

## **Course Contents for Third Year First Semester**

### **AGR 31013 MANAGEMENT OF PLANTATION AND EXPORT CROPS (3:35/20)**

#### **Objectives**

Furnish the students with knowledge and practical skills on present status of export crop production in various ecological regions and their export market, propagation techniques, appropriate agronomic practices to increase the yield, processing techniques, storage techniques and national and international demand.

#### **Learning Outcomes**

- Explain plant growth in relation to and environmental conditions for common export agriculture crops in Sri Lanka
- Exhibit the skills on the propagation and planting techniques of important export crops
- Acquire basic skills, knowledge and attitude to manage a sustainable plantation crops with suitable agronomic practices
- Demonstrate about the processing techniques adopted for of major export crops in Sri Lanka

#### **Course Contents**

##### **Theory**

Production technology, nursery establishment, propagation techniques, crop establishment, fertilizer management, weed control, pruning and training, harvesting and processing of major export crops such as coffee, cocoa, pepper, cloves, cardamom, nutmeg, cinnamon, cashew and palmyrah.

##### **Practical**

Visit to export crop fields, research station and private farms; Propagation of export agricultural crops; Visit to cashew field; Palmyrah seedlings production and planting.

### **Recommended Readings**

- 1) Shanmugavelu, K.G., Kumar, N. and Peter, K.V. (2002) Production technology of spices and plantation crops. Agrobios, India.
- 2) Sivaram, B. (2000) Plantation management in the new millennium. National Institute of Plantation Management, Athuragiriya.
- 3) Giriappa,S. (1989) Role of Plantation Crops in Agricultural Development. 1<sup>st</sup> edition. South Asia Books.

### **AGR 31022 STATISTICAL METHODS (2:23/15)**

#### **Objectives**

Furnish the students with basic principles on Bio-Statistics, summarizing data, use of variety of statistical tests by manual and with aid of statistical packages and interpreting the results from statistical tests.

#### **Learning Outcomes**

- Show the ability to apply fundamental concepts in exploratory data analysis
- Know how to organize, manage, and present dataUse Ms Words, Excel to represent raw data in a summarized manner
- Perform a wide variety of parametric statistical test manually and with the aid of computer packages
- Describe foundations for classical inference involving confidence intervals and hypothesis testing

#### **Course Contents**

##### **Theory**

Types of data, parameters and estimates, measures of centre and dispersion, frequency distributions, types of variables, discrete and continuous variables, concept of probability,

probability distributions, normal distributions, t and F distributions, concept of hypothesis testing, testing means, Z-test, and t- test, confidence interval

### **Practical**

Data summarization using excel, graphs, hypothesis testing, introduction to SAS, Minitab and other statistical packages used to analyze biological data, computer aided data analysis

### **Recommended Reading**

- 1) Mead, R., Curnow, R.N. and Hasted, A.M., (1993) Statistical methods in Agriculture and experimental biology. 2<sup>nd</sup> edition. Chapman and hall, London.
- 2) Aczel, A.D. (1995) Statistics: Concepts and application. Irwin, Chicago.
- 3) Rohlf, F.J (2011) Biometry. W. H. Freeman
- 4) Sokal, R.R. (2012) Statistical Tables. Chapman and Hall.

## **ANS 31013 MANAGEMENT OF NON RUMINANTS (3: 23/45)**

### **Objectives**

Understand the characteristics of different breeds of poultry, swine and rabbits. Gain hands on skill on management of different stages of animals. Gain knowledge on selection and culling of monogastrics. Will learn techniques associated with production of hygienic products.

### **Learning Outcomes**

- Able to select suitable breed/breeds according to the need
- Demonstrate skills on management of poultry, swine and rabbit with regard to housing, feeding and breeding
- Demonstrate ability to operate and manage poultry hatchery to obtain maximum hatchability and viable broiler and layer chicks
- Ensure hygienic production of meat and egg.

## Course Contents

### Theory

Breeds of poultry, swine and rabbits; Management of functional groups of poultry: parent stock, incubation, brooder stock, growers, layers and broilers; egg quality determination, incubator and brooder management; management of different functional groups of swine: management of boar, sow, piglings, growers/ fatteners; Management of different functional groups of rabbits: kindlings, doe, buck, fatteners; Herd composition; culling of unproductive poultry swine and rabbit; Housing systems of poultry swine and rabbits; Identification systems of poultry, swine and rabbits; farm planning and record keeping in poultry, pig and rabbit farms.

### Practical

Poultry Breeds of poultry, performance evaluation, selection of egg for incubation, incubator management, brooder management, starter, grower and layer management, broiler management, slaughter and dressing of broilers, duck and turkey management, cost benefit analysis for a given flock of poultry. Swine: Pig breeds, feeding of swine, general management practices of swine and housing of swine. Rabbit: Identification of rabbit breeds, management of rabbits under cage and free range system, construction of different types of cages for different classes of rabbits.

### Recommended Reading

- 1) Sherlock. C.C. (2009) Care and Management of Rabbits:-1920. Cornell University Library.
- 2) Dematawewa, B.C.M., Silva, G.L.L.P., and Premasundera, A.S. (2009) Swine Industry in Sri Lanka. 1<sup>st</sup> edition. Department of Animal production and health, Getambe, Peradeniya.
- 3) Coburn, F.D. (2009) Swine Husbandry: A Practical Manual for the Breeding, Rearing and Management of Swine, With Suggestions as to the Prevention and Treatment of Their Diseases [1897]. Cornell University Library.
- 4) Gupta, V. K. (2008) Management in Small Poultry Farms. Abhinav Publications.
- 5) Fuller, J.G. and Alexander, A.S. (2012) Practical Swine Management. Nabu Press.
- 6) Sandford, J. (1989) Rabbits: A Guide to Management. Crowood Press.
- 7) Jull, M.A. (2008) Successful Poultry Management. 2nd Edition. Biotech Books.

