

CURRICULUM/SCHEME OF STUDIES

BSC. (HONS.) ANIMAL SCIENCES

Curriculum/ Scheme of Studies of BSc (Hons) Animal Sciences

BSc (Hons) Animal Sciences

Background and Rationale

Livestock is an important sector of Pakistan having share of 60.54 percent in agriculture and 11.22 percent in GDP. South Punjab is enriched with huge no of livestock population and majority of people is engaged in Livestock farming. The program will help in provision of skilled human resource in animal science to address and solve problems of livestock farmers of South Punjab.

Program objectives

The BSc(Hons.) Animal Sciences 4 years (8 semesters) degree aims equipping the students with knowledge and skills required to analyze and finding the solutions of challenges faced by Livestock sector in present scenario, consistence with the interest of all stakeholders. Animal Science – the study of the biological function of domestic and captive animals and their utilization by people – focuses on modern, efficient and humane ways to care for and make the best use of the animals who share our lives. The degree provides a broad foundation in biological sciences and instruction in basic sciences, research skills and the health, welfare, behavior, nutrition, genetics and breeding of animals, including farm animals, pets and performance animals. The program also includes a component in practical skills such as animal handling and the development of lifelong learning skills, critical thinking and effective communication with scientists and lay people involved with animals.

UN's Sustainable Development Goal

BS Animal Sciences will address the UN's Sustainable Development Goal No. 1 and Goal No. 2

Goal No. 1. Poverty

Goal No. 2. Zero Hunger

Online courses

Free online available courses regarding BS Animal science

- Dairy Production and Management (**Course Platform:** Coursera, Cost: Free)
- Animal behavior and welfare (**Course Platform:** Coursera, Cost: Free)
- Sustainable Food Production Through Livestock Health Management (**Course Platform:** Coursera, Cost: Free)

Available at: <https://www.classcentral.com/subject/veterinary-science>

<https://www.coursera.org/browse/health/animal-health>

Eligibility Criteria

A candidate must have passed F. Sc (Pre-Medical) or standard equivalent examination with at least 50% marks from University or Boards with Physics, Chemistry, Biology. Candidates having FSc Pre-engineering and FSC Pre- Agriculture degree are eligible for admission subject to qualify the deficiency course in Biology: Essentials of Biology BIO-301, 3(2-1).

Total Credit hours: 138 Credit Hours Excluding Audit Courses

Fee/Dues Requirements

Dues and Fee requirements will be same as per of BSc (Hons) Poultry Sciences.

Major courses

Course No.	Title of the Course	Credit Hours
LM-301	Introduction to Livestock Management	2(1-1)
AN-301	Fundamentals of Animal Nutrition	2(1-1)
ABG-302	Introductory Molecular Genetics	2(1-1)
LM-302	Management of Dairy Animals	3(2-1)
AN-302	Metabolism of Primary Nutrients	3(3-0)
ABG-401	Introductory Population Genetics	3(2-1)
LM-403	Principles of Small Ruminant Production	3(2-1)
AN-403	Minerals and Vitamins in Nutrition	2(2-0)
PS-401	Introduction to Poultry Science	2(1-1)
ABG-402	Principles of Animal Breeding	3(2-1)
LM-402	Principles of Milk Production	2(1-1)
AN-402	Nutrient Requirements of Farm Animals	3(2-1)
PS-402	Incubation Principles and Hatchery Management	2(1-1)
PS-404	Poultry Housing and Equipment	2(1-1)
ABG-501	Utilization and Conservation of Animal Genetic Resources	3(2-1)
LM-501	Range Livestock Production	3(2-1)
AN-501	Feeding of Farm Animals	3(2-1)
PS-501	Poultry Farm Management	3(2-1)
ABG-502	Selection for Economic Traits in Farm Animals	3(2-1)
LM-502	Equine and Camel Production	3(2-1)
AN-502	Principles of Poultry Nutrition	2(1-1)
PS-502	Poultry Feeding Practices	3(2-1)
ABG-601	Introduction to Animal Genomics	3(2-1)
LM-601	Principles of Meat Production	2(1-1)
LM-603	Behavior and Welfare of Farm Animals	2(1-1)
AN-601	Feed Evaluation, Formulation and Processing Technology	3(2-1)
AS-601	Remote Sensing and GIS Applications in Animal Sciences	3(2-1)
PS-601	Poultry Hygiene and Disease Prevention	3(2-1)
UAM-611	Preparation of Research Project and Scientific Writing	2(1-1)
AS-612	Internship and Research Project	6(0-6)
Total Credit Hours		81

Compulsory Courses

Course No.	Title of Course	Credit Hours
CS-301	Computer Appreciation and Application	3(2-1)
ENG-301	English composition and comprehension	3(3-0)
MATH-301	Elementary Mathematics	3(2-1)
STAT-302	Introductory Statistics	2(2-0)
SSH-302	Pakistan Studies	2(2-0)
ENG-302	Communication and Presentation Skills	3(3-0)
ENG-401	Technical and business English Writing	3(3-0)
IS-301/SSH-301	Islamic Studies/Ethics (for Non-Muslims)	3(3-0)
BIOCHEM-301	Elementary Biochemistry	3(2-1)
Total Credit Hours		25

Minor Courses

Course No.	Title of Course	Credit Hours
PHYSIO-302	Introduction to Animal Physiology	3(2-1)
AGRON-401	Fodders and Forages	2(1-1)
ZOOL-401	Fish and Fisheries of Pakistan	3(2-1)
ENT-401	Insect Pests of Household, Human and Animals	2(1-1)
ANAT-402	Introduction to Veterinary Anatomy	3(1-2)
FRW-402	Agro-Forestry, Range and Wildlife Management	3(2-1)
AR-305	Introduction to Animal Reproduction	3(2-1)
PATH-502	Pathobiology	3(2-1)
AE-501	Human Resource Management	3(3-0)
MED-502	Introduction to Farm Animal Health	3(2-1)
MAB-502	Livestock and Poultry Marketing Management	2(2-0)
FMP-601	Fundamentals of Mechanized Farming	2(1-1)
Total Credit Hours		32

Audit Courses

Course No.	Title of Course	Credit Hours
UAM-301	Social and Religious Tolerance	Audit
UAM-302	Citizenship Education and Community Engagement	Audit

SCHEME OF STUDY

SEMESTER 1

Course No.	Course Title	Credit Hours	Course Type
LM-301	Introduction to Livestock Management	2(1-1)	Major
AN-301	Fundamentals of Animal Nutrition	2(1-1)	Major
BIOCHEM-301	Elementary Biochemistry	3(2-1)	Compulsory
CS-301	Computer Appreciation and Application	3(3-0)	Compulsory
ENG-301	English composition and comprehension	3(2-1)	Compulsory
MATH-301	Elementary Mathematics	3(2-1)	Compulsory
IS-301/SSH-301	Islamic Studies/Ethics (for Non-Muslims)	3(3-0)	Compulsory
	Total	19	

SEMESTER 2

Course No.	Course Title	Credit Hours	Course Type
ABG-302	Introductory Molecular Genetics	2(1-1)	Major
LM-302	Management of Dairy Animals	3(2-1)	Major
AN-302	Metabolism of Primary Nutrients	3(3-0)	Major
STAT-302	Introductory Statistics	2(2-0)	Compulsory
SSH-302	Pakistan Studies	2(2-0)	Compulsory
ENG-302	Communication and Presentation Skills	3(3-0)	Supporting
PHYSIO-302	Introduction to Animal Physiology	3(2-1)	Minor
UAM-301	Social and Religious Tolerance	Audit	Audit
	Total	18	

SEMESTER 3

Course No.	Course Title	Credit Hours	Course Type
ABG-401	Introductory Population Genetics	3(2-1)	Major
LM-403	Principles of Small Ruminant Production	3(2-1)	Major
AN-403	Minerals and Vitamins in Nutrition	2(2-0)	Major
PS-401	Introduction to Poultry Science	2(1-1)	Major
AGRON-401	Fodders and Forages	2(1-1)	Minor
ZOOL-401	Fish and Fisheries of Pakistan	3(2-1)	Minor
ENT-401	Insect Pests of Household, Human and Animals	2(1-1)	Minor
ENG-401	Technical and business English Writing	3(3-0)	Compulsory
UAM-302	Citizenship Education and Community Engagement	Audit	Audit
	Total	20	

SEMESTER 4

Course No.	Course Title	Credit Hours	Course Type
ABG-402	Principles of Animal Breeding	3(2-1)	Major
LM-402	Principles of Milk Production	2(1-1)	Major
AN-402	Nutrient Requirements of Farm Animals	3(2-1)	Major
PS-402	Incubation Principles and Hatchery Management	2(1-1)	Major
PS-404	Poultry Housing and Equipments	2(1-1)	Major
ANAT-402	Introduction to Veterinary Anatomy	3(1-2)	Minor
FRW-402	Agro-Forestry, Range and Wildlife Management	3(2-1)	Minor
	Total	18	

SEMESTER 5

Course No.	Course Title	Credit Hours	Course Type
ABG-501	Utilization and Conservation of Animal Genetic Resources	3(2-1)	Major
LM-501	Range Livestock Production	3(2-1)	Major
AN-501	Feeding of Farm Animals	3(2-1)	Major
PS-501	Poultry Farm Management	3(2-1)	Major
AR-501	Introduction to Animal Reproduction	3(2-1)	Minor
AE-501	Human Resource Management	3(3-0)	Minor
	Total	18	

SEMESTER 6

Course No.	Course Title	Credit Hours	Course Type
ABG-502	Selection for Economic Traits in Farm Animals	3(2-1)	Major
LM-502	Equine and Camel Production	3(2-1)	Major
AN-502	Principles of Poultry Nutrition	2(1-1)	Major
PS-502	Poultry Feeding Practices	3(2-1)	Major
MED-502	Introduction to Farm Animal Health	3(2-1)	Minor
AS-502	Livestock and Poultry Marketing Management	2(2-0)	Minor
PATH-502	Pathobiology	3(2-1)	Minor
	Total	19	

SEMESTER 7

Course No.	Course Title	Credit Hours	Course Type
ABG-601	Introduction to Animal Genomics	3(2-1)	Major
LM-601	Principles of Meat Production	2(1-1)	Major
LM-603	Behavior and Welfare of Farm Animals	2(1-1)	Major
AN-601	Feed Evaluation, Formulation and Processing Technology	3(2-1)	Major
PS-601	Poultry Hygiene and Disease Prevention	3(2-1)	Major
FMP-601	Fundamentals of Mechanized Farming	2(1-1)	Minor
AS-601	Remote Sensing and GIS Applications in Animal Sciences	3(2-1)	Major
UAM-611	Preparation of Research Project and Scientific Writing	2(1-1)	Major
Total		20	

SEMESTER 8

Course No.	Course Title	Credit Hours	Course Type
AS-612	Internship and Research Project	6(0-6)	Major

Course Contents

LM-301 Introduction to Livestock Management 2(1-1)

Learning Objectives

During the course, students will be able to:

- Learn and identify different breeds of farm animals
- Learn common management practices in Farm animals

Theory

Taxonomic classification of domestic animals; Types and breeds of farm animals; Livestock and their products; Measures to increase milk and meat production; housing of farms animals; economics of livestock farming; Judging and selection; Hygienic milk production; Livestock production systems; Animal welfare; Prophylactic measures.

Practical

Recognizing various breeds of farm animals; Identification; feeding practices; Vaccination; shearing; Deworming; Record keeping.

Suggested Readings

1. Beede, D.K. 2017. Large Dairy Herd Management. 3rd Ed. American Dairy Sci. Assoc., IL, USA.
2. Khan, B.B., M. Yaqoob, M. Riaz, M. Younas and A. Iqbal. 2004. Livestock Management Manual. Pak TM Printers, Faisalabad, Pakistan.
3. Khan, B.B. 2008. Health and Husbandry of Dairy Animals. Pak TM Printers Faisalabad, Pakistan.
4. Khan, M.S. and A.O. Okeyo. 2016. Judging and Selection in Beetal Goats. GEF-UNEP-ILRI FAnGR Asia project. University of Agriculture, Faisalabad, Pakistan.
5. Shah, S.I. 1994. Animal Husbandry. National Book Foundation, Islamabad, Pakistan.

AN-301 Fundamentals of Animal Nutrition 2(1-1)

Learning Objectives

During the course, students will be able to:

- Learn basics of animal nutrition
- Learn Importance of animal nutrition

Theory

History, scope and development of science of animal nutrition; Basic terms in animal nutrition; Soil, plant animal relationship; Classification of animal and poultry feeds; digestive organs, digestion and absorption in different species of animals; nutrients: Classification and functions; nutrition for body maintenance; Growth, production and reproduction; Effect of over and underfeeding in livestock and poultry and its economic importance

Practical

Digestive system in ruminant and monogastric animals; Visual and microscopic identification of feed ingredients; Physical characteristics of feed ingredients; Introduction to feed analysis

Suggested Readings

1. Beede, D.K. 2017. Large Dairy Herd Management. 3rd Ed. American Dairy Sci. Assoc, IL, USA.
2. Maynard, L.A., J.K. Loosli, H.F. Hintz and R.G. Warner. 1991. Animal Nutrition. 7th

Ed. McGraw-Hill Co., NY, USA.

3. Wilson, G. P., D.B. Church, K.R. Pond and P.A. Schoknecht. 2004. Basic Animal Nutrition and Feeding. John Wiley and sons, NY, USA.

BIOCHEM-301

Elementary Biochemistry

3(2-1)

Learning Objectives

During the course, students will be able to:

- Identify the cell and its organelles.
- Learn Basic information about basic ingredients of diet.
- Learn Structure and functions of macro-molecules.

