseases and Management (E)	3
Plsc 621	Advanced Biometrics	3
Total		9 (12)

Summer II

Course Code	Course Title	Credit Hours
Anst 603	Advanced forage Production & Range Management	3
Anst 611	Advanced Animal Physiology	3
Anst 622	Advanced Animal Breeding	3
Anst 601	Advanced Apiculture	2

Total	9 (11)
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Summer III

Course Code	Course Title	Credit Hours
Anst 632	Advanced Processing of Animal Product	2
Anst 636	Advanced Meat Production	2
Anst 638	Advanced Dairy Production	3
Anst 640	Current Topics in Animal Production	1
Total		8

Summer IV

Course Code	Course Title	Credit Hours
Anst 741	Seminar in Animal Production	1
Anst 743	Thesis	6

9. Course Descriptions

Course title: Advanced Animal Nutrition

Course Code: Anst 601

Credit Hours: 3(2+1)

Course Description: concept of food chain, Nutritional quality of feed stuff. Methodology for the evaluation of feed resources; Assessment of nutritive value through chemical analysis (the proximate (Weende) analysis method and the detergent (Van Soest) method of analysis); other analytical procedures used in the determination of feed components; estimation of nutritive value from chemical analysis data; degradability tests, digestibility, feeding and production trials; the estimation of digestibility; and the summative system; recent advances in feed analysis and prediction of nutritive value. Refractory and inhibitory substances in livestock feed environment

and forage quality. Digestive systems: fermentation; rumen microbiology; biotechnology; kinetics of digestion and metabolism. Nutrient absorption and metabolism, intermediary metabolism; regulation of nutrient utilization for various animal products. Nutrient specification for various functions and least cost ration for various animal products. Nutrient specification for various functions and least cost ration for different classes of livestock. Voluntary intake and its regulation. Feed budgeting estimation and forecasting of requirement; conservation, preservation and storage of feed and fodder. Feed crises mitigation-strategic feeding; the role of unconventional feeds. Biotechnology for enhancement of nutritive value and utilization of feeds and nutrients. The technology of complete feed production.

Course title: Advanced Forage Production and Range Management

Course code: Anst 603

Credit hours: 3 (2+1)

Course description: Objectives of forage production and range management ; differences between native and improved grasslands; highland and lowland production systems; the potential and role of forage production; influence of climate on production objectives; foraging theory: relationships between forage quantity, quality and maturity versus animal output: production versus forage utilization: important native and improved forage crops; importance of legumes in pastures; morphological response to grazing or browsing. Management of forage resources: fertilization, over sowing, stocking rates, herd structures, communal and commercial grazing strategies; principles of Grassland and Range management. Economics of forage production and range management under topical conditions.

Course title: Advanced Animal Physiology

Course code: Anst 611

Credit hours: 3

Course description: Physiology of circulatory, digestive, respiratory, urinary, neuromuscular and reproductive systems of important domestic animal. The direct and indirect effects of physical factors on physiological process and productivity of animals. Bioclimatic effect on growth, production and reproduction of livestock. Fluid and electrolyte balance, acid- base balance. Thermoregulation, acclimation and acclimatization to different environmental conditions. Analysis of mechanisms of adaptation to direct and indirect environmental stress of animals.

Course title: Advanced Biochemistry

Course code: Anst 613

Credit hours: 3

Course description: Animal cell, ultra structure of the cell, cell memoranda Structure and function of bio-molecules –protein (amino acids), lipids (fatty acids and cutin), carbohydrates, etc; plant secondary metabolites (anti-nutritional factors) ; biochemical reactions; enzymes and enzyme kinetics.

Metabolism (carbohydrate, protein, lipid and minerals), including photosynthesis in C3 and C4 plant and organ specialization. Integration of carbohydrate, protein and lipid metabolism and regulation. Biosynthesis of macromolecules. Rumen metabolism, fate of different nutrients in the rumen. The biochemistry of pregnancy, foetal metabolism and milk synthesis. Regulation of growth during postnatal development. Genetic manipulation of ruminant biochemistry and physiology for improved productivity.

Course title: Advanced Farm Animal Diseases and Management (E)

Course code: Anst 615

Credit hours: 3 (2+1)

Course description: General epidemiology chains of disease, the aetiology, source and route of infection, ways and means of disease transmission and ways of exit and impact on the host. Aetiology, epidemiology, symptoms, diagnosis, prevention and control of enternal and internal parasite of farm animals with a special focus on ticks, mites, insects, helminthes and protozoa of tropical importance. Infectious diseases farm animals caused by bacteria, virus and rickettsia, zoonotic diseases of public health importance.

Non-infections disease prevention and control. Health management programs in extensive and intensive farming systems; biotechnological advances in diagnosis and prevention of livestock diseases.

Course title: Advanced Biometrics

Course code: Plsc 621

Credit hours: 3

Course description: Probability and probability distribution. Sampling and sampling distribution, testing of hypothesis based on Z, t and Chi-square and F distribution. Models and analysis of variance, assumptions of analysis of variance and their tests, alternatives in case of

failures of assumptions. Correlation, linear regression and related tests. Rank and intra-class correlation, partial correlation, multiple regression and associated tests. Non linear regression. Principles of field experimentation, C.R.D., R.C.B.D, Split plot, latin square designs, incomplete block designs. Factorial experiment. Confounding and transformation. Different animal models used in analysis of variance. Analysis of non orthogonal animals data, planning of animal experiments. Matrix and generalized inverse of matrices. Regression models, variance component estimation, illustrative examples from animal science experiments.