- 8) Saif, Y.M., Fadly,A.M., Glisson, J.R., Mcdougald, L.R., Nolan, I.K. and Swayne, D.E. (2008) Diseases of poultry. 12<sup>th</sup> Edition. Wiley-blackwell.
- 9) Cunha, T.J. (1977) Swine feeding and nutrition. 1<sup>st</sup> Edition. Academic Press.
- 10) Reece, W.O. (2004) Dukes' physiology of domestic animals.12<sup>th</sup> edition. Comstock publishing associates.

## **ANS 31021 AQUACULTURE TECHNOLOGY (1:08/15)**

### **Objectives**

Scope of this course is to provide fundamental principles of aquaculture technology and the students will get a general idea of novel technologies which could be adapted in Aquaculture.

### **Learning Outcomes**

- Able to understand the fundamental principles of aquaculture, appropriate technologies related to aquaculture which are relevant to the region.
- Able to plan an operation by considering the resources available locally while getting some exposures through study visits to the research institutes as well as aqua farms.

### **Course Contents**

#### **Theory**

Introduction to aquaculture, cultivable finfish and shell fishes, aquaculture systems and management, basic principles of aquaculture nutrition and feed technology, principles of aquatic resource management, pathology and health management of fin fish and shell fish, aquatic resource management.

#### **Practical**

Construction of pond for fish culture, rearing different species of fish under monoculture and polyculture systems, performance evaluation, determination of physico – chemical parameters of fish pond, construction of ornamental fish tanks, breeding fish and field visits.

### **Recommended Reading**

- 1) Christoph, C. and Meske. (1985) Fish Aquaculture, technology and experiments. Perguman press ltd., Headington hill hall, England.
- 2) Wheaton, F.W. (1993) Aquacultural engineering. Wiley interscience publication, John wiley and cons, New York.
- 3) Parker, R. (2012) Aquaculture science, International edition, printed in the United States of America.
- 4) Tidwell, J.H. (2012) Aquaculture production systems. 1<sup>st</sup> Edition. Wiley-blackwell.
- 5) Lucas, J.S. and Southgate, P.C. (2012) Aquaculture: farming aquatic animals and plants. 2<sup>nd</sup> Edition. Wiley-blackwell.
- 6) Romanowski, N. ( 2006) Sustainable freshwater aquacultures: the complete guide from backyard to investor University of New South, Wales Press.
- 7) Parker, R. (2000) Aquaculture science. 2<sup>nd</sup> Edition. Delmar cengage learning.

### **AGB 31033 Plant Protection (3: 30/30)**

#### **Objectives**

To impart knowledge on pests and diseases of crops of economically important and their management

#### **Learning outcome**

- Classify different pests and diseases causing losses on crop plants
- Diagnose different symptoms of crop diseases and identification of the cause.
- Describe pests and their bionomics for forecasting and management
- Suggest/recommend suitable methods to manage the crop pests and diseases

#### **Course contents**

##### **Theory**

Concepts of pest, EIL/ETL and pest management, Types of pests, their association with crop plants of economic importance. Pest dynamics, population indices and their importance.

Bionomics of insect pests of crops such as: rice and other cereals, pulses, vegetable, fruit crops, plantation crops, export crops and stored products and non-insect pests. Symptomatology and etiology of disease causing plant pathogens, Plant diseases and distribution of diseases in crop ecosystem, Parasitic nematodes,. Disease cycles, etiology and existence of diseases under different ecosystems. Evaluate the potential of different methods for integrated pest management, Pesticide use and safety, Management of pesticides, Residual analysis

### **Practical**

Plant protection appliances and their uses in Integrated Pest Management, Pesticides and their management, Diseases and insect pests of rice, pulses, oil seed crops; Ground nut, Sesamum and Castor, Vegetables; Brinjal, Tomato, Chilli and Bhendi, Cole crops; Cabbage, Cauliflower and Radish, Tuber crops; Potato, Sweet potato, Manioc, fruit crops; Mango, Banana, Citrus, Guava, Pomegranate and Grape, Plantation crops and export crops; Tea, Coconut, Black pepper, Coffee, Rubber. Fungicides and their usage, developing Integrated disease management for various diseases. Visit to Vegetable Farmers field to study the pest status and their management.

### **Recommended Reading**

- 1) Agrios, G. N. (2004) Plant pathology. 5<sup>th</sup> edition. Academic press
- 2) Singh, K. (1998) Principles of plant pathology. Kalyani publications, New Delhi.
- 3) Dubey, and Mageswary, (1999) Text book of microbiology. Kalyani publications, New Delhi.
- 4) Lee, D.L. (2002) The Biology of Nematodes. APS press.
- 5) Narayanasamy, P. (2001) Plant Pathogen Detection and Disease Diagnosis. Marcel Dekker.
- 6) Madedia, K.M, Dakouo, D. and Mota-Sanchez, D. (2003) Integrated Pest Management in the Global Arena, CABI Publishing, p.522

## **AGB 31022 AGRICULTURAL BIOTECHNOLOGY (2:30/00)**

### **Objectives**

To impart knowledge on tissue culture techniques, PCR techniques, development of transgenic plants and gene technology

### **Learning outcome**

- Describe tissue culture techniques, cDNA libraries.
- Describe PCR techniques, transformation techniques.