Theory:

Cell structure and function: Structure, composition and functions of cell organelles; Biomembranes and their functions, cyroskeleton, pH, buffers, transport mechanisms across biological membranes, diffusion, osmosis and osmotic presucellenvironment; temperature, pH, buffers, transport mechanisms across bio-membranes, diffusion, osmosis and osmotic pressure; Enzymes: classification, nomenclature, characteristics, coenzymes, cofactors and prosthetic groups; Mechanism of enzyme action; Enzyme inhibition; Carbohydrates: Classification, characteristics, ring structures and isomerism; Aerobic and anaerobic oxidation of glucose; Biological functions of carbohydrates; Lipids: Composition and classification, structures of saturated and unsaturated fatty acids and their properties, characteristics of fats and oils. General metabolism of fats, beta oxidation of fatty acids; Proteins: Composition and classification, characteristics and classification of amino acids, molecules derived from amino acids, peptides and levels of structural organization of proteins; Physiological functions and general metabolism of proteins;Nucleic acids: Chemical composition and structures of DNA and RNA; Functions of DNA and different types of RNA in the cell; Extra-nuclear DNA and plasmids; Central Dogma and its significance; Introduction to replication, transcription and translation processes.

Practical:

Preparation of buffers of definite PH; Determination of PH value of biological fluids; Estimation of optical activity by polarimetry; Qualitative analysis of carbohydrates; Qualitative analysis of urine for albumin, acetone bodies and sugar; Estimation of glucose in biological fluids; Determination of acid, saponification and iodine values of fats/oils; Estimation of lactose and casein in milk.

Suggested Reading

1. Ahmed, M. 2011. Essentials of Model of Biochemistry. 8th Ed. Merit Publishers, Lahore, Pakistan.
2. Ferrier, D. 2013. Biochemistry: Lippincott's Illustrated Reviews. 6th Ed. Lippincott Williams and Wilkins, USA.
3. Murray, R. K., D.A. Bender, K.M. Botham, P.J. Kennelly, V.W. Rodwell and P.A. Weil. 2012. Harper's Illustrated Biochemistry. 29th Ed. McGraw Hill, New York, NY, USA.
4. Nelson D.L and M.M. Cox. 2013. Lehninger Principles of Biochemistry. 6th Ed. WH Freeman & Company, New York, NY, USA.
5. Plummer, D.T. 2009. An Introduction to Practical Biochemistry. 3rd Ed. Tata

McGraw-Hill Education McGraw Hill, New York, NY, USA

CS-301 Computer Appreciation and Application**3(2-1)****Learning Objectives**

During the course, students will be able to:

- Understand the basic knowledge about computer and its parts.
- Understand the types of network and terminology related to computer.
- Use the computer in professional life.

Theory:

Overview of computer system: brief history of computers, uses and misuses, importance, future needs; Types of Computer: super, mainframe, minim, micro, desktop, notebook, personnel and workstation; Parts of Computer, CPU, control unit, arithmetic unit, memory; ROM and its types; RAM and its types; Flash memory and cash memory; Buses: data bus, address bus, control bus; Motherboard (circuit boards) Micro-processor and its types; Interacting with Computer; Input device, key board, mouse, track ball, touch screen, touch pads, barcode readers etc, output device: Monitors, types of monitors, printers: types of printers, plotters, storage devices: magnetic storage and optical storage hard disc, tape device, CD etc. Software: Types of software, system software, shareware, application software; Operating system; Network: uses and types of network LAN, WAN; Data communication over telephone lines; Modem, ISDN, DSL and high speed lines, internet: Working of internet, feature of internet: email, newsgroups, telnet, FTP, WWW, HTTP, online services, Addressing schemes: DNS, IP.

Practical:

Window operating system; Uses of MS Word procession; MS Excel (spreadsheets); Power point exercises and essential use of internet; E-mail and surfing.

Suggested Readings

1. David, R. 2010. A Balanced Introduction to Computer Science. 3rd Ed. Pearson Education, 3rd Ed. Omaha, NE, USA.
2. Norton, P. 2004. Introduction to Computer. 7th Ed. McGraw-Hill Technology Education. New York City, NY. USA.
3. Saeed, I., A. Raza and T. Mahmood. 2011. The Concept of Information Technology, IT Series Publishers, Lahore, Pakistan.
4. Shelly, G.B. and G.A. Wagoner. 2011. Using Computers: A gateway to Information. Boyd and Fraser Publishers, San Francisco, CA, USA.

ENG-301 English Composition and Comprehension**3(3-0)****Learning Objectives**

During the course, students will be able to:

- Demonstrate proficiency in English grammar and comprehension skills
- Read, analyze and discuss reading with an understanding of structure and mechanics
- Develop competency in producing correct and error free piece of writing

Theory

Reading skills; effective reading habits, comprehension; How to Live to be 200 (Stephen Leacock; TV addiction (marie Winn), Writing skills; Principles of writing good english; Understanding composition process: word, sentence and paragraph level; Process of writing,

observing, audience analysis, collecting, composing, drafting and revising, personal writing, descriptive writing; argumentative writing; Narrative writing; Expository writing; précis writing; Grammatical tools; Knowledge about parts of speech and their analysis, punctuation, dash, comma, semi colon, capitalization, presentation skills; Preparing effective presentations.

Suggested Readings

1. Eastwood, J. 2009. Oxford Practice Grammar. 3rd Ed. Oxford University Press, Karachi, Pakistan.
2. Mark, P. 2013. Presenting in English. Language Teaching Publications. Hove, UK.
3. Shah, S.S.A. 2006. Exploring the world of English. Ilmi Kitab Khana, Urdu Bazar, Lahore, Pakistan.
4. Wren, P.C. and H. Martin. 2009. English Grammar and Composition. S. Chand & Compay Ltd, New Delhi, India.

Math-301

Elementary Mathematics

3(2-1)

Learning Objectives

During the course, students will be able to:

- Understand the basics of mathematics
- Learn important the mathematical designs/equations
- Solve mathematical questions and problems

Theory

Number System; Sets and Probability, basic definitions; Sets: algebra of sets; Venn diagram, the real number system; Factorial, Permutations and Probability, Polynomial equations; Finding roots of linear and quadratic equations; Quadratic formula, synthetic division; Application relating polynomial equation; Matrices: Basic definitions; Determinant of a square matrix inverse of a square matrix; Elementary row operations; Solution of system of linear equations with application; Curve tracing; Graph of line and parabola; Curve tracing on matlab; Trigonometry; Basic definitions, congruent triangles, similar triangles;

Practical:

Application of trigonometry in finding height and width etc. Differentiation; Basic definitions, limit and continuity; Differentiation by definition, differentiation using formulae; Graphical interpretation of continuity and derivative; Derivative a slope of tangent line; Differentials; Application of differentiation; Integration; Basic definitions; Integration of polynomials.

Suggested Readings

1. Anton, H. 1999. Calculus. 6th Ed. John Wiley & Sons, New York, NY, USA.
2. Kaufmann, J.E. 1987. College Algebra, and Trigonometry. PWS-Kent Company, Boston, Massachusetts. USA.
3. Kreyszig, E. 2000. Advanced Engineering Mathematics. 8th Ed. John Wiley and sons, New York City, NY, USA.
4. Thomas, G.B. 2002. Finney. Calculus and Analytical Geometry, 9th Ed. RoohaniAr Press Islamabad, Pakistan.

Learning Objectives

اهداف و مقاصد

- 1:- طلبہ و طالبات کو قرآن وحدیث سے استفادہ کے قابل بنانا۔
- 2:- طلبہ و طالبات کے قلوب و اذہان میں قرآن وسنت کی روح اور علم کو راسخ کرنا۔
- 3:- طلبہ و طالبات میں اسوہ ختم المرسلین ﷺ کے اجراع اور حب رسولؐ کا جذبہ پیدا کرنا۔
- 4:- اسلام کی بنیادی تعلیمات کا فہم آسان بنانا اور طلبہ کی اسلامی بنیادوں پر تربیت کرنا۔
- 5:- امت مسلمہ کو درویش عصر جدید کے چیلنجوں سے طلبہ کو آگاہ کرنا۔
- 6:- طلبہ و طالبات میں مذہبی اور سماجی برداشت پیدا کرنا اور انہیں پابندی کی خدمت کرنا۔

غیر مسلموں سے مسلمانوں کے تعلقات اور اسلامی تعلیمات

الاعراف، ۷: ۱۵۸

قرآن کی روشنی میں غیر مسلموں سے تعلقات

(یہ عنوان درج ذیل قرآنی آیات کی روشنی میں پڑھایا جائے گا)

الاسراء، ۷: ۱۰۱، الانعام، ۷: ۱۰۸، الاعراف، ۷: ۱۰۹، الحج، ۲: ۱۵۶، اہل، ۱۲۵: ۵، المائدہ، ۵: ۸۴، المائدہ، ۵: ۵، الحج، ۲: ۲۹، آل عمران، ۳: ۱۱۸، المائدہ، ۵: ۵۹-۵۷، المائدہ، ۵: ۶۱-۶۲، التوبہ، ۹: ۲۹، التوبہ، ۹: ۲۳، التوبہ، ۹: ۲۳، التوبہ، ۹: ۸، التوبہ، ۹: ۸، الزلزل، ۷: ۳۳، الحج، ۲: ۱۰۱، الاعراف، ۷: ۱۰۹، الانبیاء، ۲۱: ۱۰۳، الاحزاب، ۳۳: ۲۱

سنت نبوی ﷺ کی روشنی میں غیر مسلموں سے تعلقات

(اس عنوان کی تدریس میں درج ذیل احادیث اور واقعات سے مدد لی جائے گی)

الکشاف للبخاری: ص ۶۸۱، بخاری: باب غزوة ذات الرقاع، کتاب الاستیذان، باب الصدیہ للشکرین، باب اثم من قتل معاهدة غیر جرم، باب شرار التیمی ہانسیدہ، صحیح مسلم: باب فتح مکہ، سنن ابی داؤد: باب الرجل یسوت لقریبہ شکرک، باب لبس الرقع، باب فی تعسیر العمل الذمہ اذا اختلفوا، الجامع ترمذی: باب ما جاء فی مرضیہ، باب ما جاء فی قول ہدایا لشکرین، تفسیر سورۃ الحج، سنن احمد بن حنبل: ص ۲۲۱/۳، ۲۷۰، معصف عبدالرزاق، ص ۳۹۲/۱۰، ایضاً ص ۳۶۶، بیہقی: شعب الایمان، ص ۵۱۸/۶، اکتب السنہ، ص ۵۲۷، ابن ہشام: السیرت النبویہ، ص ۱۹۳-۱۹۷، شبلی نعمانی: سیرۃ النبی، ص ۲۵۶-۲۵۷، بیہقی: آدم القزحی: کتاب الخراج، ص ۲۱۵، الاصابہ، ص ۸۱۲، طبقات ابن سعد، ص ۱۱/۲۳-۲۳، ص ۳۵۷/۱

مطالعہ قرآن مجید کی ضرورت و اہمیت

قرآن کریم سے متعلق موضوعات کے بارے میں آیات دی جائیں گی اور ان کی تفسیر کی جائے گی۔

(۱) ایمانیات (دلائل کا عقلی و قلبی مطالعہ)

توحید، رسالت، ملائکہ، کتب اور آخرت کے اثبات پر دلائل۔ ختم نبوت۔ ناموس رسالت

(ب) عبادات

نماز، زکوٰۃ، روزہ، حج، جہاد

(ج) فکرو تدبیر۔ اسلام کا تصور علم اور تصور اچھا

- (د) خدمتِ خلق
(ه) مؤمن کی صفات
(و) دعوتِ دین کی ضرورت و اہمیت، نوعیت، امر بالمعروف، نہی عن المنکر
(ز) کسبِ حلال

قرآن کریم کی منتخب آیات

- (۱) البقرة (۲: آیات ۲۸۴-۲۸۶) اللَّهُ مَا فِي السَّمَوَاتِ وَمَا فِي الْأَرْضِ عَلَى الْقَوْمِ الْكَافِرِينَ ه (ایمانیات)
(۲) الحجرات (۴۹: آیات ۱-۱۸) موضوع آداب نبوی، معاشرتی احکام
(۳) المؤمنون (۲۳: آیات ۱-۱۱) صفات مؤمنین
(۴) الفرقان (۲۵: آیات ۶۳-۷۷) موضوع آداب معاشرت
(۵) الانعام (۶: آیات ۱۵۲-۱۵۴) احکام
(۶) الاحزاب (۳۳: آیات ۶-۲۱-۴۰-۵۶-۵۷-۵۸) تخصصات نبوی
(۷) النحل (۵۹: آیات ۱۸-۱۹-۲۰) کفر آخرت - عظمت قرآن
(۸) القصف (۶۱: آیات ۱-۱۴) نظرو تدریس متعلق آیات - بشارت بعثت ختم المرسلین - دعوت اور اقامت دین
(۹) حم اسجدہ (۴۱: آیت ۵۳) سَنُرِيهِمْ آيَاتِنَا فِي الْأَفَاقِ وَلِي نُنْفِيسَهُمْ حَتَّىٰ يَتَبَيَّنَ لَهُمْ أَنَّهُ الْحَقُّ ه
(۱۰) آل عمران (۳: آیات ۱۹۰-۱۹۱) "إِنَّ فِي خَلْقِ السَّمَوَاتِ وَالْأَرْضِ وَأَخْتِلَافِ اللَّيْلِ وَالنَّهَارِ لَآيَاتٍ لِّأُولِي الْأَلْبَابِ....."
(۱۱) النحل (۱۶: آیات ۱۲-۱۴) "وَسَخَّرْنَاكُمْ اللَّيْلَ وَالنَّهَارَ"، قرسن (۳۱: آیت ۲۰) "تَرَوُنَّ اللَّهَ سَخَّرَ لَكُمْ مَاءَ فِي السَّمَوَاتِ وَمَاءَ فِي الْأَرْضِ وَاسْتَمِعَ عَلَيْكُمْ نِعْمَهُ....."