Course title: Advanced Animal Breeding

Course code: Anst 622

Credit hours: 3

Course description: Constraints in livestock breeding in tropics, reproduction, fertility, sterility and their genetic basis. Growth, milks, meat and egg production and their genetic basis. Genetic structure of the population, gene and genotype frequencies, breeding value, phenotypic, genetic and environmental variances. Performance evaluation of indigenous and exotic breeds and their crosses, genetic improvement tools: selection and mating systems, prediction and measurement of genetic gain, selection index theory. Field and modern recording systems for growth, egg, milk, meat production and their application. Native breeds performance, scope and methods of improvement. Introduction of improved exotic breeds-choice of breed, selection criteria, interpretation of performance records of different countries. Precautions and procedure of importation. Breeding plans for the tropics- Production environment, objective, traits, structure, organization, people's participation and constraints. Village breeding schemes. Group breeding program. Nucleus herd breeding. New breed formation. Hereditary defect. Breeding for disease resistance, heat tolerance and adaptation.

Course title: Advanced Processing of Animal Production

Course code: Anst 632

Credit hours: 2 (1+1)

Course description: Scientific principles (including Physical, Chemical and Microbiological) relevant to the processing of products from various animal species including meat, milk, eggs, hides and skin, etc. Basic processing operations. Techniques employed at slaughter, evisceration, dressing, packaging, freezing storage and transport. Marketing of quality products, quality control (emphasis on TQM- Total Quality Management and HACCP- Hazard Analysis critical

control point) and maintenance, grading, Standardization, economics of storage and transport. Major spoilage organisms.

Course title: Advanced Apiculture (E)

Course code: Anst 634

Credit hours: 2 (1+1)

Course description: Bee biology, bee species and bee foraging; diseases, pests and other enemies of bees. Beekeeping systems and hive types, bee equipment. Beekeeping with wild bees, honey hunting, hives and colony management. Production and processing of hive products: beeswax, pollen, propolis, royal jelly, bee venom (bee stings) and bee broods. The apitherapeutic roles of hive products. Queen rearing, colonies and packages of bees and hiring of bees for pollination.

Course title: Advanced Meat Production

Course code: Anst 636

Credit hours: 2

Course description: Diversity of meat sources and consumption; description and evaluation of various meat production systems. Constraints for improvement of meat production in the tropics; improvement through range, feedlot, nutrition, management and breeding of cattle, sheep and goat. Physical evaluation of slaughter animals. Carcass and meat characteristics and quality evaluation. Meat as a product and factors affecting meat. Live animals, meat and meat product trade and marketing

Course title: Advanced Dairy Production

Course code: Anst 638

Credit hours: 3 (2+1)

Course description: Milk production- national and international situation. Role of cattle, camel, Goat and sheep. Milk production systems in the topics. Recent practices of optimizing immunocompetency of young stock, growth rate and puberty. Pre and post parturition practices to maximize reproduction and milk production. Principles of replacement and culling. Housing, equipment and management in warm climates. Modern milking management- milking method, milk quality, hading and marketing. Maintenance of herd health and productivity. Small and large scale commercial dairying- Project proposal, Establishment and expansion. Administration- technical and financial records.

Efficient utilization of land, labour, feed and fodder. Technical and financial evaluation of dairy enterprise.

Course title: Current Topics in Animal Production

Course code: Anst 640

Credit hours: 1

Course description: Supervised study on advanced topics of current importance in Animal Production or related topics that are not discussed in the program and which must be approved by the DGC. Students present seminars based on literature review so that they are exposed to the methodology of the preparation and presentation of scientific papers.

Course title: Seminar in Animal Production

Course code: Anst 741

Credit hours: 1

Course description:

Progress report on thesis research presented in the form of a seminar.

Course title: Thesis

Course code: Anst 743

Credit hours: 6

Course description:

Research conducted by graduate student under the advice of graduate faculty on national and regional priority problem areas in Animal Production to Culminate in M.Sc. Thesis.

Department: Department of Animal Science & Technology

Specialization: Animal Production

Summer Program Course break down

Summer I.

Course Code	Course Title	Crhr	Remark
Anst 613	Advanced biochemistry	3	
Anst 611	Advanced Animal Physiology	3	
Anst 621	Advanced Biometrics	3	
Anst 615	Farm Animal Diseases and Management (E)	3	
Anst 634	Advanced Apiculture (E)	2	
Total		11 (12)	

Distance I.

Course Code	Course Title	Crhr	Remark
Anst 603	Advanced Forage production and range management	3	
Anst 632	Advanced Processing of Animal Products	2	
Total		5	

Summer II.

Course Code	Course Title	Crhr	Remark
Anst 622	Advanced Animal Breeding	3	
Anst 638	Advanced Dairy Production	3	
Anst 601	Advanced Animal Nutrition	3	
Total		9	

Distance II.

Course Code	Course Title	Crhr	Remark
Anst 636	Advanced Meat Production	2	
Anst 640	Current topics in Animal Production	1	
Total		3	

Summer III.

Course Code	Course Title	Crhr	Remark
Anst 741	Senior Seminar	1	
Anst 743	Thesis	6	