SCHEME OF STUDIES

FOR

Ph.D. Animal Nutrition

Department of Livestock Production and Management

Faculty of Veterinary and Animal Sciences

Pir Mehr Ali Shah Arid Agriculture University, Rawalpindi

List of Courses

FOR

Ph.D. in Animal Nutrition

Course No.	Course Title	Credit Hours
AN-801	Modern Concepts in Ruminant Feeding	3(3-0)
AN-802	Molecular Animal Nutrition and Nutrigenomics	3(2-2)
AN-803	Animal Nutrition and Gastrointestinal Ecology	3(3-0)
AN-804	Clinical Animal Nutrition	3(3-0)
AN-805	Recent Advances in Avian Nutrition	3(3-0)
AN-820	Seminar-I	1(1-0)
AN-820	Seminar-II	1(1-0)
AN-899	Thesis	50(0-100)

DETAIL OF COURSES

AN-801 MODERN CONCEPTS IN RUMINANT FEEDING 3(3-0)

Theory

Developments in ruminant digestive physiology, Feed input and milk output relationship, Synchronization of energy and protein in rumen for maximum utilization of nutrients for enhancement in productivity, Bypass nutrient technology, Concept of phase feeding, Modern concepts of amino acid nutrition at various physiological status, Concept of limiting amino acids for high yielders, Role of vitamins and minerals in health and disease, nutrition and fertility, Biological upgrading of feed and feed components, Advances in new generation feeds and feed additives, Modern rumen manipulation techniques to reduce methanogenesis, Nutrition-immunity interaction, Feeding for designer animal products

Books Recommended

1. Paneri, P.F., E. Christaki and I. Giannenas. 2019. Feed additives: aromatic plants and herbs in animal nutrition and health. San Diego : Elsevier Science & Technology, USA.
2. Yucel, B and Taşkın, T. 2018. Animal Husbandry and Nutrition. IntechOpen, UK.
3. Jurgens, M. H., K. Bregendahl, J. Coverdale and S. L. Hansen. 2012. Animal Feeding and Nutrition. 11th edition. Kendall Hunt Publishing, Dubuque, Iowa.
4. Garnsworthy, P.C. and J. Wiseman. 2012. Recent Advances in Animal Nutrition. Nottingham University Press, UK.
5. Guyton, A.C. and J. E. Hall. 2010. Text book of Medical Physiology. 12th Ed. W.S. Saunders Co., Philadelphia, USA.

AN-802 MOLECULAR ANIMAL NUTRITION AND NUTRIGENOMICS 3(2-2)

Theory

Key concepts in molecular biology for the study of nutrition. Biotechnological and molecular techniques used in nutrition. Molecular ecology and diversity studies of the GIT nutritional microbiota. Molecular regulation of metabolism. Nutrigenomics, proteomics and metabolomics; concepts, opportunities and challenges. Role of nutrients and dietary components in regulation of genome structure, expression and stability. Roles for nutrients in signal transduction and proteolysis. Interrelationship of genetic variation and individual nutrient requirements. Application of nutrigenomics in animal health and nutrition; Metabolic imprinting. Engineering of metabolic pathways to improve animal nutrition and health.

Practicals

Demonstration of molecular techniques including DNA/RNA extraction, PCR. Application of molecular tools to understanding nutrient metabolism. Recombinant DNA technology and primary tools for analysis of mammalian gene structure and function. Molecular Fingerprinting of Microbiota.

Books Recommended

1. Carsten C., S. M. Ulven and F. Molnár. 2020. Nutrigenomics: How Science Works. Springer Publishers, New York, USA.
2. Zempleni, J. and H. Daniel.2003. Molecular Nutrition. CABI Publishing. USA.
3. Brigelius-Flohé, R. and H. G. Joost. 2006. Nutritional Genomics. Wiley Interscience, USA.

4. Ordovas, J.M. and L. Parnell. 2007. Nutrigenetics and Nutrigenomics. 1st Edition. Wiley-Liss, NY. USA.
5. Mine, Y., K. Miyashita, and F. Shahidi. 2009. Nutrigenomics and Proteomics in Health and Disease: Food Factors and Gene Interactions. 1st Edition, Wiley-Blackwell, San Francisco, CA, USA.