احادیث مبارکہ

- (۱) عن عبد الله قال : قال رسول الله ﷺ طلب كسب الحلال فريضة بعد الفريضة (بيهقي، شعب الإيمان) -
(۲) عن ابي سعيد قال : قال رسول الله ﷺ التاجر الصدوق الأمين مع النبيين والصديقين والشهداء. (جامع ترمذی . سنن دارمی)
(۳) عن ابن مسعود عن النبي ﷺ لا تزول قدما ابن آدم حتى يستل عن خمس عن عمره فيما افناه وعن شبابه فيما ابلاه وعن ماله من اين اكتسبه وفيما انفقه وما اذا عمل فيما علم (جامع ترمذی) -
(۴) عن ابي هريرة قال : كان رسول الله ﷺ يقول : اللهم اني اعوذ بك من الاربعة من الاربعة : من علم لا ينفع، ومن قلب لا يخشع ومن نفس لا تشيع، ومن دعاء لا يسمع (مسند احمد، ابو داود، ابن ماجه) مشكاة المصابيح ج ۲ : ص ۲۳ حديث نمبر ۲۸۶۸) -
(۵) عن علي قال : رسول الله ﷺ من ملك زاد او راحلة تبلغه الى بيت الله ولم يحج فلا عليه ان يموت يهوديا او نصرانيا وذلك ان الله تبارك وتعالى يقول ولله على الناس حج البيت من استطاع اليه سبيلا (جامع ترمذی) -
(۶) عن ابن عباس ان النبي ﷺ قال اربع من اعطينهن فقد اعطى خيرا الدنيا والاخرة قلبا شاكرا او لسانا ذاكرا او بدنا على البلاء صابرا وزوجة لا تبغيه حوبا في نفسها وماله (سنن لساني) -
(۷) عن ابي هريرة ان رسول الله ﷺ قال : اندرون ما المفلس؟ قالو : المفلس فينا من لا درهم له ولا متاع، قال : ان المفلس من امتي من ياتي يوم القيامة بصلاة وصيام وزكوة ، وياتي قد شتم هذا وقذف هذا واكل مال هذا وسفك دم هذا وضرب هذا، فيعطى هذا من حسناته وهذا من حسناته ، فان فئت حسناته قبل ان يقضى ما عليه اخذ من خطاياهم فطرحت عليه ثم طرح في النار -

- (۸) عن ابی ہریرۃؓ قال : قال رسول اللہ ﷺ من اتاه اللہ مالاً فلم یؤد زکوٰۃ مثل ما لہ یوم القیامۃ شجاعاً اقرع لہ زببتان یطوقہ یوم القیامۃ ثم یأخذ بلہزم متیہ (یعنی شدقیہ) ثم یقول انا مالک وانا کتکک ثم تلا ولا یحسین الذین یبخلون بما اتہم اللہ من فضلہ ہو خیر الہم بل ہو شر الہم سیطوقون ما یبخلوا بہ یوم القیامۃ (صحیح بخاری)۔
- (۹) عن شبرمۃ بن معبدؓ قال : قال رسول اللہ ﷺ مروا الصبی الصلوٰۃ اذا بلغ سبع سنین واذ بلغ عشر سنین فاضر بوبہ علیہا۔ اخرجہ ابو داود و الترمذی و لفظہ علموا الصبی الصلوٰۃ ابن سبع سنین و اضربوہ علیہا ابن عشر۔
- (۱۰) قال رسول اللہ ﷺ تجدون شر الناس یوم القیامۃ ذالو جہین الذی یاتی ہو لاء بوجہ و ہو لاء بوجہ (متفق علیہ)۔
- (۱۱) قال رسول اللہ ﷺ یجاء بالرجل یوم القیامۃ فیلقى فی النار فتندلق اقبابہ فی النار فیطحن فیہا کطحن الحمار برحاہ فیجتمع اهل النار علیہ فیقولون ، ای فلان ماشانک؟ ایس کنت تامرنا بالمعروف و تنہانا عن المنکر؟ قال کنت امرکم ولا اتیہ و انہا کم عن المنکر و اتیہ۔
- (۱۲) عن ابی ہریرۃؓ قال : قال رسول اللہ ﷺ من سلك طریقاً یلتمس فیہ علماً سهل اللہ لہ بہ طریقاً الی الجنۃ ، و ما یجتمع قوم فی بیت من بیوت اللہ یتلون کتاب اللہ و یتدارسون بینہم الا نزلت علیہم السکینۃ و غشیتہم الرحمۃ و حفتہم الملائکۃ و ذکرہم اللہ فیمن عنده ، و من بطأہ عملہ لم یسرع بہ نسبہ (مسلم)۔
- (۱۳) قال رسول اللہ ﷺ ان اقل شی یوضع فی میزان المؤمن یوم القیامۃ خلق حسن ، و ان اللہ یغض الفاحش البذی (ترمذی ابو الدرداء)۔
- (۱۴) عن عمر بن الخطابؓ قال : قال رسول اللہ ﷺ حین سئل عن الایمان ان تؤمن باللہ و ملائکتہ و کتبہ و رسلہ و الیوم الآخرہ و تؤمن بالقدر خیرہ و شرہ (متفق علیہ)۔
- (۱۵) عن عباس بن عبدالمطلبؓ قال : قال رسول اللہ ﷺ ذاق طعام الایمان من رضی باللہ رباً و بالاسلام دیناً و بمحمد رسولاً۔
- (۱۶) عن انس قال : قال رسول اللہ ﷺ و الذی نفسی بیدہ لایومن عبد حتی یحب لا خیہ ما یحب لنفسہ (متفق علیہ)۔
- (۱۷) عن النعمان بن بشیر قال : قال رسول اللہ ﷺ نری المؤمنین فی تراحمہم و توادہم و تعاطفہم کمثل الجسد ان اشتکی عضو تداہی لہ سائر الجسد بالسہر و الحمی (متفق علیہ)۔
- (۱۸) عن ابن عمرؓ قال : قال رسول اللہ ﷺ بنی الاسلام علی خمس شہادۃ ان لا الہ الا اللہ و ان محمد عبده و رسولہ۔ و اقام الصلوٰۃ ایتاء الزکوٰۃ و الحج و صوم رمضان (متفق علیہ)۔
- (۱۹) عن ابی سعید الخدری عن رسول اللہ ﷺ قال من رای منکم منکراً فلیغیرہ بیدہ فان لم یستطع فیلسانہ فان لم یستطع فلیقلہ و ذالک اضعف الایمان (رواہ مسلم)۔
- (۲۰) عن عبداللہ بن عمر قال : قال رسول اللہ ﷺ الا کلکم راع و کلکم مسئول عن رعیتہ فالامام الذی علی الناس راع و ہو مسئول عن رعیتہ و الرجل راع علی اهل بیئہ و ہو مسئول عن رعیتہ و المرأۃ راعیۃ علی بیت زوجها و ولده و ہی مسئلۃ عنہم و عبد الرجل راع علی مال سیدہ و ہو مسئول عنہ الا فکلکم راع و کلکم مسئول عن رعیتہ (متفق علیہ)۔

سیرت النبی صلی اللہ علیہ و آلہ وسلم

- (۱) مطالعہ سیرت النبی ﷺ کی ضرورت و اہمیت
- (۲) تزکیہ نفس اور تہذیب سیرت و شخصیت
- (۳) اقامت دین کا نبوی طریق۔ خلافت
- (۴) اجتماعیت و تشکیل معاشرت اور اسوہ حسنہ۔ اخوت و اتحاد و اہمیت
- (۵) قرآن مجید میں سیرت سرور عالم ﷺ کا بیان (۶) غزوات نبوی۔ مقاصد و حکمت

تہذیب و اخلاق

تہذیب کا مفہوم، اسلامی تہذیب کی خصوصیات، حسن معاشرت، فضائل اخلاق، رد اہل اخلاق۔
 حقوق العباد۔ حقوق نسواں۔ تربیت اولاد۔ حلال و حرام۔ غیر مسلموں سے تعلقات۔ عدل۔ احسان۔ ایٹائے ذی القربی۔ بنیادی انسانی حقوق

Learning Objectives

During the course, students will be able to

- Learn Ethical teachings of world religions
- Learn major theories of the moral standards

Theory

Definition and scope of ethics; Relation of ethics to psychology; Metaphysics and relegation; A brief review of major theories of the moral standard: The standard as law; The standard as happiness; The standard as perfection; Promotion of Moral Values in society through family and various educational and cultural institutions; Concept of good and evil; Freedom and responsibility; various theories of punishment; Ethical teachings of world religions with special reference to Hinduism, Buddhism, Judaism and Islam; Hunderd ethical precepts from the Quran and the sayings of the Holy Prophet (PBUH). Islam's attitudes towards minorities.

Suggested Readings

1. Gaer, J., 1984. What the Great Religions Believe. The New American Library, New York, NY, USA.
2. Henry, S. 1963. The Methods of Ethics, 1963, MacMillan & Co. Ltd., London, UK.
3. Lillie, William, An Introduction to Ethics, 1957.
4. Mackenzie, J. A. 1957. A Manual of Ethics, Latest editions University Tutorial Press Ltd., London, UK.
5. Mazhar, U., A. Kazi. 1991. Treasury of Hadith. Ferozeson (Pvt.) Ltd, Lahore, Pakistan.
6. Maudoodi, S. A. A. Islamic Riyasat, Islamic Publications Ltd., 13-E, Shah Alam.Lahore, Pakistan.
7. Proceedings of the Islamic Collequim. 1957. Lahore, Pakistan.

ABG-302 Introductory Molecular Genetics**3(2-1)****Learning Objectives**

During the course, students will be able to:

- Learn about description of DNA/RNA.
- Know about genetic engineering and its applications.
- Know about various cytogenetic techniques.

Theory:

Biochemical basis of heredity: the nature of genetic material, nucleic acids, structure of DNA and RNA, DNA replication, transcription, and translation; Developmental aspects of genetic control: gene expression and cell differentiation, control of gene expression in eukaryotes; Genetic basis of immune response: components of immune system; Mutations: gene mutations and their types; Genetic engineering: basic concepts of recombinant DNA technology, gene cloning and manipulation, application and future.

Practical:

Demonstration of various cytogenetic techniques; Polymerase Chain Reaction; Gel Electrophoresis, DNA extraction and sequencing.

Suggested Readings

1. Hartl, L. 2006. Essential Genetics: A Genomics Perspective. 4thEd. Jones and Bartlett

Publishers, Sudbury, MA, USA.

2. Hartl, L. 2009. Genetics: Analysis of Genes and Genomes. 7thEd. Jones and Bartlett Publishers, Inc. Sudbury, MA, USA.
3. Hodge, R. 2009. Genetic Engineering: Manipulating the Mechanisms of Life. Infobase Publishing, New York, USA.
4. Klug, W.S., M.R. Cummings, C. Spencer and A.M. Palladino. 2008. Concepts of Genetics. The Benjamin Publishing Co, Menlo Park, CA, USA.

LM-302

Management of Dairy Animals

3(2-1)

Learning Objectives

During the course, students will be able to

- Understand basics of dairy enterprise management
- Learn dairy animal characteristics

Theory

Scope and importance of the dairy industry of Pakistan; Characteristics of local, exotic and crossbred dairy animals; Principles of profitable dairy production; Buffalo and cow as major dairy animals; camel as a dairy animal; Selection of dairy animals; establishing a dairy enterprise; raising replacement stock; management of sire, pregnant and lactating animals; Significance of dry buffalo/cow therapy; thermal stress and buffalo/cow performance; feeding for economical milk production; An ideal udder; Defects of udder; plans and specifications for dairy buildings and equipment; Record keeping; Dairy herd improvement associations; Dairy system models; Modern trends in dairy industry; Buying and selling guide; Prophylactic measures

Practical

Demonstration of characteristics of an ideal dairy animal; Judging, selection and use of score cards; Body condition scoring; weaning practices; Care, handling and feeding of calves; milking practice (hand/machine milking); Identification of dairy breeds; design and layout plans for dairy buildings; Demonstration of dehorning/disbudding, castration, extra teat removal, teat dipping, hoof trimming ; Dry cow/buffalo management; Planning for year round fodder availability; Fodder preservation practices; preparing feasibility reports; Use of computer for record keeping; Visit to dairy farms and shows.

Suggested Readings

1. Beede, D.K. 2017. Large Dairy Herd Management. 3rd Ed. American Dairy Sci Assoc, IL, USA.
2. Fuquay, J.W., P.F.Fox and P.L.H. McSweeney. 2011. Encyclopedia of Dairy Sciences, 2nd Ed. San Diego, USA.
3. MLA. 2009. Advisers Guide to Good Dairy Herd Management in the Tropics: A Manual for Dairy Advisers, Technical Staff and Other Dairy Specialists. Meat and Livestock, Sydney, Australia.
4. Moran, J.B. 2005. Tropical Dairy Farming: Feeding Management for small Holder Dairy Farmers in the Humid Tropics. Landlinks Press, Melbourne, Australia.
5. Tyler, H.D. and M.E. Ensminger. 2005. Dairy Cattle Science. 4th Ed. Prentice Hall INJ, USA.

AN-302**Metabolism of Primary Nutrients****3(3-0)****Learning Objectives**

During the course, students will be able to:

- Have knowledge about the classification and factors effecting carbohydrate metabolism.
- Have knowledge about the basic metabolic processes.
- Analysis of feed ingredients.