### **Course contents**

#### **Theory**

Importance of agricultural biotechnology, Tissue culture techniques, requirements for *in-vitro* cultures, micro propagation, type of cultures, germ plasm conservation, gene and cDNA libraries, regulation and expression, DNA sequencing, DNA finger printing, gene silencing, Vector, Recombinant DNA technology, *Agrobacterium*-mediated transformation techniques, Transgenic plants, PCR, RFLP, RAPD, Gene technology for plant protection, Bioethics, career opportunities in agricultural biotechnology

### **Recommended Reading**

- 1) Goel, P.K. and Pathade, G.R. (2004) Biotechnological Applications in Environment and Agriculture. Jaipur, ABD.
- 2) Ryu, D. D. Y. and Furusaki, S. (1994). Plant Biotechnology. Elsevier.
- 3) Caldentey, K.O. and Barz, W. (2002) Plant Biotechnology and Transgenic Plants. Marcel Dekker.

## **ACH 31012 SOIL FERTILITY AND PLANT NUTRITION (2: 15/30)**

### **Objectives**

The course is designed to provide a clear knowledge on plant nutrients and their significance in agriculture, their sources from organic matter and fertilizers, fertilizer recommendation problem soils and chemistry of submerged soils.

### **Learning Outcomes**

- Describe the concepts of soil fertility and plant nutrition and sustainable management
- Explain fertilizer recommendation methods
- Identify, measure and interpret different plant and soil nutrients and fertilizers

### **Course Contents**

#### **Theory**

Plant nutrients, availability in soils, nutrient cycling, role of nutrients in plant nutrition, deficiency and toxicity of plant nutrients, manufacture and properties of fertilizers, fertilizer use efficiency, organic sources of nutrients, soil nutrient evaluation and fertilizer recommendation.

#### **Practical**

Qualitative tests for fertilizers and essential elements, study of deficiency and toxicity symptoms, determination of total nitrogen, available nitrogen, available phosphorus, available potassium, available sulfur, lime requirement, gypsum requirement, C/N ratio, rapid plant tissue tests for nutrients.

#### **Recommended Reading**

- 1) Brady, N.C. Weil, R.R. (2002) The Nature and Properties of soil. 13<sup>th</sup> edition. Prentice Hall, New Jersey.
- 2) Rajendra, P. and James, F.P. (1997). Soil fertility management for sustainable Agriculture. CRC Press LLC.

- 3) Datta, S.K. (1981) Principles and practices of rice production. Wiley inter science publication.
- 4) Das, P.C. (1993) Manures and Fertilizers. Kalyani publishers.
- 5) Simpson, K. (1986) Fertilizers and manures. Longman publications.
- 6) Singh, S.S. (1996) Soil fertility and nutrient management. Kalyani Publishers
- 7) Gupta, P.K. (2003) A hand book of soil, fertilizer and manure. 2<sup>nd</sup> Edition. Agrobios.
- 8) Samuel, L. T., Werner, L.N., James, D.B. and John, L.H. (1993) Soil Fertility and Fertilizers. 5<sup>th</sup> Edition. Prentice Hall, India.

### **AEN 31013: POSTHARVEST ENGINEERING (3:30/30)**

#### **Objectives**

The aim of the course is to provide knowledge on postharvest engineering aspects of agricultural produces, basic thermodynamics, psychrometry and its application on drying and storage of grains, physical properties of agricultural produces, basic rheology and its applications in postharvest engineering and steps to be taken towards minimization of postharvest losses.

#### **Learning Outcomes**

- Explain basic scientific concepts of postharvest engineering and their importance
- Apply reasonable techniques to reduce losses after harvesting for better processing
- Identify postharvest losses of Agricultural produces and factors affecting postharvest losses
- Describe basic quality indicators of fruits & vegetables of harvesting and methods available for maturity determination
- Asses basic physical properties of fruits & vegetables and basic mechanical properties of Agricultural produces
- Relate fundamentals of thermal processing and psychrometric processing

## **Course content**

### **Theory**

Parboiling of grains, Principle of Parboiling, changes in parboiling, methods of parboiling, Storage of grains, Requirement for storage, factors affecting storage, storage methods, Separation of grains, Separation methods Husking of Grains ,Milling operation, Polishing and whitening, grinding - Plain grinding and selective grinding, Grinding machines, Physical and thermal properties of agricultural produces, Laws of thermodynamics and its fundamentals, Ideal cycles with perfect gases, Thermodynamic properties of water and steam, Psychrometry and drying of grains, usage of psychometric chart, Drying, Dehydration and selection of grain dryers, Quality control and grading system, combine harvester, threshers, reapers and their losses.

### **Practical**

Paddy parboiling, Heat exchanger design for processing, Application rheology in postharvest engineering, Mass transfer in packaging materials, Mass and Energy balance applications in postharvest Engineering, Function operation and maintenance of milling machines, Measurement of physical properties, Components of combine harvesters and their maintenance, Milling yield analysis, Cooling load calculations, Cyclone design for grain separations, Application of thermodynamics in postharvest engineering, Dehydration system design, Application of belt conveyors, pneumatic conveyors, screw conveyors, and bucket elevators in postharvest handling of grains.

### **Recommended Reading**

- 1) Kepner, R.A., Bainer, R. and Barger, E.L. (1987) Principles of Farm machinery. 3<sup>rd</sup> CBS Publishers and distributors, New Delhi.
- 2) Royall, A.L. and Pentzer, W.T. (1982) Handling transportation and storage of fruit and vegetables, Volume 2. 2<sup>nd</sup> edition. AVI Publishing company, inc., Westport.
- 3) Broker, B.D., Bakker, F.W. and Hall, C.W. (1997) Drying and storage of grains and oil seeds. CBS publishers and distributors, New Delhi.