AN-803 ANIMAL NUTRITION AND GASTROINTESTINAL ECOLOGY 3(3-0)

Theory

Intestinal ecology, structure, interactions, and biochemical activities. Rumen microflora and microfauna, their habitat, diversity, considerations and limitations in relation to ruminant feeding practices. Interaction between nutrition and microbial populations. Comparison of gastrointestinal microbiota in different animals, Microbial and protozoal count, total volatile fatty acids, ammonia and methane production and metabolism, Manipulation of rumen fermentation: physical, chemical and biological means, mitigation of rumen methanogenesis, Role of sulphur and phosphorus in rumen fermentation. Modeling ruminant digestion and metabolism, Techniques for enumeration, isolation and identification of ruminal microorganisms. Gnotobiotic animals - their production and characteristics

Books Recommended

1. Peter ,J. V. S. 2019. Nutritional Ecology of the Ruminant. Cornell University Press, USA.
2. Hynd, P.L. 2019. Animal Nutrition: From Theory to Practice. CABI, Boston, Massachusetts.
3. Barton, L. L., D. E. Northup. 2011. Microbial Ecology. Wiley-Blackwell, USA.
4. Harinder P.S.M. and C. McSweeney .2005.Methods in Gut Microbial Ecology for Ruminants. Springer Publishers, New York, USA.
5. Holzapfel, W H. and P. J. Naughton, 2005. Microbial Ecology in Growing Animals. Elsevier, Edinburgh, New York ,USA.

AN-804 CLINICAL ANIMAL NUTRITION 3(3-0)

Theory

Nutritional factors responsible for disorders. Metabolic disorders and production diseases in farm animals. Prevention of metabolic disorders. Recommended dietary regimen. Nutrition and immune responses, Effect of coccidiostats and dietary antigens in early weaned livestock. Nutrition in relation to diseases. The rational use of dietary supplements and nutraceuticals. Role of gastrointestinal flora in animal health, Effect of nutrition on fertility, reproduction and lactation. Toxic minerals and counter action, Clinical vitamin nutrition, Stress nutrition and post-surgical nutrition. Blood profiling for clinical nutritional status assessment. Nutritional manipulation and feeding of sick animals. Toxic residues in feed and its impact on animal health, production and reproduction.

Books Recommended

1. Pinna, S.R., K., and E.N. Whitney. 2020. Understanding Normal and Clinical Nutrition. 12th Edition. Wadsworth Publishing, Thompson Learning, Belmont, CA. USA.
2. Wu, A. 2019. Food safety and mycotoxins. Springer, NY, USA.

3. Chan, D. L. 2015. Nutritional Management of Hospitalized Small Animals. John Wiley & Sons, USA.
4. Nikolaos K., C. Dimosthenopoulos, M. D. Kontogianni, E. Manglara and K. Poulia. 2011. Clinical Nutrition in Practice. John Wiley & Sons, USA.
5. Nanda, J. and T. H. Herdt. 2006. Production Diseases in Farm Animals. Wageningen Academic Publishers,Netherland.

AN-805 RECENT ADVANCES IN AVIAN NUTRITION 3(3-0)

Theory

Recent developments in avian digestive physiology, Feed and host interaction. Gastrointestinal environment and production relationship. Advances in feeding standards. Recent developments in nutrient metabolism and nutrient requirements. Advances in nutritional specifications for specific genetic strains. Alternative feedstuffs for poultry ration. Biological and chemical contamination of poultry feeds. Development of of nutritional supplements for health and production. New aspects of feed additives in improving gut microflora and performance. Nutrition-immunity interaction. influence of nutritional factors on hatchability; eggshell formation and quality. Feeding for designer avian products.

Books Recommended

1. Paneri, P.F., E. Christaki and I. Giannenas. 2019. Feed additives: aromatic plants and herbs in animal nutrition and health. San Diego : Elsevier Science & Technology, USA.
2. Leeson, S. and Summers, J.D. 2019. Scott's Nutrition of the Chicken. International Book Distributing Company, India.
3. Gupta, R.C., A. Srivastava and R. Lall Nutraceuticals in Veterinary Medicine. 2019. Springer, NY, USA.
4. Garnsworthy, P.C. and J. Wiseman. 2012. Recent Advances in Animal Nutrition. Nottingham University Press, UK.
5. Guyton, A.C. and J. E. Hall. 2010. Text book of Medical Physiology. 12th Ed. W.S. Saunders Co., Philadelphia, USA.

AN-820 SEMINAR-I 1(1-0)

AN-820 SEMINAR-II 1(1-0)

AN-899 Thesis 50(0-100)