Theory

Metabolic functions of water; Metabolism of carbohydrates; Classification, digestion, absorption and utilization in monogastric and ruminant animals; Glycolysis; Lactic acid and volatile fatty acid fermentation; Citric acid cycle; Pentose phosphate pathway; Gluconeogenesis; Glycogenesis and glycogenolysis; Metabolism of lipids; Classification, digestion, absorption, and utilization in monogastric and ruminant animals; Beta oxidation of fatty acids; Fate of glycerol with respect of fat synthesis, glucose/glycogen syntheses and its oxidation; Storage of fat; Catabolism of fat and ketosis; metabolism of proteins; Classification, digestion; Absorption and utilization in monogastric and ruminant animals; Essential and non-essential amino acids; Protein quality; Fate of absorbed amino acids; Transamination; Deamination; Trans-methylation; Decarboxylation and inter-conversion of amino acids; Utilization of non- protein nitrogenous compounds in ruminants

Suggested Readings

1. Beede, D.K. 2017. Large Dairy Herd Management. 3rdEd. American Dairy Sci. Assoc. , IL, USA
2. McDonald, P., R.A. Edwards, J.F.D. Greenhalf and C.A. Morgan. 2008. Animal Nutrition. 6th Ed. Longman Scientific and Technical Publisher, UK.
3. Rodwell, V., W. Bender, D.A. Botham, K.M. Kennelly and P.A.Weil. 2015. Harper's Illustrated Biochemistry 30th Ed. McGraw Hill Education, NY, USA.

STAT-302**Introductory Statistics****2(2-0)****Learning Objectives**

- During the course, students will be able to:
- Learn basic and applied knowledge about statistics for collection and description of data.

Theory

Definition and importance of statistics in agriculture; Data, grouped and ungrouped data; Different type of data and variable; Measurement and measurement Scales, classification and tabulation of data, graphical representation of data; Measures of central tendency and Measures of variability. Skewness and kurtosis; Sampling and sampling distribution of means and difference between means and their properties; Statistical inference, point estimates, interval estimates; Testing of hypothesis for mean; Difference between mean Chi-square test for independence; Goodness of fit test; Analysis of variance, one way and two way.

Suggested Readings

1. Choudhry, M.R. 2001. Polymer's modern statistics. 2nd Ed. Polymer's Publications Urdu Bazar, Lahore, Pakistan.
2. Choudhry, S.M. and S. Kamal. 2002. Introduction to statistical theory. 6thEd. IlmiKitabKhana Urdu Bazar, Lahore, Pakistan.

3. Clark, G.M. and D. Cooke. 1998. A Basic Course in Statistics. 4thEd. Arnold Publications, London, UK.
4. Muhammad, F. 2000. Statistical methods and data analysis. KitabMarkaz. Aminpur Bazar, Faisalabad, Pakistan.

SSH-302

Pakistan Studies

2(2-0)

Learning Objectives

During the course, students will be able to

- Learn two nation theory and its necessity.
- Learn different clarities involved in revelation of Pakistan.
- Learn about the brief history of Pakistan.

Theory

Theory:

Evolution of two nation concept in the sub-continent; Role of two nation theory in the creation of Pakistan; Ideology of Pakistan, founding fathers of Pakistan; Mujadid Alf Sani; Shah Waliullah; Sir Syed Ahmed khan; Allama Iqbal; Quaid-e-Azam; Constitutional development in Pakistan, objective resolution; basic principle committee reports; Bogra formula; salient features of 1956 constitution; foreign policy of Pakistan ; determinants of Pakistan's foreign policy; different phases of Pakistan's foreign policy; Pakistan's relations with super powers, United Nations Organization; main organs; special agencies; Pakistan role in the UNO.

Suggested Readings

1. Amin, S., 2012. Pakistan's Foreign Policy, Oxford University Press, Karachi, Pakistan.
2. Hussain, A.Z. 2012. Encyclopedia of Pakistan, Jahangir Book Depot, Lahore, Pakistan.
3. Khan, H. 2012. Constitutional and Political History of Pakistan, Oxford University Press, Karachi, Pakistan.
4. Lawrence, Z. 2013. Pakistan: At the Cross Current of History. One Worlds Publishers, UK.
5. Rabbani, I. 2012. Pakistan Affairs, Carvan Book House, Lahore, Pakistan.

PHYSIO-302

Introduction to Animal Physiology

3(2-1)

Learning Objectives

During the course, students will be able to:

- Understand basics of physiology of farm animals
- Learn Physiological systems in animals

Theory

Introduction: intracellular organization and physiology; Body fluids, blood, lymph, cerebrospinal fluid, synovial fluid; Blood circulation and cardiovascular system: physiological properties and cellular and chemical constituents of blood, blood coagulation, blood groups and their importance in livestock; the conduction system of the heart; Regulation of cardiac output, regulation of the heart and blood vessels; regional circulation and pulmonary circulation;

respiratory system: mechanism of respiration, types of breathing, air volumes and capacities exchange of gases, control of respiration, artificial respiration; digestive system: ingestion of food by various animals, mastication, salivation and deglutition, functions of saliva; Simple stomach digestion: gastro-intestinal motility, secretions and functions, liver and pancreatic secretion and functions. digestion in the ruminant stomach; rumination, fermentation, functions of omasum and abomasum, absorption from stomach and intestines; Water balance and excretion: electrolytes, physiology of the kidney and physiology of the skin; Endocrine glands and their secretions and functions; Physiology of lactation; Nervous system; Spinal cord and brain functions, autonomic nervous system.

Practical

Introduction of various laboratory instruments; Collection of blood in different species of animals and use of anticoagulants; Measurements of normal pulse, respiration and rectal temperature; hematological experiments; determination of blood groups; Determination of blood pressure; determination of various lung capacities & volumes; Urine examination for normal constituents; microscopic examination of urine; test for saliva; dissection for location of endocrine glands in rat and chicken; Visit to university farm for observation on prehension; mastication and rumination of domestic animals; Observation on the stomach of buffalo, cattle and camel.

Suggested Readings

1. Akers R.M. and D.M. Denbow. 2013. Anatomy and Physiology of Domestic Animals. Wiley-Blackwell Publishing. Hoboken, New Jersey, USA.
2. Hill, R.W., G.A. Wyse and M. Anderson. 2016. Animal Physiology. 4th Ed. Oxford University Press, Oxford, UK.
3. Klein, B.G. 2013. Cunningham's Textbook of Veterinary Physiology. 5thEd. Saunders Publishing, Philadelphia, PA, USA.
4. Rahman Z.U., J.A. Khan, T. Khaliq and A. Ali. 2012. Manual of Physiology-.University of Agriculture, Faisalabad, Pakistan.
5. Reece W.O., H.H. Erickson, J.P. Goff and E.E. Uemura. 2015. Duke's Physiology of Domestic Animals. 13th Ed. Wiley-Blackwell Publishing. Hoboken, NJ, USA.

ENG-302 Communication and Presentation Skills

3(3-0)

Learning Objectives

During the course students will be able to:

- Understand fundamentals of English language, communication and presentation skills
- Communicate and present effectively and professionally
- Prepare effective presentations and deliver with confidence

Course Contents

The nature of communication: Types of communications; Effective communication and its barriers, verbal communication skills, 7Cs of communication, non-verbal communications; Characteristics, functions and types; Listening (audio aids TOEFL and IELTS Practice Tests); Presentation skills; Oral presentations, Persuasive presentations, Computer-based Presentations, Team communication; Negotiation Skills; Debate; Persuasive presentations on research report; Resumes; CV and covering letters; Interview taking; Meetings; Business letters, memos and minutes; Writing and presenting proposals; Class Presentations; Assignments to be given during the course; Letter writing; Proposal writing; Team writing; Sales brochure.

Suggested Readings

1. Eastwood, J. 2009. Oxford Practice Grammar. 3rd Ed. Oxford University Press, Karachi. Pakistan.
2. Mandel, S. 2011. Effective Presentation Skills: A Practical Guide Better Speaking, New York, NY, USA.
3. Shah, S.S.A. 2006. Exploring the world of English. Ilmi Kitab Khana, Urdu Bazar, Lahore. Pakistan.

PS-401

Introduction to Poultry Science

2(1-1)

Learning Objectives

During the course, students will be able to:

- Learn about importance of poultry in Pakistan.
- Learn different purpose of poultry production.
- Know about prospects of poultry production.

Theory

Importance of poultry science; Developments at national and international level in poultry sector; Scope of poultry science in future; Classification of poultry and their characteristics; Production systems for broilers and layers; Role of automation and innovations in poultry farming; Rural poultry production and improvement plans; Scope of organic and free range poultry; Gamebird production; Fancy birds production; modern meat and egg production systems; Integrated poultry enterprises; production of ostrich, quail, turkey and ducks; Poultry welfare; Selection and culling in poultry; waste management; Role of soft wares in modern poultry enterprises .

Practical

Description and demonstration of different poultry breeds; Body parts of chicken, structure of an egg; demonstration of incubators; Poultry housing types; Selection and culling techniques; Dead bird disposal methods; Visit to a commercial poultry enterprise.

Suggested Readings

1. Donald, D. Bell and D. William and J. Weaver. 2007. Commercial Chicken Meat and Egg Production. Springer Pvt. Ltd. New Delhi, India.
2. Pandey, D. 2018. Handbook of Poultry and Technology. Thomas Press Ltd. New Delhi, India.
3. USDA, 2013. Poultry Industry Manual. Center for Food Security and Public Health, Iowa State University of Science and Technology Ames, IA, USA.
4. Yousaf, M., A. Haq and A. Haq. 2017. Poultry Production Technology. University of Agriculture, Faisalabad, Pakistan.

AGRON-401

Fodder and Forages

2(1-1)

Learning Objectives

During the course, students will be able to:

- Have Knowledge about fodder production in Pakistan.
- Learn Conservation of Feed/fodders for future use

Theory

Importance of forages and fodders; Taxonomy of forages and fodders crops; Forage production in Pakistan: current status and future scenario; Agro techniques of production of non-legume forages/fodders; Forages legumes production techniques, sustainable forage production; Increasing productivity of pastures and range lands; Seed production constraints and remedies; Fodder preservation (Hay and Silage); Fodder research studies in Pakistan.

Practical:

Identification of fodder/forage crops and seed; Estimation of sprout density and plant population silage and hay making practices; Preparation of fodder calendar; Determination of foage quality parameters; Visits of university farms.

Suggested Readings:

1. Khalid, I.A and A. Jan. 2006. cropping technology, national book foundation,

- Islamabad, Pakistan.
2. Martin, J.H., R.P. Waldern and D.L. Stamp. 2006. Principles of field crop production 4th ed. Pearson Prantice Hall, Upper Saddle River, NJ, USA.
 3. Mukherjee, A.K. and S. Maiti. 2009. Forage crop production and conservation. Kalyani publishers, New Delhi, India.
 4. Singh. A.K, M.A. Khan, N. Subash and K.M. Singhy 2001. Forages and fodders. Daya Publishing house, Delhi, India.

ENG-401 Technical and Business English Writing 3(3-0)

Learning Objectives

This course will enable the students to:

- Understand the requirements and ethics of technical and business writing
- Work professionally to produce effective business documents incorporating verbal, visual, and multimedia materials as necessary
- Communicate effectively by analyzing audience, organizing documents, writing clearly and precisely with no grammar errors

Theory

Introduction of business and technical english; Oral Communication; Reader-Centered Writing, Audience Analysis; Effective Communication; Defining Objectives; Planning Business Messages; Composing business Messages; Revising business Messages, Memorandums, Meeting Documents and Proposals, Letters; Writing Direct Requests, Writing Routine, Good-News and Goodwill Messages; Writing Bad-News Messages; Writing Persuasive Messages, Writing Short Reports; Planning Long Reports; Writing long reports, General reports, Empirical Research Report; Feasibility Reports; Progress Reports. Proposals; Instructions, Using Visual Aids; Creating Twelve Types of Visual Aids; Writing Specifications and Analysis Reports, How to avoid common writing problems; Language Review: The Paragraph; Sentences, Words and Punctuation; Writing Mechanics; Interviews; Planning interviews and conducting Meetings; Giving Speeches and Oral Presentations.

Suggested Readings

1. Brown, B.W. 2009, Successful Technical Writing/Instructor's Guide, Goodheart-Willcox Publisher
2. Hardesty, R.E. 2010. Technical and Business Writing for Working Professionals, Xlibris Corporation, Bloomington, IN, USA.
3. Handford, M., M. Lisboa, A. Koester and A. Pitt. 2011. Business Advantage Upper-intermediate Student's, Cambridge University Press
4. Shahid, G.M. 2010. Business Communication and Report Writing. Rizwan Publishers, Faisalabad, Pakistan.
5. Shah, A.S. 2006. Exploring the World of English. Ilmi Kitab Khana, Lahore, Pakistan.

Zool-401**Fish and Fisheries of Pakistan****3(2-1)****Learning Objectives**

During the course, students will be able to:

- Understand Importance of fish farming and types of fishes
- Understand the methods of fish farming .

Theory

Introduction to fish, fisheries and aquaculture; Concept of marine, brackish and freshwater fisheries and aquaculture; Freshwater resources and fishes of Pakistan; Types of fish culture; Pond fish culture, Types, usage, planning and construction of fish pond, water quality of fish pond; Culturable fishes of Pakistan; Biology of indigenous and exogenous culturable fishes; Fish pond fertilization, types and effect on fish growth and water quality; Fish feed and feeding; Feed ingredients and feeding formulation; Induced breeding of fish, fish diseases and their control; Integrated fish farming.