- 4) Rizvi, S.H. and Mittal, G.S. (1997) experimental methods in food engineering. CBS publishers and distributors, New Delhi.
- 5) Toledo, R.T. (1997) Fundamentals of food processing engineering. 2<sup>nd</sup> edition. CBS publishers and distributors, New Delhi.
- 6) Pandey, P.H. (1994) Principle of Agricultural processing. Kayani publishers, New Delhi.
- 7) Pandey, P.H. (1998) Principle and practices of post harvest technology. Kalyani publishers, New Delhi.

### **AEC 31022 AGRICULTURAL MARKETING (2:23/15)**

#### **Objectives**

The objective of this course is to provide students with a theoretical and empirical basis for evaluating agricultural marketing organizations and factors for market performance and public policy decision, and to enable them to develop and use the tools of economic theory to analyze issues related to the marketing of agricultural commodities.

#### **Learning Outcomes**

- Apply economic theory to problems of agricultural marketing;
- Design strategies for effective market performance;
- Apply the marketing concepts for analyzing market structure and performance in agriculture and formulation of effective agricultural marketing policy;
- Apply theoretical models of imperfect market structures to inform public policy
- Describe organizational forms unique to agricultural industries.
- Describe the price discovery mechanisms under different market structures
- Explain marketing decisions

#### **Course content**

##### **Theory**

Introduction to food marketing, Market imperfections and Market failure, Agricultural production and marketing, Food wholesaling and retailing, Price analysis and exchange function,

Competition in food markets, Food marketing costs, Market development and demand expansion, Market bargaining power, Market information, Standardization and grading.

### **Practical**

Identifying the types of markets functioning around the Northern region, Recording the seasonal fluctuations of the market prices for agricultural commodity, Estimating the transportation cost, retailer and wholesaler margins for some selected agricultural commodities, Collecting information regarding existing storage, grading and sales promotions system around the peninsula, Estimating the percentage of value addition for some selected agricultural products

### **Recommended Readings**

- 1) Kohls, R.L. and Uhl, J.N. (2002) Marketing of Agricultural Products. Prentice Hall.
- 2) Amstrong Gary and Philip Kotler. (1997) Marketing an introduction. Pearson, International Edition.
- 3) Debertin, D.L. (1986) Agricultural Production Economics. Collier Macmillan publishers.
- 4) Gregory Mankiw. (2007) Principles of Micro Economics. Thomson south-western, USA

### **ACC 31011: BIOETHICS (1:15/00)**

#### **Objectives**

To impart knowledge on the importance of bioethics, its necessity, application in experiments and in agricultural production

#### **Learning outcome**

- Explain the importance of bioethics in agriculture,
- Demonstrate how bioethics regulations are important and maintained
- Adopt in their personal and professional carrier

#### **Course content**

Ethics and bioethics, ethics of science and technology, Environmental ethics, Role of bioethics in agriculture, Code of ethics, Research ethics, Ethics of dissemination of knowledge, Ethics of Intellectual Property Rights, Role of Ethical review committees in Sri Lanka, Case studies

**Recommended Reading**

- 1) Macer, D.R.J. (1998) *Bioethics is Love of Life: An Alternative Textbook*. Eubios Ethics Institute, Thailand.
- 2) Macer, D.R.J. (Ed.) (2006) *A cross-cultural Introduction to Bioethics*, Eubios Ethics Institute, Thailand

## **Course Contents for Third Year Second Semester**

### **AGR 32012 CROPPING SYSTEMS AND AGROFORESTRY (2:23/15)**

#### **Objectives**

To impart knowledge and practical skills on cropping systems, sustainability of cropping systems, evaluation of cropping system efficiency and significance of agro-forestry in system management and sustainability.

#### **Learning Outcomes**

- Describe the role of forests on climate change mitigation and adaptation and sequestration through cropping systems
- Explain the benefits of different cropping systems in terms of sustainability
- Explain the benefits of agro-forestry in terms of sustainability
- Classify the main systems of forestry and agro-forestry using various bases for classification specially in Sri Lanka
- Evaluate the major ecological processes in the agro-forestry systems
- Discuss the possibilities and limitations of application of agro-forestry in the context of local ecological and socio-economic conditions

#### **Course Contents**

Importance of cropping systems, different types of cropping system practice in Sri Lanka and their impact on production and sustainability, merits and demerits of different cropping systems, evaluation of cropping system efficiency and cropping system research and farming system, sustainable land use pattern in Sri Lanka, importance and impact of forest on eco system and socio economic of the country, forest community analysis, forest productivity, and nutrient cycling, forest succession, distribution and classification of forest, structure and composition of forest, deforestation and its impacts on environment, classification of agro-forestry and different agro-forestry systems in Sri Lanka and agro forestry.

## **Practical**

Field visit to study the different cropping system, its importance, benefits, sustainability and profitability: Studies the efficiency of inter cropping system practiced in field crops and plantation crops: Establishment of alley cropping and other cropping systems; Visit to the agro-forestry systems; Establishment of model agro-forestry

## **Recommended Readings**

- 1) Buck, L.E., Lassoie, J.P. and Fernandes, E.C.M. (1998) Agroforestry in sustainable Agricultural systems (Advances in Agroecology), CRC - Press
- 2) Chatterjee, B.N., Maiti, S. and Mandal, B.K. (1989) Cropping system: Theory and Practice. 2<sup>nd</sup> edition. oxford and IBM publication, New Delhi.
- 3) Chundawat, B.S. and Gautam, S.K. (1993) Text book of Agroforestry. Oxford and IBM publication, New Delhi.
- 4) Crawford, M. (2010) Creating a forest Garden: Working with nature to grow edible crops, Green books
- 5) Jah, L.K. (1995) Advances in agroforestry. APH publication, New Delhi.
- 6) Kumar, B.M. and Nair, P.K.R. (2011) Carbon sequestration potential of agroforestry systems: opportunities and challenges (advances in agroforestry) second edition, Springer

## **ANS 32012 ANIMAL PRODUCTS PROCESSING TECHNOLOGY (2: 15/30)**

### **Objectives**

Understand the importance of promoting dairy, meat and fish production technology in Sri Lanka. Students will learn the technologies involved with producing different milk, meat and fish products. Students also get hands on experience on production different products,

determination of nutritive value of value added foods and quality control aspects. Performing cost benefit analysis for different products to get a feel of profitability.

### **Learning Outcomes**

- Demonstrate the importance of processing milk, meat and fish
- Demonstrate the steps involved in mother culture preparation
- Describe the steps and technologies involved in production of different milk, meat and fish products
- Able to produce different milk, meat and fish products
- Assess the quality of raw products and processed products
- Predict the profitability of different products

### **Course Contents**

#### **Theory**

Scope of the dairy manufacturing industry in Sri Lanka. Present status of fluid milk procurement, processing and marketing system in Sri Lanka. Organizations involved and methods of pasteurization, sterilization, spray drying and condensed milk production. Study of problems associated with general management of milk and food processing plants. Thermodynamics involved in processing and preserving dairy and food products. Fundamental concepts of microbial cultures used in fermented foods with emphasis on manufacture of butter, cheese, cultured dairy products, importance of clean milk production, milk borne disease, prevention and control of milk borne diseases, principles of production of cheese, butter, yoghurt, ghee, ice cream, milk toffee etc., Slaughtering of farm animals, carcass quality, meat preservation, meat products, utilization of slaughter house by products. Processing and preservation of fish.

#### **Practical**

Study visits to milk collection/ Chilling centers and milk processing plants, Laboratory practical on milk testing, Production of cheese, butter, yoghurt, curd and other flavored dairy product. Visits to slaughter house to demonstrate ante-mortem and post-mortem examination, Training of students in techniques involved in, processing and packing of meat products, Demonstration of

Anatomical features of major systems in fish. Preparation of meat and fish products, Demonstration on fishing gears, Identification of different varieties of fish.

### **Recommended Readings**

1. Aberle, E.D., Forrest, J.C. Gerrard, D.E., Mills, E.W., Hedrick, H.B. and Merkel . (2001) Principles of meat science. 4<sup>th</sup> Edition. Kendallhunt pub co.
2. Toldr, F. (2010) Handbook of meat processing. 1<sup>st</sup> Edition. Wiley-blackwell.
3. FAO. (2004) Good practices for the meat industry, FAO animal production and health manual. Food & Agriculture org.
4. Hall, G. (2010) Fish processing: sustainability and new opportunities. 1<sup>st</sup> Edition. Wiley-blackwell.
5. Gil. (1990) A colour atlas of meat inspection. 1st Edition. CRC press.
6. HillD, H. (1989) Cattle and Buffalo meat production in the tropics: intermediate tropical agriculture series. Longman international education.
7. Lawrie, R.A. and Davidledward. (2006) Lawrie's meat science. 7th edition. CRC press.
8. Eastman, W.F. (2002) A guide to canning, freezing,curing and smoking meat, fish & game. Storey publishing, LLC.
9. Warriss, P.D. (2010) Meat science: an introductory text (modular texts). 2<sup>nd</sup> Edition. Cabi.
10. Pearson, A.M. and Dutson, T.R (1999) HACCP in meat, poultry and fish processing (advances in meat research). 1st Edition. Springer.
11. Helwag, R. (2010) The complete guide to making cheese, butter, and yogurt at home. Atlantic publishing group inc.
12. Early, R. (1998) The technology of dairy products. Springer.

### **AGB 32012 GENETICS AND PLANT BREEDING (2:23/15)**

#### **Objectives**

To impart knowledge on the principles of genetics and plant breeding in a simple and acceptable form. Familiarize with methods of breeding of field crops and explain the methods of breeding in simple language and to use suitable examples familiar to students.

## Learning outcome

- Describe genetics and plant breeding.
- Adopt technical skill in breeding methods, utilize genetic principles in breeding in a systematic manner.
- Practice with self-confidence and self-reliance in plant breeding activities.
- Develop as a professional plant breeder to plan and implement sound programmes in crop improvement.

## Course contents

### Theory

Mendelian principles and their extension, Linkage, recombination, coincidence and interference. Chromosome mapping, cytogenetics and quantitative genetics. population genetics, Basic concepts of plant breeding, Genetic basis of plant breeding, Breeding methods, Self-pollinated, cross-pollinated and asexually propagated crops, Breeding techniques, Emasculation, pollination, Screening techniques for insect pests and disease resistance in crops, Heterosis and hybridization. Genetic resources and conservation. Center of origin and Bio-diversity.