Practical

Study of morphological characteristics of fish; Identification of local fish species with the help of key; Dose calculation of fertilizer and feed for fish pond; Artificial feed ingredients; Feeding methods; Visit to fish farm and hatchery; Monitoring of pond water for quality parameters.

Suggested Readings

1. Ali, S.S. 1999. An Introduction to Freshwater Fishery Biology. University Grants Commission, Islamabad, Pakistan.
2. Boyd C. E. and A. A. McNevin. 2014. Aquaculture, Resource Use and the Environment. Wiley-Blackwell, New York, NY, USA.
3. Pillay, T.V.R. and M.N. Kutty. 2005. Aquaculture: Principles and Practices. Blackwell Science Limited, NY, USA.
4. Royce. W. F. 2013. Introduction to the Fishery Science. Amsterdam, Netherlands.
5. Stickney, R.R. 2016. Aquaculture: An Introductory Text. 3rd Ed. CABI Publishing, London, UK.

ENT-401**Insect Pests of Household, Human and Animals****2(1-1)****Learning Objectives**

During the course, students will be able to:

- Understand important pests of agriculture
- Learn about basic biology of insects and pests

Theory

Introduction; Identification and biology of insects of agriculture and livestock importance ; Control of different insect pests like ants, termites, cockroaches, silver-fish, cricket, powder-post and carpet beetles, cloth-moths, psocids, lice, bed-bugs, fleas, mosquitoes, house flies, sand flies, stable flies, flesh flies, blow flies, tsetse flies, black flies, midges.

Practical

Collection, identification, and demonstration of control of different insect pests.

Suggested Readings:

1. Atwal, A.S. 2005. Agricultural Pests of Southeast Asia and their Management. Kalyani Publishers, Ludhiana, India.
2. Meds, D. 2002. Venoms and Poisonous Animals. CRC Press, Boca Raton, FL, USA.
3. Metcalf C.L. and W.P. Flint 1978. Destructive and Useful Insects. Their Habits and

- control 2nd Ed. McGraw Hill Book Corporation, New York, NY, USA.
4. Pfadt., R.E. 1985. Fundamental of Applied Entomology, 4th Ed. The Macmillan Corporation, New York, NY, USA.

LM-403

Principles of Small Ruminant Production

3(2-1)

Learning Objectives

During the course, students will be able to:

- Understand small ruminant characteristics and importance
- Understand small ruminant production and management

Theory

Domestication; Scope of small ruminant industry in Pakistan; Share in national economy; World distribution; Feeding, breeding, selection, kidding/lambing, rearing and housing; Nursing orphan kids/lambs; Systems of production; sheep and goat as meat and dairy animals; Systems of production; Measures for increased production; establishing commercial flocks; Economics of sheep and goat production; Preparing feasibility reports; Characteristics and utility of wool, hair/mohair; Shearing and handling wool/hair; sheep and goats on ranges; Transportation and marketing; Slaughter and flaying; Showing of sheep/goats; Keeping flock healthy; Common ailments.

Practical

Identification of different sheep and goat breeds; Judging for milk, meat and wool/hair production; Farm practices such as castration, hoof trimming, condition scoring; Feeding lambs/kids, identification, docking, drenching, dipping and spraying; Dentition; Use of marking harness, housing plans, shearing and handling; grading and sorting wool; Studying characteristics of hair, wool and mohair in the lab; Flaying and skin preservation; Various farm records; Practical prophylactic measures; Shepherd calendar; Visit to sheep and goat farms.

Suggested Readings

1. Khan, B.B.,A. Iqbal and M.I.Mustafa. 2003. Sheep and Goat Production. Department of Livestock Management, University of Agriculture, Faisalabad, Pakistan.
2. Khan, M.S. and A.O. Okeyo. 2016. Judging and Selection in Beetal Goats. GEF-UNEP-ILRI FAnGR Asia project. University of Agriculture Faisalabad, Pakistan.
3. Mackintosh, J. B. 1993. Sheep Production in Pakistan. PARC. Islamabad, Pakistan.
4. Rosalee, S. and P. Rudenberg. 2008. Raising Goats for Milk and Meat. Heifer International, I World Avenue, Little Rock, AR, USA.
5. Solaiman, S.G. 2010. Goat Science and Production. Wiley-Blackwell, New York, NY, USA.

Learning Objectives

During the course, students will be able to

- Understand Mineral and Vitamin Types and importance
- Understand Importance of Mineral and Vitamins

Theory

Historical perspective of minerals and vitamins; Essential minerals, classification, distribution and their functions in living body; Interrelationship; Deficiency and toxicity of macro and micro minerals; relationship of minerals with dietary components; Classification, chemical structure and functions of vitamins; Deficiencies and hypervitaminosis; Interrelationship among vitamins and other nutrients; Different sources of minerals and vitamins

Suggested Readings

1. Ensminger, M.E., J.E. Oldfield and W.W. Heinemann. 1990. Feeds and Nutrition. Ensminger publishing Corporation. 648 West Sierra Avenue Clovis, CA, USA.
2. FAO. 2016. Development of Integrated Multipurpose Animal Recording Systems. FAO Animal Production and Health Guidelines. FAO, Rome, Italy.
3. Khan, M.S. and A.O. Okeyo. 2016. Judging and Selection in Beetal Goats. GEF-UNEP-ILRI FAnGR Asia project. University of Agriculture Faisalabad, Pakistan
4. Maynard, L.A., J.K. Loosli, H.F. Hintz and R.G. Warner. 1991. Animal Nutrition. 7th Ed. McGraw-Hill Education, New York, NY, USA.
5. McDonald, P., R.A. Edwards, J.F.D. Greenhalf and C.A. Morgan. 2008. Animal Nutrition. 6th Ed. Longman Scientific and Technical Publisher, London, UK.

Learning Objectives

During the course, students will be able to:

- Understand animals Selection principles,
- Understand mating systems and breeding goals

Theory

Selection: natural and artificial selection; Methods of selection; Tandem method, independent culling level and selection index; Kinds of selection: mass selection, selection based on multiple records or lifetime average, pedigree selection, progeny testing, family selection; Selection for single and multiple traits: correlated response, genetic effects of selection, methods of assessing genetic progress; Various systems of breeding: random mating; inbreeding and its effects on small and large populations; Line-breeding for increased prepotency; Outbreeding; outcrossing, crossbreeding, grading up, phenotypic assortativematings; Development of inbred lines; Lethal genes; selection for best combining abilities; reciprocal recurrent selection; Breeding for threshold characters.

Practical

Estimation of genetic gain; evaluation of livestock on the basis of their own performance, pedigree and progeny; Calculation of breeding values from single and repeated records; Measurement of coefficient of relationship and inbreeding by methods of paths and variance-covariance chart. Measurement of heterosis; Estimation of genetic changes in performance traits due to various mating systems; Exercises on the feasibility of purebreeding and crossbreeding in farm animals.

Suggested Readings

1. Bourdon, R.M. 2013. Understanding Animal Breeding. Prentice-Hall, Inc. Upper Saddle River, NJ, USA.
2. Lasley, J.F. 1987. Genetics of Livestock Improvement. Prentice-Hall International Inc. Englewood Cliffs, NJ, USA.
3. Legates, J.E. and E.J. Warwick. 1990. Breeding and Improvement of Farm Animals. McGraw-Hill Publishing, New York, NY, USA.
4. Willis, M.B. 1998. Dalton's Introduction to Practical Animal Breeding. Blackwell Science, New York, NY, USA.

Learning Objectives

During the course, students will be able to:

- Understands basics of Anatomy
- Have knowledge about anatomy of farm animals

Theory

Anatomical terminology; classification and functions of skeleton; Muscular and nervous system (brain, spinal cord and major nerves); Osteology: structure of bone, skeleton of horse, ox and chicken, vertebral column, ribs, sternum, skull, forelimb and hindlimb; Arthrology: Joints, their classification and types; Skeletal muscles and their function; muscle contraction; levers; neurons; receptors; the reflex arc; Digestive system; the mouth, teeth, tongue, salivary glands, pharynx, oesophagus, ruminant and non-ruminant, stomach, intestines, pancreas. liver and spleen; the peritoneum; Respiratory system: the nostrils, nasal cavity, pharynx, larynx and trachea; pleura and lungs; Urinary system: the kidneys, ureters, urinary bladder and urethra; Genital system: male genital organs including scrotum, testes, spermatic cord, vesiculaeseminalis, prostate, uterus masculinus, bulbourethra glands and the penis; female genital organs including ovaries, fallopian tubes, uterus, vagina, vulva and mammary glands; endocrine glands, hypophysiscerebri, epiphysis cerebri, thyroid, parathyroid, adrenal, pancreas, ovary and testes; Angiology study of heart, pericardium and major arteries and veins; Superficial lymph glands; Anesthesiology: study of sense organs and the common integument.

Practical

Identification of the various bones; Ligaments, tendons and their attachment to the bones of different domestic animals; Form, structure and topographical study of various organs located in the thoracic, abdominal and pelvic cavities of different domestic animals.

Suggested Readings

1. Ankers, R.M. and D.M. Denbow, 2008. Anatomy and Physiology of Domestic Animals. Blackwell Publishing, New York, NY, USA.
2. Dyce, K.M., W.O. Sack and C.J. Wensing. 2002. Textbook of Veterinary Anatomy. 3rd Ed. WB Saunders Co., USA.
3. Guyton, A.C. and J.E. Hall. 2010. Textbook of Medical Physiology. 12th Ed. WB Saunders Publishing, MO, USA.
4. Klein, B.G. 2013. Cunningham's Textbook of Veterinary Physiology. 5th Ed. Saunders Publishing, WB Saunders Publishing, MO, USA.

Learning Objectives

During the course, students will be able to:

- Understand mammary system of animals
- Understand milk production and processing techniques

Theory

Structure and functions of mammary gland; Blood and nerve supply to the udder; Mammogenesis, lactogenesis and galactopoises; Synthesis of milk; Milk ejection- neural and hormonal component; Milking methods; factors affecting milk production and composition; Measure to increase milk production; common malpractices used in milk production; Physical and chemical properties of milk; Hygienic milk production; Collection and transportation, processing and marketing of milk; Dairy products; Milk ordinance; Milk borne diseases.

Practical

Milking practice; hand versus machine milking; Milk let down and its inhibition; Removal of residual milk; Milking time hygiene, screening tests, macro and micro structure of udder; analysis of milk; Cleaning and sanitizing of barns and equipment; Visit to milk processing plants.

Suggested Readings

1. Bilal, M. Q. and A. Ahmad. 2004. Dairy Hygiene and Disease Prevention. Usman and Bilal Printers and Publishers, Faisalabad, Pakistan.
2. FAO. 2016. Development of Integrated Multipurpose Animal Recording Systems. FAO Animal Production and Health Guidelines. FAO, Rome.
3. Khan, B.B. 2008. Health and Husbandry of Dairy Animals. Pak T.M. Printers, Faisalabad, Pakistan.
4. Larson, B. L. 1985. Lactation. The Iowa State Univ. Press, Ames, IA, USA.
5. Schmidt, G.H., L.D. Van Vlek and M.F. Hutjenes. 1988. Principles of Dairy Science. 2nd Ed. Prentice Hall Inc. Englewood Cliffs, NJ, USA.

AN-402

Nutrient Requirements of Farm Animals

3(2-1)

Learning Objectives

During the course, students will be able to:

- Understand the basics of nutrient requirements in Farm animals
- Understand types and balance of various nutrients in animals

Theory

Feeding standards; History, usefulness and limitations; Nutrient requirements of cattle, buffaloes, sheep, goats, for maintenance, growth, production and reproduction; Measurement of body needs, digestibility and balance trials; Factors affecting digestibility and balance of nutrients; Respiratory quotients; partitioning of nutrients in body; Factors governing energy; protein; Minerals and vitamins needs of farm animals; Concept of rumen bypass nutrients.

Practical

Determination of nutrient digestibility and nitrogen balance; Determination of energy value of feedstuffs

Suggested Readings

1. Ensminger, M.E. and J.E. Old field and W.W. Heinemann. 1990. Feeds and Nutrition. The Ensminger Publishing Co. Clovis, CA, USA.
2. FAO. 2016. Development of Integrated Multipurpose Animal Recording Systems. FAO Animal Production and Health Guidelines 19. FAO, Rome.
3. NRC. 2000. Nutritional Requirements of Beef cattle. 7th Ed. National Academy Press. Washington, USA.
4. NRC. 2001. Nutrient Requirements of Dairy Cattle. 7th Ed. National Academy Press, Washington, USA.

PS-402

Incubation Principles and Hatchery Management

2(1-1)

Learning Objectives

During the course, students will be able to

- Learn about incubation and hatchery management
- Understand Basic tools while construction of poultry shed

Theory

History, development and scope of hatchery industry in Pakistan; Collection, handling, selection, fumigation, storage and transport of hatching eggs; Seasonal hatching; Incubation methods; types of incubators and incubation requirements; Role of computer in modern hatchery operations; Setting and candling of eggs; daily changes in embryonic development during incubation, physical act of hatching; factors influencing fertility, hatchability and quality of chicks; taking off hatch; hatchery services; Hatchery sanitation and waste disposal; Trouble shooting during incubation; Incubation records.

Practical

Planning and designing of hatchery; practices regarding collection, selection, cleaning, fumigation and storage of hatching eggs; Demonstration of parts of incubators; Setting and candling of hatching eggs; Handling of incubators; Disinfection and fumigation of incubators; observing daily changes during embryonic development; Sexing, grading, detoeing, and dubbing of baby chicks; Examining malposition of embryo; dead embryo and dead in shell; Estimation of fertility and hatchability; Trouble tracing chart of the chick embryo; Feasibility report of

hatchery; Visits to commercial hatcheries.