### Practical

Problems related to Mendel's law, Epistasis and lethality, Linkage, Crossing over, cytogenetics, population genetics, mode of reproduction in crop plants, floral structure and floral biology of important cereals, pulses, oil seeds, commercial crops, selfing techniques in crop plants, tools used in breeding (Breeder's kit), emasculation techniques in crop plants, pollination methods

## Recommended Reading

- 1) Chopra, V. L. (1989) Plant Breeding theory and practices. Oxford and publishing Co.pvt. Ltd, New Delhi.
- 2) Singh, B.D. (2004) Plant breeding. Kalyani publishers, India.
- 3) Arulnandhy, V. (2000) Vegetable crops breeding manual. Eastern graphics, Sri Lanka.

- 4) Jain, H.K. and kharkwal, M.C. (2004) Plant breeding; Mendelian to molecular approaches. Agritech.

## **ACH 32013 FOOD TECHNOLOGY (3:35/20)**

### **Objectives**

This course aims to provide the knowledge of basic principles and methods food preservation, processing technologies, causes of microbial food spoilage and parameters of foods controlling microbial activity

### **Learning Outcomes**

- Describe the basic principles and practices of the major techniques used in food preservation
- Explain the principles of food processing techniques and apply principles of food processing techniques to specific commodities
- Categorize and explain the intrinsic/extrinsic conditions affecting the growth, survival and death of microorganisms in foods

### **Course Contents**

#### **Theory**

Principles and methods of food preservation, fruits and vegetables processing technology, sugar and confectionary processing technology, alcoholic beverages processing technology, cereals and starch processing technology, oils and fat processing technology food deterioration and its control, intrinsic and extrinsic parameters in foods controlling microbial activity

#### **Practical**

Laboratory practical: Estimation of salt content in salted dry fish, estimation of ethanol content in wine/toddy, Preparation of some fruit products

Field visits: Visit to fruit processing and soft drink factories, rice mills, bakery, traditional and modern oil extraction mills, pot still and patent still distilleries, sweet and confectionary manufacturing industries

### **Recommended Reading**

1. Aylward, F. (2001) Food technology: Processing and laboratory control, Agrobios, India.
2. Sivasanker, B. (2002) Food processing and preservation, Prentice-Hall of India private Limited, New Delhi, India Bohra, A. and Parihar, P. (2006), Food microbiology, Agrobios, India
3. Ray, B. and Bhunia, A. (2008) Fundamental food microbiology, 4<sup>th</sup> edition, CRC Press, New York
4. Blank, F.C. (2007) A hand book of foods and nutrition, Agrobios, India
5. Hosney, R.C. (2010) Principles of cereal science and technology, 3<sup>rd</sup> edition, American Association of Cereal Chemists, Inc.
6. Kalia, M. and Sood, S. (1996) Food preservation and processing, Kalyani Publishers, India
7. Potter, N.N. and Hotchkiss, J.H., (1996) Food Science, 5<sup>th</sup> edition, CBS Publishers and distributors, India

### **ACH 32021 SOIL AND POLLUTION MANAGEMENT (1: 15/00)**

#### **Objectives**

The aim of the course is to provide a better understanding of hazardous effects of indiscriminate use of fertilizers and various pesticides on the environment and the possibilities of managing pollution

#### **Learning Outcomes**

- Identify and explore the effects of fertilizers on environment
- Classify the pesticides and explore the fate and effects of pesticide in the environment
- Recommend soil management practices to face global warming

- Explore soil contamination and recommend remediation techniques

## **Course Contents**

### **Theory**

Fertilizers and environment, pesticides, classification and fate in ecosystem, soil, water and air pollution due to agricultural activities, eutrophication, green house gas emissions, global warming, soil erosion and sedimentation, soil contamination and remediation techniques

### **Recommended Reading**

1. Handa, K. (2004) Principles of pesticide chemistry. 1<sup>st</sup> Edition. Agrobiosis.
2. Tomlin, C.D.S. (1999).The pesticide manual. 7<sup>th</sup> edition. British crop protection council.
3. Wild, A. (1993) Soils and the Environment: An Introduction, Cambridge University Press.
4. Gupta, P.K. (2003) A hand book of soil, fertilizer and manure. 2<sup>nd</sup> Edition. Agrobios.

## **AEN 32012 Environmental Engineering (2:23/15)**

### **Objectives**

The aim of the course is to provide enough basic engineering knowledge about environment to use available resources of nature in an eco-friendly manner to produce better with low waste generation and damage to environment.

### **Learning Outcomes**

- Solve environmental problems using basing engineering knowledge
- Explain various process influencing environmental stability
- Analyze different industrial for resource optimization
- Develop eco-friendly environmental strategies for conserving environment

## Course content

### Theory

Waste and environment, climate change, air pollution, salinity development, solid waste, compost making, Environmental Impact Assessment and mitigation, introduction to renewable energy, Agricultural and industrial pollution-pollutants, suspended particulate matters (SPM), SO<sub>2</sub>, CO, NO<sub>x</sub>, oxidant/ ozone and their control measures, Effect of industrial pollution, Solid waste management, Municipal waste and household waste, Waste water management, Waste water and its properties, sewage disposal and treatment and Reuse of waste water, oxygen dynamics of stream discharged with industrial effluent, contaminant transport and the break through curves.

### Practical

Preparation EIA sheet, Measurement of the parameters of waste water, Break through curve development, Oxygen dynamics of water bodies polluted by industrial effluent, Application of Solid waste options for better efficiency, Design of constructed wetland, Design of efficient compost making plant.

### Recommended Reading

1. Mihelcic, Martin T. Auer, Julie Beth Zimmerman (2009) Environmental Engineering: Fundamentals, Sustainability, Design by James R. Wiley.
2. Davis, M.L. and Cornwell, D.A. (1991) Interdiction to Environmental Engineering. 2<sup>nd</sup> edition. Mcgrow hill Inc. New Delhi.
3. Agarwal, V.K. and Verma, P.S. (1996) Environmental Ecology. S.Chand and company ltd., New Delhi.
4. Banerji, S.K. (1999) Environmental chemistry. 2<sup>nd</sup> edition. Prentice Hall, India.
5. Chhabra, R. (1996) Soil salinity and water quality. Oxford and IBH publishing co.pvt.ltd., New Delhi.
6. Asawa, G.L. (2006) Irrigation and Water Resources Engineering. New Age International.

## **AEC32022 INTRODUCTION TO ECONOMETRICS (2:23/15)**

### **Objectives**

To learn how to set up econometric models that can be used to test theories, hypothesis; to study how to organize, present, and analyze data, as well as how to present the results obtained from the analysis.

### **Learning Outcomes**

After successful completion of the course, students will be able to;

- Explain the fundamental theory underlying regression analysis
- Estimate economic relationships by applying regression analysis to data
- Test economic hypotheses.
- Interpret and analyze regression estimates.

### **Course content**

#### **Theory**

ordinary least squares regression models - simple and multiple regression methods using cross-sectional data, focusing on issues of estimation and inference.

#### **Practical**

Loading data in econometric packages, Data Transformations, Checking for Statistical Properties of Series, Detection of Classical Assumptions Violation, Estimate simple linear regression model including logarithmic transformations, test for the statistical significance of the estimates and the model, Estimate multiple linear regression model, test for the statistical significance of the estimates and the model, Interpretation of Results, diagnostic testing

### **Recommended Readings**

- 1) Basic Econometrics by Damodar Gujarati
- 2) Stock, James H. and Mark W. Watson: Introduction to Econometrics, 1<sup>st</sup> Edition, Addison – Wesley, 2003.

- 3) Wooldridge, Jeffrey M.: Introductory Econometrics, 1<sup>st</sup> Edition, Thompson: South-Western, 2003.

## **ACC 32012 ORGANIZATIONAL AND DISASTER MANAGEMENT (2:30/00)**

### **Objectives**

The prime objective is to provide necessary skills to the students in planning, organizing, leading and controlling the efforts of organization members and resources to achieve stated organizational goals and be able to constantly solve problems and make decisions that are of benefit. The overall aim of disaster management is to prevent or reduce losses that occur due to hazards, disasters and emergencies.

### **Learning Outcomes**

- Describe the management concepts and its applications to an organization as well as in an emergency situation.
- Explain the classical approach, behavioral approach, Quantitative approach and contingency approach to management.
- Apply required skills in managing time and human resource optimally.
- Explain the ways in reducing damages and deaths under an emergency situation.

### **Course content**

#### **Theory**

Definition of management, Evolution of management, Functions of management, Management process, Levels of management, Nature and Scope of human resource management, Human Resource Planning, Job Analysis and Design, Personal management, Emergency or Disaster management definition and structure, Emergency management cycle, Disaster recovery plan.

### **Recommended Reading**

- 1) Aswathappa, K. (2004) Human Resource and Personnel Management. Tata McGraw-Hill.
- 2) Hersey, P.H. Blanchard, K.H. and Johnson, D.E. (2007) Management of Organizational Behavior. 9<sup>th</sup> Edition. Prentice Hall.
- 3) Ivancevich, J. and Konopaske, R. (2010) Organizational Behavior and Management. McGraw-Hill/Irwin.
- 4) Haddow, G. and Bullock, J. (2010) Introduction to Emergency Management, Butterworth-Heinemann.
- 5) Coppola, D.P. (2011) Introduction to International Disaster Management, Butterworth-Heinemann

### **ACC 32021 INDUSTRIAL TRAINING (1: 00/60)**

#### **Objectives**

The course aims to impart hands on training at agro-based industries to strengthen managerial and technical ability

#### **Learning Outcomes**

On completion of the course the students will be able to

- Incorporate the experience gained into their professional carrier
- Work towards commercialization
- Initiate and manage agro based industries

#### **Course content**

Each student will be assigned to an agro-based industry based on his/her specialization discipline for four weeks during the end semester vacation of third year second semester. They will be

trained on technical and management aspects by the relevant industry. On completion of the training the students will share their experience through a presentation and by submitting a report. The presentation and report will be evaluated.

### **Third year second semester specialization courses**

#### **AGRS 32012 CROP PHYSIOLOGY (2:23/15)**

##### **Objectives**

To impart knowledge on physiological changes at different stage of rice, maize and pulse crops, tuber crops, photo assimilate translocation with in a plant, yield components and their contribution towards crop yield.

##### **Learning Outcomes**

- Explain plant type concept in rice and its contribution toward high yield
- Describe concept of optimum and correlate it to high crop yield
- Elaborate physiology of photosynthesis of leaves and photo assimilates translocation in crops
- Correlate yield components and their contribution to crop yield in rice, maize and pulse crops

##### **Course contents**

###### **Theory**

Physiological aspects of major crops which influence growth and development, canopy development and photosynthesis, photo assimilate translocation and sink source interaction. Plant type concept for high yielding, environmental effect on crop photosynthesis yield components

## **Practical**

Study the different growth stages of rice, maize and Pulse crops; Morphology of old and new improved rice varieties; Leave emergence and development of rice crops; Estimation of LAI in rice and pulse crops; Yield components and calculation of theoretical yield in rice, maize, and pulse crops; Assess the sink source relationship in maize crops.