Suggested Readings

1. Donald, D. Bell and D. William and J. Weaver. 2007. Commercial Chicken Meat and Egg Production. Springer Pvt. Ltd, India.
2. Pandey, D. 2018. Handbook of Poultry and Technology. Thomas Press Ltd. New Delhi, India.
3. USAID. 2015. Practical Poultry Raising. Peace Corps Publication. Washington, DC, USA.
4. Yousaf, M., A. Haq and A. Haq. 2017. Poultry Production Technology. University of Agriculture, Faisalabad, Pakistan.
5. Yousaf, M., A. Haq and A. Haq. 2017. Poultry Production Technology. University of Agriculture, Faisalabad, Pakistan.

PS-404

Poultry Housing and Equipment

2(1-1)

Learning Objectives

During the course, students will be able to

- Know Importance of housing in management of poultry.
- Learn about basic tools while construction of poultry shed.
- Establish the poultry farm.

Theory

Importance and purpose of poultry housing; poultry housing systems; Types and styles of poultry houses; selection of site and location of poultry house; Construction of poultry farm buildings; light, gas and water fittings in poultry houses; Heating and cooling systems; role of house design, insulation, opens-sided and environmentally controlled housing; Brooding, rearing and laying house equipment; Feeding and watering systems; Automation and innovations in poultry housing; Equipment and effective climatic control in poultry houses; Feasibility report of poultry housing.

Practical

Basic principles for site selection and poultry house construction; Demonstration of poultry farm buildings; Designing of farm buildings; Poultry house insulation materials; Demonstration and operation of poultry farm equipment; Automatic feeding and watering systems and its trouble shooting, poultry housing practices; Visit to a poultry farm.

Suggested Readings

1. Pandey, D. 2017. Poultry Production. Thomas Press Ltd. New Delhi, India.
2. Sindhu, A.S. 2018. Poultry Nutrition and Environment Management. Random Publications, New Delhi, India.
3. USAID. 2015. Practical Poultry Raising. Peace Corps Publication. Washington, DC, USA.
4. Yousaf, M. and A. Haq. 2017. Poultry Production Technology. University of Agriculture, Faisalabad, Pakistan.

Learning Objectives

During the course, students will be able to:

- Understand basics of forestry and wildlife
- Understand Forestry and wildlife range

Theory

Forestry: Importance of the subject and its potential; Various branches of forestry; Basic terminology related to forestry; Relationship of forestry and range management with the allied fields; Functional structure of trees such as crown, stem and roots; Tree growth and environment; Land capability classification; Principles of forestry and Agro-Forestry such as precise objectives (why to grow); Selection of suitable site (where to grow), selection of suitable species (what to grow), establishment; Cultural operations, felling, proper conversion and skillful marketing. Various combinations of agro-Forestry systems; Distribution of trees in the farmlands; Elements of wood seasoning and preservation; Pakistan timber and their uses, various forest types of Pakistan; Tree planting in problem soils; History and scope of urban forestry, management of urban forests, forestry education, training and research in Pakistan.

Range: Importance of rangelands and range management in Pakistan; Basic concepts and terminology; Relationship of range management with allied fields. History of range management with reference to Pakistan; Various components and functioning of range ecosystem; Problems and constraints in managing the rangelands; Principles of Range Management. Rangelands of Pakistan, their distribution, problems and proposed solutions; Range forages of Pakistan, natural as well as cultivated; Range livestock of Pakistan, distribution, types characteristics; Range livestock Grazing methods and systems.

Wildlife: Introduction of Wildlife and Wildlife Management; Basic concepts and terminology. Principles and wildlife decline in Pakistan; Measures to improve wildlife situation in Pakistan. Concept of Protected areas as national park, wildlife Sanctuary, Game Reserve and Zoological Garden; Important Wildlife species in different ecological regions of Pakistan.

Practical

Identification of important tree species; Practice of various nursery and field activities; Planting materials, methods and seasons; Various silvicultural operations; Maintenance of tree record; Afforestation techniques in problem soil/site; Visits to various Forest types of Pakistan; Visit to various urban forestation project, preparing plan for selected areas; Identification and preservation of important range forage species; Range improvement techniques; Estimation of carrying capacity of a range site; Visits to various range types and livestock/cattle/sheep/goat farms; Visits to various Forest parks, wildlife parks, national and Zoological Gardens.

Suggested Readings

1. Grey. G.W. and F.J. Demeke. 1986. Urban Forestry. John Wiley and Sons. New York, NY, USA.
2. Quraishi M. A.A., G.S. Khan and S. Yaqoob. 2010. Range Management in Pakistan, Univ. of Agriculture Faisalabad.
3. Quraishi M. A., G.S. Khan and S. Yaqoob. 2005. Range Management in Pakistan, A-One Publishers, Urdu Bazar, Lahore, Pakistan.
4. Sheikh, M.I. 2017. Forests and Forestry in Pakistan. Pakistan Forest Institute, Peshawar, Pakistan.

Learning Objectives

During the course, students will be able to:

- Understand animal genetic resources
- Understand methods of Conservation of Animal Genetic Resources

Theory

Origin and history of livestock industry, status and trends of farm animal genetic resources; Threats to genetic diversity; Characterization, inventory and monitoring, successful breeding programs; Animal identification, registration and traceability; Development and implementation of animal recording system; Emerging biotechnologies, breeding strategies and programmes; Conservation programmes, identifying breeds at risk, determining the conservation value of a breed; In vivo conservation; Cryopreservation; Development in animal genetic resource economics, challenges and opportunities in conservation.

Practical

Case studies and analysis of conservation schemes in different farm animal species; Simulation exercises on breeding strategies to minimize inbreeding and improve effective population size; Exercises on animal recording setups for improved utilization

Suggested Readings

1. FAO. 2013. In vivo conservation of Animal genetic resources. FAO Animal Production and Health Guidelines 14. FAO, Rome.
2. FAO. 2015. The second report of the state of the World's Animal Genetic Resources for food and Agriculture. FAO, Rome.
3. FAO. 2016. Development of Integrated Multipurpose Animal Recording Systems. FAO Animal Production and Health Guidelines 19. FAO, Rome.
4. Oldenbroek, K. 2007. Utilisation and Conservation of Farm Animal Genetic Resources. Wageningen Academic Publishers, The Netherlands.

LM-501 Range Livestock Production**3(2-1)****Learning Objectives**

During the course, students will be able to:

- Understand management of farms animals on range lands
- Learn animal grazing management systems

Theory

Introduction to ranges; Basic concepts and terminology; range statistics; Ecological zones of world/Pakistan; Soil, plant and animal relationship; Various range animals; Range management policy; Vegetation manipulation and other tools for improvement; Important range and cultivated grasses; trees and shrubs as animal feed; Grazing management systems and supplementary feeding; Grazing capacity and stocking rates; Effect of climate on animals and vegetation; Shelter on ranges and fence types; wild animals; Poisonous plants, their hazards and prophylactic measures on ranges.

Practical

Identification of various range grasses, trees, shrubs and cultivated forages; Preservation/mounting of important range grass samples; Determining range carrying capacity and forage production, animal units and stocking rates; animal take off rate; Visit to rangelands.

Suggested Readings

1. FAO. 2016. Development of Integrated Multipurpose Animal Recording Systems.
2. FAO. 2016. Animal Production and Health Guidelines 19. FAO, Rome.
3. Pandey, D. 2017. Poultry Production. Thomas Press Ltd. New Delhi, India.
4. Quraishi, M.A.A., G.S. Khan and M. S. Yaqoob. 1993. Range Management in Pakistan. Kazi Publications, Ganpat Road, Lahore, Pakistan.
5. Quraishi, M.A.A., M. Ishaque and R.A. Khan. 2000. Field Exercises in Range management and Wildlife. University of Agriculture, Faisalabad, Pakistan.

AN-501 Feeding of Farm Animals**3(2-1)****Learning Objectives**

During the course, students will be able to:

- Understand feed resources and its types
- Understand conservation of feed for animals

Theory

Feed resources for livestock and poultry; Nutrient composition of feeds; feeding management of dairy animals in different physiological stages; Feeding of beef animals; Feeding of small ruminants; Nutritional management of grazing livestock, concept of forage-concentrate ratios in feeding; Hay and silage making; treatment of low quality roughages; Utilization of non-conventional feed resources; Nutritional disorders.

Practical

Formulation of least cost balanced rations for different classes of farm animals; Feeding trials; treatment of crop residues.

Suggested Readings

1. Cheeke, P.R. 1991. Applied Animal Nutrition: Feeds and Feeding. Prentice Hall International, London, UK.
2. FAO. 2016. Development of Integrated Multipurpose Animal Recording Systems.

- FAO Animal Production and Health Guidelines 19. FAO, Rome.
3. FAO. 2016. Animal Production and Health Guidelines 19. FAO, Rome.
 4. NRC. 2001. Nutrient Requirements of Dairy Cattle. National Academy Press, Washington DC. , USA.
 5. Pandey, D. 2017. Poultry Production. Thomas Press Ltd. New Delhi, India.

PS-501

Poultry Farm Management

3(2-1)

Learning Objectives

During the course, students will be able to:

- Understand Managemental practices at poultry farm.
- Manage farm in different stages of poultry life.

Theory

International poultry meat and egg production perspective; Recent trends and future scope of poultry farming; Brooding requirements for chicks; rearing of young stock; Shifting and housing of pullets; raising broilers, layers and breeders; Feeding practices for broilers, layers and breeders; Light management; Practices to boost egg and meat production; management of flock during hot and cold climates; cannibalism; Importance and scope of flock recycling in poultry; Poultry welfare and modern poultry enterprises; Cage vs. floor management; Furnished cages for layers; Poultry waste disposal; trouble shooting in poultry farms; Characteristics of an ideal poultry farm manager; bio-security measures; cost benefit ratio of different poultry enterprises; Significance of record keeping; Use of computers and soft wares in poultry farming.

Practical

Demonstration and handling of various types of brooders; Vaccination, medication, beak trimming and detoeing techniques; Flock recycling techniques and their application; poultry farm routine practices; Postmortem of poultry birds; Preparation of birds for transportation; Applied aspects of biosecurity at poultry farms; Remedies for different vices in poultry; Computerized record keeping at farms; Feasibility report of commercial broiler, layer and breeder flocks; Visit of environment controlled poultry farm.

Suggested Readings

1. Donald, D.B. and W.D. Weaver. 2007. Commercial Chicken Meat and Egg Production. Springer Pvt. Ltd., India.
2. Pandey, D. 2017. Poultry Production. Thomas Press Ltd. New Delhi, India.
3. USAID. 2015. Practical Poultry Raising. Peace Corps Publication. Washington, DC. , USA.
4. Yousaf, M. and A. Haq. 2017. Poultry Production Technology. University of Agriculture, Faisalabad, Pakistan.

AR-501

Introduction to Animal Reproduction

3(2-1)

Learning Objectives

During the course, students will be able to:

- Understand basic knowledge of Animal Reproduction
- Understand role of reproductive hormones
- Learn about diagnostic tools for pregnancy in animals

Theory

Physiology of female reproduction: Puberty and breeding season in farm animals; Hormones of hypothalamus, pituitary, placenta, ovaries and uterus; Oestrous cycle, oogenesis, ovulation, fertilization, gestation and parturition; Involution of uterus and post-partum ovarian activity; Methods of heat detection and pregnancy diagnosis; Reproductive efficiency parameters; Factors affecting the reproductive efficiency of farm animals; Physiology of male reproduction: Puberty in farm animals; Hormone of the testes; spermatogenesis; methods of semen collection; Physical characteristics of the semen of farm animals; Artificial insemination.

Practical

Functional anatomy of male and female reproductive system; In vitro palpation of female reproductive organs for anatomical and morphological study; Observation of oestral activity; Breeding soundness examination of the bull: physical examination of the bull; Preparation of artificial vagina; Semen collection, evaluation and processing.

Suggested Readings

1. Ball, P.J.H. and A.R. Peters. 2004. Reproduction in Cattle. 3rdEd. Blackwell Publishing Ltd, Oxford, UK.
2. FAO. 2016. Development of Integrated Multipurpose Animal Recording Systems. FAO Animal Production and Health Guidelines 19. FAO, Rome.
3. Hafez, E.S.E. and B. Hafez 2000. Reproduction in Farm Animals, 7thEd. Lea and Febiger, Philadelphia, USA.
4. I.A.E. A. 2007. Improving the Reproductive Management of Dairy Cattle subjected to Artificial Insemination. Joint FAO/IAEA Program of Nuclear Technique in Food and Agriculture, FAO, Rome.

AE-501

Human Resource Management

3(3-0)

Learning Objectives

During the course students will be able to:

- Understand basic knowledge of Human resource management
- Understand human resource planning and Job Analysis

Theory

Introduction to human resource management, functions of management and leadership; Ethical context of human resource management; Work process engineering and technology effects; The strategic and operational role of human resource management; Human resource planning and job analysis, recruitment and selection; Performance appraisal; Training and development, career development; Organizational development, program planning, design and evaluation, employee socialization and orientation; Skills and technical training, maintaining high performance, workplace issues, safe and healthy work environment; Social responsibility of organization.

Suggested Readings

1. DeCenzo, D.A. and S.P. Robbins. 2005. Human Resource Management. John Wiley and Sons, Inc. NY, USA.
2. Robbins, S., R Bergman, I. Stagg and M. Coulter. 2003. Management. Prentice Hall, Sydney, Australia.
3. Swart, J., M. Clare, B. Steve and P. Alan. 2005. Human Resource Development. Elsevier Butterworth Heinemann, Oxford, UK.

ABG-502 Selection for Economic Traits in Farm Animals 3(2-1)

Learning Objectives

During the course, students will be able to:

- Understand the economic traits in farm animals and poultry
- Understand breeding plans for genetic improvement of farm animals

Theory

Traits of economic importance in farm animals; Selection of dairy heifers and bulls; Use of standardized records; Relative economic values, breeding values and selection indices; Crossbreeding for milk and meat production; Traits of economic importance in poultry and their improvement: formation of breeding stock for layers and broilers; Development of dual purpose birds and rural poultry; National breeding policy for improvement and conservation of livestock; Review of the animal breeding practices used by the developed countries; Future breeding plans for genetic improvement of farm animals in different agro-ecological zones of Pakistan; Emerging biotechnologies for increasing animal productivity.

Practical

Exercises on the maintenance and standardization of productive and reproductive records; Estimation of Breeding Values using standardized records; Exercises on the estimation of relative economic values; Construction of selection indices for large and small animals; Orientation of computer packages for animal conservation and evaluation.

Suggested Readings

1. Fasoo, D. 2016. Textbook of Animal Genetics and Breeding. Syrawood Publishing House, Portsmouth, NH, USA.
2. FAO. 2016. Development of Integrated Multipurpose Animal Recording Systems. FAO Animal Production and Health Guidelines 19. FAO, Rome.
3. Muir, W.M. and S.E. Aggrey. 2003. Poultry Genetics, Breeding and Biotechnology. CAB International, Wallingford, Oxon, UK.
4. Simm, G. 1998. Genetic Improvement of Cattle and Sheep. Farming Press, Miller Freeman, UK.
5. Weller, J.I. 2016. Genomic selection in Animals. John Wiley & Sons. Inc, NJ, USA.

LM-502

Equine and Camel Production

3(2-1)

Learning Objectives

During the course the students will be able to

- Understand basics of camel and equine production
- Understand body characteristic of camels and equines

Theory

Camel as milk, meat and draught animal; Equines (horses, mules & donkeys) as draught animals; Types and breeds of camel and equines; Special characteristics, body conformation and draught ability of camel and equines; Selection for various types; Breeding, feeding and reproduction management of camel, horse & donkey; principles of equitation; Common ailments and prophylactics; Welfare of camel and equines.

Practical

Demonstration of body conformation and defects; Determining age; marking camel and horses; Grooming and cleaning; use of various management tools and equipment; Care of foot; use and care of harness and saddles; Equitation practices; Measuring physiological norms; Visit to stud farms.

Suggested Readings

1. Barly, M. 1981. Horse B A practical and Scientific Approach. McGraw Hill Book Co. , NY
2. FAO. 2016. Development of Integrated Multipurpose Animal Recording Systems. FAO Animal Production and Health Guidelines 19. FAO, Rome. .
3. Higgens, A.A. and I.A. Wrights. 1989. Equine Manual. W.B. Saunders Co. Philadelphia, USA.
4. Kacker, R.N. and B. S. Panwar. 1996. Text Book of Equine Husbandry. Vikas Pub. Pvt. Ltd, New Delhi, India.
5. Manefield, G.W. and A.H.Tinson. 1997. Camels A compendium. Postgraduate Foundation, Sydney, NSW, Australia. .

AN-502

Principles of Poultry Nutrition

2(1-1)

Learning Objectives

During the course, students will be able to:

- Understand classification of nutrients and their functions
- Understand role of vitamins and minerals in poultry feed
- Understand digestion and absorption of nutrients

Theory

Sources and classification of nutrients and their functions; Digestion and absorption of nutrients; Metabolism of water, carbohydrates, protein and fats; Hormonal control of metabolism; Nutritional diseases caused by vitamins and minerals deficiencies; Feed additives, antibiotics, coccidiostats, antioxidants, probiotics, enzymes, metabolic antagonistics and incompatibilities in mixed feed, stability, availability, vitamin, antagonists, amino acids, antimetabolites, goitrogens; Drug toxicities; Toxic substances in poultry feed; Optimum levels of essential nutrients in poultry rations; Amino acids and energy ratio in poultry rations; Nutrients requirements of commercial layers, broilers, breeders, quails, ducks and turkeys.

Practical

Composition of feedstuffs used in poultry rations; Characteristics of poultry rations; Formulation

of rations for broilers, layers and breeders, quails; Introduction to computer ration formulation; economics of poultry rations; Visits to feed mills and poultry farms

Suggested Readings

1. Dagher, N. J. 1995. Poultry Production in Hot Climates. CAB International, UK.
2. Lesson, S. and J. D. Summers. 2001. Commercial Poultry 4th Ed. University Book. P. O. Box 1326, Guleph, Ontario, Canada.
3. NRC. 1994. Nutrient Requirements of Poultry. National Academy of Sciences, USA.
4. Rose, S.P. 1996. Principles of Poultry Science. CAB International, UK.
5. Singh, R.A. 2004. Poultry Production. Kalyani Publishers. New Delhi, Ludhiana, India.

PS-502

Poultry Feeding Practices

3(2-1)

Learning Objectives

During the course the students will be able to:

- Know about basic knowledge of poultry feed.
- Evaluate the poultry feeds.
- Prepare feed mixing.

Theory

Importance of poultry feeding; principles of poultry feeding; Common feedstuffs used in poultry rations; Poultry feed formulation; feeding methods and their advantages; Forms of feed; Feed and water quality in relation to performance of chickens; Factors affecting quality of feeds; measures to avoid feed toxicity; Manual versus automatic feeding systems; Feed and water space requirements, poultry feed additives; Storage of poultry feed to maintain quality; Types of poultry diets; Poultry feeding strategies during hot and cold climate; Measures to avoid wastage of feed.

Practical

Different feeding methods; feeding practices at farm; Evaluation of poultry feed by gross examination; Storage of commercial feed at farm; mixing of feed additives in poultry feed; Home feed mixing; Economics of home feed mixing; Visit to commercial feed mill and environment controlled poultry houses.

Suggested Readings

1. Donald, D.B. and W.D. Weaver, Jr. 2007. Commercial Chicken Meat and Egg Production. Springer Pvt. Ltd. , India.
2. Pandey, D. 2015. Recent Techniques in Poultry Farming and Feed Formulation. Random Publications, New Delhi, India.
3. Schiabile, P.J. and H. Patrick. 2018. Poultry Feeds and Nutrition. Scientific International Publishers, New Delhi, India.
4. Sindhu, A.S. 2018. Poultry Nutrition and Environment Management. Random Publications, New Delhi, India.

Learning Objectives

During the course, students will be able to:

- Know about basic knowledge of animal health
- Know about Cardinal signs of animal health& Disease
- Understand about Medication/Vaccination against diseases

Theory

Concept of farm animal medicine/herd medicine; Methods of prevention and control of diseases in farm animals; Recognition of systemic disorders and introduction to bacterial, viral, fungal, parasitic and metabolic disorders in farm animals; biosecurity on farms; Systemic disorders: chocking, indigestion, impaction, colic, tympany, pneumonia and mange etc. bacterial diseases: mastitis, hemorrhagic septicemia, black leg, salmonellosis, tuberculosis, paratuberculosis brucellosis, actinobacillosis, actinomycosis, malignant oedema, mycoplasmosis, q-fever and bovine farcy; viral diseases: ephemeral fever, foot and mouth disease, rinder pest bovine viral diarrhea, bovine malignant catarrh, infectious bovine rhinotracheitis, blue tongue, bovine spongiform encephalopathy, fungal diseases: ring worm, aspergillosis, histoplasmosis, dermatophilosis, candidiasis, deg-nala disease and mycotoxicosis; parasitic diseases: coccidiosis, babesiosis, and theileriosis, diseases caused by nematodes, cestodes, trematodes and arthropodes; Metabolic disorders and deficiency diseases: parturient haemoglobinuria, milk fever, transit tetany, lactation tetany, hypomagnasemictetany, ketosis, vitamins and mineral deficiencies/imbalance; Poultry: gumboro, ND, pullorum, CRD etc.

Practical

Vaccination and deworming schedule for farm animals; Mastitis microbiology, sensitivity profiling, evaluation of mastitis treatment formulations and teat dips ; Screening tests of mastitis; evaluation of milking machine; microbiological examination of milk and other dairy products for potential human health pathogens, diagnostic techniques for brucellosis, glanders, tuberculosis, toxoplasmosis, hydatidosis etc ; Detection of antibiotic residues in milk and other dairy products; Manual and computerized farm records.

Suggested Readings

1. Ajello, S.E. and M.A Moser. 2016. The Merck Veterinary manual. 11th Ed. Merck& company, INC, Whitehouse station. NJ, USA.
2. Andrews, A. H. 2000. The health fo Dairy cattle, Blackwell science, oxford, UR.
3. FAO. 2016. Development of Integrated Multipurpose Animal Recording Systems. FAO Animal Production and Health Guidelines 19. FAO, Rome.
4. Peter, D. Constable, K.W. Hincheliff, S.H. Done and W. Gruenberg 2016. Veterinary Medicine. A textbook of the diseases of Cattle, Sheep, Pigs, Goats and Horses. 11th Ed. Elsevier Health Sciences.
5. Smith, B.P. 2014. Large Animal Internal Medicie. 5thEd. Elsevier Mosby Co. Philadelphia, USA.

Learning Objectives

During the course, students will be able to:

- Know about types of marketing
- Know about Marketing of for livestock, poultry and their products

Theory

Importance of livestock, poultry and their products in the economy of Pakistan; Marketing approaches and their application to livestock and poultry; Major marketing functions and institutions involved in the marketing of livestock, poultry and their products; Management of wholesale markets of livestock and poultry; Marketing efficiency in theory and practice for livestock, poultry and their products; Current systems of livestock and poultry marketing in Pakistan; Challenges and policy options in the management of livestock poultry and their products; Role of Punjab Agriculture and Meat Company (PAMCO) and Pakistan Dairy Development Company (PDDC) in Livestock sector.

Suggested Readings

1. Bardhan D. 2012. Textbook on Livestock Economics Marketing and Business. Satish Serial Publishing House, New Delhi, India.
2. FAO. 2016. Development of Integrated Multipurpose Animal Recording Systems. FAO Animal Production and Health Guidelines 19. FAO, Rome.
3. Ghafoor, A. 2017. Agribusiness Management in Pakistan. University of Agriculture, Faisalabad, Pakistan.
4. Kohls, R.L. and J.N.Uhl. 2005. Marketing of Agricultural Products. Max Well. Macmillan, NY, USA.
5. Mohy-ud-Din and H. Badar. 2011. Marketing of Agricultural Products in Pakistan: Theory & Practice, Higher Education Commission, Islamabad, Pakistan.

Learning Objectives

During the course, students will be able to:

- Learn about pathology, parasitology and Bacteriology
- Learn about different diseases and their symptoms.
- Learn about diagnostic techniques.

Theory:

Introduction: introduction and importance of pathobiology, terminologies used in pathobiology; Modes of disease transmission, immunity and its types; Infectious and non-infectious diseases; Vaccine and its types; Quarantine and its importance.

Section-1-: Introduction: Introduction and importance of pathology, terminologies used in pathology; Inflammation (characteristics, mode, type and symptoms); Etiology, transmission, clinical sign/symptoms, diagnosis, post-mortem lesion and control in various infectious, non-infectious; Metabolic and nutritional diseases of small and large ruminants.

Section-2-: Introduction to parasitology and protozoology: introduction to protozoa, cell structure of protozoans; Vector and its importance; Etiology, transmission, clinical sign/symptoms, diagnosis; Post-mortem lesion and control of important protozoal disease of animals and poultry (*Trypanosomiasis, Leishmaniasis, Anaplasmosis, Babesiosis, Trypanomoniasis*); Introduction and lifecycle of trematodes, Nematodes and Cystodes; Introduction to entomology; Etiology, transmission, life cycle, clinical signs/symptoms, diagnosis, post-mortem lesion and control of important diseases of animals and poultry caused by trematodes; Nematodes and cystodes.

Section-3 Bacteriology: Introduction to bacteria, its structure, mode of replication; Difference between prokaryotic and eukaryotic cells, types of bacteria; Media its types and culturing of bacteria; Etiology, transmission, clinical sign/symptoms diagnosis, post-mortem lesion and control of important bacterial diseases of animals and poultry: *Anthrax, Enterotoxaemia, Tetanus, Black Quarter, Hemorrhagic Septicemia, Brucellosis, Actinomyces. Actinobacillosis, Pluropneumonia, Glanders, Strangles, Enteritis, Mastitis, Metritis (pyometra), White Scour, Tuberculosis, Salmonellosis, infectious Coryza, Chronic Respiratory Disease (CRD), Fowl Typhoid, Fowl Cholera, Pluram Disease, Colibacillosis, Pneumonia.*

Practical:

Diagnostic techniques of Parasites, Bacteria and pathological techniques; Precautionary measures and principals of working in laboratory; Introduction to laboratory glass wares, equipment and devices, Microscopy, Sterilization, Techniques; Preparation of media/broth for bacterial culture (general, selective and specific media); Preparation of media/broth for Fungal culture; Principle, Protocol, implementation & interpretation of staining techniques (negative staining, Gram's Staining, AZ Staining, Spore Staining, Capsule Staining).

Suggested readings

1. Chiodini, P.L., A.H. Moody, D.W. Manser. 2011. Atlas of Medical Helminthology & Protozoology by 4th Ed. Churchill Livingstone. Theobalds, UK.
2. Garcia, L.S. 2016. Diagnostic Medical Parasitology by. 6th Ed. John Wiley & Sons.
3. Hendrix, C.M. and E.D. Robinson. 2016. Diagnostic Parasitology for Veterinary Technicians-E-Book. Elsevier Health Sciences, Netherland.

Learning Objectives

During the course, the students will be able to:

- Know about basics of animal genome
- Understand genetic models and structures
- Know about DNA extraction techniques

Theory

Genetic markers: prospects and applications in genetic analysis; Designs and methods to detect QTL for production traits based on mapped genetic markers; Designs and methods to detect QTL for production traits based on random genetic models; Structural genomics: integrating linkage, Physical and sequence maps; Incorporating molecular information in breeding programs: Methodology; incorporating molecular information in breeding programs: Applications and limitations; comparative genomics; Functional genomics; Development and gene regulation; Expressed sequence tags, DNA chip technology and gene expression profiling; DNA polymorphisms in functional genes; Strategies for the production of transgenic chickens; Future of molecular genetics in different farm animal species.

Practical

Isolation of genomic DNA; Electrophoresis of DNA; Restriction enzyme analysis; Gene cloning and sequencing of DNA; Introduction to Bioinformatics tools.

Suggested Readings

1. Barnes, M.R. 2007. Bioinformatics for Geneticists. A Bioinformatics Primer for the Analysis of Genetic Data. 2nd Ed. John Wiley & Sons, New York, NY, USA.
2. FAO. 2016. Development of Integrated Multipurpose Animal Recording Systems.
3. FAO. 2016. Animal Production and Health Guidelines 19. FAO, Rome, Italy.
4. Ghafoor, A. 2017. Agribusiness Management in Pakistan. University of Agriculture, Faisalabad, Pakistan.
5. Khatib, H. 2015. Molecular and Quantitative Animal Genetics. Wiley-Blackwell, Danvers, MA, USA.

Learning Objectives

During the course, students will be able to:

- Know about important mutton and beef production
- Know about hygienic meat production, storage and preservation and Marketing

Theory

Development of meat industry in Pakistan; Important mutton, beef and dual purpose breeds; Meat terminology; systems of meat animal production; breeding and feeding management; veal and dairy beef; Species-wise off take rate; Meat processing techniques and steps; Meat certification laws at national and international level, meat evaluation, carcass evaluation; Cuts and meat grades; Feed additives for enhanced growth and fattening; Growth rate and fattening potential of indigenous livestock breeds; Factors affecting carcass and meat quality; Pre-slaughter handling of meat animals; Post slaughter changes in carcass; spoilage of meat; Hygienic meat production, storage and preservation; Buffalo and camel as beef animals; Marketing of meat animals and meat; Economics of meat production; meat by-products; Feasibility reports; modern abattoirs.

Practical

Body conformation of beef/meat animals; dressing percentage; carcass composition and cuts; judging meat animals; Condition scoring of meat animals; preparing animals for slaughter house; Scoring carcass conformation and fatness; humane handling and animal welfare; slaughterhouse management; Practical tips for housing and feeding of meat animals; Visit to slaughterhouses and feed lots; designing modern slaughterhouses.

Suggested Readings

1. Cottle, D.J. and L.P. Kahn. 2014. Beef Cattle Production and Trade. CSIRO Publishing, Australia.
2. Desmond Hill. 1988. Cattle and Buffalo Meat Production in the Tropics. Longman Group UK Ltd, Longman House, Burnt Mill, Harlow Essex, UK.
3. FAO. 2016. Animal Production and Health Guidelines 19. FAO, Rome. Italy.
4. Ghafoor, A. 2017. Agribusiness Management in Pakistan. University of Agriculture, Faisalabad, Pakistan.
5. Phillips, C.J.C. 2001. Principles of Cattle Production. CABI Publishing, CAB International Wallingford, Oxon, UK.

Learning Objectives

During the course, students will be able to:

- Understand the behaviors of different animals
- Understand the role of hormones in exhibiting animal behaviors
- Learn about animal welfare

Theory

Basic terminology of behavior and welfare; Development of behavior; Basic concepts; why to study behavior; Behavioral profiles of farm animals (dairy animals, small ruminants, equines and camels); Types of animal behavior; communication; hormones and behavior; behavior in relation to training, handling, feeding, transport and slaughter of animals; Animal well-being (the ultimate goal); rights of animals (legal and moral); Eliminating all sorts of stress.

Practical

Methods of assessing behavior; Demonstration about five freedoms; Observing territoriality, social behavior including courtship, mate guarding, mate choice and play behavior; Determining flight and fight zones in various species; Observing aggressive, sexual and eliminative behavior and observing cases of undue stress on account of beating, exposure to severe hot and cold weather; Carelessness in feeding; Overcrowding, overloading, underfeeding and overworking by lame, emaciated and diseased animals; Writing report based on these observations.

Suggested Readings

1. Blackshaw, J.K. 2003. Notes on some topics of Applied Animal Behavior. School of Vet. Sci. , Univ. of Queensland, Australia.
2. FAO. 2016. Animal Production and Health Guidelines 19. FAO, Rome.
3. Ghafoor, A. 2017. Agribusiness Management in Pakistan. University of Agriculture, Faisalabad, Pakistan.
4. Goodenough, J. 1993. Perspectives of Animal Behavior. John Wiley and Sons, NY, USA.
5. Ruhela, A. and M. Sinha. 2010. Recent Trends in Animal Behaviour. Mehra Offset Press, Delhi, India.

Learning Objectives

During the course the students will be able to:

- Formulate the feed for different classes of poultry.
- Conduct the basic feed trial to different classes of poultry.
- Learn manufacturing of compound feeds

Theory

Techniques for estimating nutritive value of feed stuffs and their validity; In vivo and laboratory techniques; Factors affecting the nutritive value of feeds; measures of protein quality for monogastric; Protein efficiency ratio, gross protein value; the essential amino acid index; Protein evaluation systems for ruminants; natural toxicants of feeds and detoxification; Feeding systems for livestock and poultry; Raw feed material handling and storage; mixing, processing and storage of finished feed; Quality control in feed processing; forms of feeds and least cost ration formulation for ruminants and poultry; Feed stuff laws and regulations.

Practical

Use of computer for least cost feed formulation for various classes of livestock and poultry; Availability pattern of feed stuffs in local market and their price structures; Manufacturing of wholesome feed; Demonstration of feeding trials for estimating feed efficiency; Visit of feed mills.

Suggested Readings

1. Cheeke, P.R. 2005. Applied Animal Nutrition. Feeds and Feeding. 3rd Ed. Pearson, USA.
2. Ensminger, M.E., J. E. Oldfield and W.W. Heinemann. 1990. Feeds and Nutrition Digest. The Ensminger Publishing Co. Clovis, CA, USA.
3. Lesson, S. and J. D. Summers. 2001. Commercial Poultry Nutrition. University Book, Gulph, Ontario, Canada.
4. McDonalds, P., R. A. Edwards, J.F.D. Greenhalgh, C.A. Morgan, L.A. Sinclair and R.G. Wilkinson. 2011. Animal Nutrition Benjamin Cummings Publisher, USA.
5. Moughan, P. J. and W. H. Hendriks. 2018. Feed Evaluation Science. Wageningen Academic Publishers, Netherland.

PS-601 Poultry Hygiene and Disease Prevention

3(2-1)

Learning Objectives

During the course, students will be able to:

- Know about importance of poultry hygiene and disease prevention
- Learn prophylactic measures against diseases
- Learn Poultry carcass inspection

Theory

Importance of poultry hygiene and disease prevention; terms related to poultry diseases; Cleaning and disinfection of poultry houses and equipments; Disinfectants and their application; Fumigation and its importance; prophylactic measures against bacterial, viral, parasitic and mycotic diseases; Nutritional disorders and their prevention; Bio-security measures; Significance of drinking water in relation to diseases; Practices to control vertically and horizontally transmitted diseases.

Practical

Poultry carcass inspection; Blood and carcass specimen collection and dispatch to diagnostic laboratory; Vaccines and vaccination; disinfectants, medicines and vaccines available in market; Common practices for bio-security measures; dead bird disposal; Visit to poultry disease diagnostic laboratory.

Suggested Readings

1. Chauhan, H.V.S. Roy. 2016. Poultry Diseases, Diagnosis and Treatment. New Age International Publishing Pvt. Ltd. New Delhi, India.
2. Donald, D.B. and W.D. Weaver. 2007. Commercial Chicken Meat and Egg Production. Springer Pvt. Ltd. , India.
3. Yadav, G. 2016. Nutrition and Diseases of Poultry. Random Publications, New Delhi, India.
4. Yousaf, M. and A. Haq. 2017. Poultry Production Technology. University of Agriculture, Faisalabad, Pakistan

FMP-601 Fundamentals of Mechanized Farming

2(1-1)

Learning Objectives

During the course, students will be able to:

- Know about Mechanized farming
- Know about Farm Machinery/Equipment

Theory

Farm Mechanization: Introduction, objectives, and scope of farm mechanization; Present status and future prospectus of mechanization in Pakistan; Farm Power: Engine types, components and terminologies; Principle of operation of spark and compression ignition engines; Working and comparison of different types of engines; Tractor systems: Tractor troubleshooting and maintenance, Tractor log book; Fundamentals of Farm Machinery: Tillage, objective and types of tillage; Types of tillage implements: Primary and secondary tillage implements. Sowing machinery: broadcaster, seed drill/planters, seed drill calibration; Fertilizer application techniques. Plant protection Equipment: spraying machinery; Harvesting and threshing machinery: reapers, thresher, combine harvester; Wheat straw chopper, fodder chopper, foliage bailer, hay and silage making machines; Farm structures: controlled sheds for dairy, poultry and

meat production animals; Machines used in the control sheds for rearing of animals and birds; Cost analysis: Parameters to calculate fixed and variable cost; Cost analysis of agricultural machinery.

Practical

Demonstration and Identification of engine components and parts of tractor; Working principle of petrol and diesel engines; Practical demonstration of different tractor systems, daily, weekly, monthly and annual tractor maintenance programs; Demonstration of methods of hitching for different implements; Identification and functions of primary and secondary tillage implements; Calibration and operation of sowing and fertilizer machinery; Practical demonstration of different sprayers for plant protection; Study of reaper, thresher, combine harvester and fodder harvester; Practical demonstration of fodder and wheat straw chopper.

Suggested Readings

1. Bainer, R. 2010. Principles of Farm Machinery. Reads Book Design, 2010. ISBN-10: 1446523314, ISBN-13: 978-1446523315.
2. Bell, B. 2016. Farm Machinery. 6th Ed. OLD, London, UK.
3. Kutz, M. 2013. Handbook of farm, dairy and Food Machinery Engineering 2nd Ed. Published by Academic press. Myer Kutz associates, New York, NY, USA.
4. Tahir, A.R., M.S. Sabir and F.H Khan. 2003. Fundamentals of Tractor and Agricultural Machinery, faculty of Agricultural Engineering and technology, UAF, Faisalabad, Pakistan.

AS-601 Remote Sensing and GIS Applications in Animal Sciences 3(2-1)

Learning Outcomes:

During the course, the student should be able to:

- Understand basic concepts and techniques of GIS and Remote sensing
- Understand how precision farming and how it's applied in Animal Sciences and dairy farming
- Understand Digital Image Processing techniques

Theory:

Introduction to GIS and Remote Sensing; GIS and RS Agriculture; Role and functions of GIS and Remote Sensing in Animal Sciences and dairy farming; Applications of GIS in Livestock sector, Precision farming in Agriculture; Integrating GPS field data into the GIS database; Digital Image Processing Techniques in Animal Sciences; GIS and RS applications in disease management; Interactive agricultural based map in the internet.

Practical

Demonstration and use of different GIS devices; Use of basic Remote sensing techniques; Computer program and software used for Digital Image processing.

Suggested Readings:

1. Jian, G.L.P. Mason. 2009. Essential Image Processing and GIS for Remote Sensing. Wiley Publishers, Oxford, UK.
2. Keith, R.M. 2013. Resource Management Information Systems. Remote Sensing, GIS and Modelling. CRC Publishers, Boca Raton, Florida, USA.

3. Steven, M.D. and J.A. Clark. 1990. Applications of remote sensing in Agriculture. Butterworth-Heinemann, Oxford, UK.
4. Marinus, G.B. 2001. GIS and Remote Sensing Techniques in Land- and Water-management. Springer Publishers. Netherlands.
5. Nicolas B., M. Zribi. 2016. Land Surface Remote Sensing in Agriculture and Forest. Elsevier Publishers. New York, NY, USA.

UAM-611 Preparation of Research Project and Scientific Writing 2(1-1)

Learning Objectives:

During the course students will be able to:

- Learn about basics of Scientific writing
- Learn about Research project writing

Theory

Basics of Scientific writing, skills; Various written skills of Scientific paper, manuscript; How to write research project its basic parts; Reference writing for books, research papers and conferences; How to improve written skills and abilities; Consulting the relevant literature, Planning and essentials of research plan.

Practical

Training of the student in study and evaluation of problems of livestock industry and to find their solutions through research; Practical: Identification of research problem; Execution of project; Data collection, analysis, formulation of tables & figures and interpretation of results & discussion, conclusion, recommendations; Report writing, submission and presentation.

Suggested Reading:

1. Anonymous.1999.Instructions to Authors. Amer. Soc. Hort. Sci. Alexandria, Virginia.
2. Brown, B.W. 2009.Successful Technical Writing/Instructor's Guide,Goodheart-Willcox Publisher
3. Day, R.A. 1983. How to write and publish a scientific paper 2ndEd. ISI Press, Philadelphia, PA, USA.
4. Hardesty, R.E. 2010. Technical and Business Writing for Working Professionals, Xlibris Corporation, Bloomington, IN, USA.
5. Petersen, R.G. 1994. Agricultural Field Experiments–Design and Analysis. Marcel Dekker, Inc. New York, NY, USA.