## **Recommended Readings**

- 1) Sadras and Calderini (2009) Crop Physiology. Academic press.
- 2) De Costa, W.A.J.M. (2001) Plant Water Relations: Principles and Applications.
- 3) De Costa, W.A.J.M. (2000) Principles of Crop Physiology: Towards an Understanding of Crop Yield Determination and Improvement.

## **AGRS 32022 WEED MANAGEMENT (2:23/15)**

### **Objectives**

To furnish the students with knowledge and practical skill on weed management strategies towards successful management of weeds in crop field.

### **Learning Outcomes**

- Identify the important of annual and perennial weeds
- Understand and know the seed production capacity of important annual weeds and their competitive nature
- Know the various perenating parts of important perennial weeds and their production capacity.
- Explain allelopathy in weed and its effect on crop yield

- Propose strategies for weed management and recommended weed control measures.

## Course Contents

### Theory

Weed nomenclature and classification, weed propagation, integrated weed management in control of annual and perennial weeds, problems weeds and parasitic weeds, allelopathy in weeds, succession of weeds, use of herbicides in controlling annual and perennial weeds, environment and weed management

### Practical

Identification of important of annual and perennial weeds; Assessing the seed production capacity of some annual weeds; Identification of different perenating parts of perennial weeds and testing their germination capacity; Study the nut let production capacity of important perennial weed *Cyperus rotandus*; Planning and implementation of weed management plan for crops.

### Recommended Readings

- 1) Gupta, O.P. (2008) Modern weed management with special reference to agriculture in the tropics and sub tropics, 3<sup>rd</sup> revised edition, Agrobios, Jodhpur, India.
- 2) Mandal, R.C. (2004) Weed weedicide and weed control: principle and practices, agrobios, Jodhpur, India.
- 3) Raju R.A. (1996) Ecology of aquatic weeds and their control, kalyani publication, Ludhiana.
- 4) Ravinder K.Kohli, Harminder Pal Singh and Daizy R.Batish (2001) Allelopathy in Agroecosystem, IBDC, Lucknow.
- 5) Zimdahl, R. L. (2007) Fundamentals of Weed Science: (3e), Academic press

## **ANSS 32012 SUSTAINABLE ANIMAL BREEDING (2: 23/15)**

### **Objectives**

This course is designed to give some insight into the needs for better use of animal genetic resources in the context of projected demands for food.

### **Learning Outcomes**

- Will be in a position to use quantitative methods to estimate genetic parameters and to select genetically superior animals
- In addition they will be in a position to plan appropriate breeding programmes according to the resources available.

### **Course Contents**

#### **Theory**

Global perspectives of animal genetic resources, knowledge of indigenous genetic resources, quantitative methods in animal breeding, National livestock development policies and strategies, development of breeding programmes.

#### **Practical**

It will include manual and computer exercises on genetic relationships and inbreeding, quantitative characters, selection index, selection and genetic gain, prediction of breeding values, breeding plans.

### **Recommended Readings**

1. Ingram, J., Ericksen, P. and Liverman, D. (2010) Food security and global environmental change. Earthscan. London, Washington.
2. Walley, T. (2010) Hints on the breeding and rearing of farm animals. Nabu press.
3. Wesley, M. (1877) (2010) Breeding of farm animals. Nabu press.

4. Harmon, J. (2000) Swine breeding and gestation facilities handbook. 1<sup>st</sup> Edition. Mid west plan service.
5. Bourdon, R.M. (1997) Understanding Animal Breeding. Prentice Hall, USA.
6. Falconer, D.S. and Mackay, F.C. (1996) Introduction to Quantitative Genetics. 4<sup>th</sup> Edition. Longman, London.
7. Mrode, R.A. (1996) Linear Models for the Prediction of Animal Breeding Values. CAB international, United Kingdom.
8. Greenslade, J.A. (1952) Modern pig breeding. Pearson.

## **ANSS32022 FISH PRODUCTION AND TECHNOLOGY (2: 20/20)**

### **Objectives**

This course is designed to give students knowledge of the basic principles of fish production and technology by introducing the culture techniques of finfish and shellfish.

### **Learning Outcomes**

- know the morphological, physiological and economic characteristics of profitable fish species
- Able to establish a fish farm giving emphasize to major technological and economic parameters.

### **Course contents**

#### **Theory**

Economic importance of fishery, Fisheries potential in Sri Lanka, Maritime boundaries of Sri Lanka, Overview of fisheries management, economically important cultivable marine and inland finfish and shell fishes. fish biology and reproduction, factors influencing on aqua enterprising, Different species breeding, hatcheries and culture techniques, feeding and nutrition of fish, water quality management, effluent management, breeding harvesting and transportation of economically important finfish and shell fish, disease and parasites of finfish and shellfish, Scope and culture of ornamental and aesthetic fish production, Pathology and health management of fin fish and shell fish,

### **Practical**

Visits to fish landing sites or harbours, identification of different varieties of fish, Demonstration on fishing gears, Dissection and demonstration of anatomical features of major systems in fish, Building and construction of fish ponds, calculating things like the flow rate, water, soil analysis, grow out trials and management, cost benefit analysis

### **Recommended Readings**

1. Frandson, D. R., Wilke, L.W. and Fails, A.D. (2009) Anatomy and physiology of farm animals. 7<sup>th</sup> edition. Blackwell publishing.
2. Wilbur, F. and Eastman, Jr. (2002) A guide to canning, freezing, curing and smoking meat, fish and game. Storey publishing, LLC.
3. Andrew, B. (1999) Economics of brackish water shrimp culture. Daya Publishing House, India.
4. Yadav, B.N. (1999) Fish and Fisheries. 2<sup>nd</sup> Edition. Daya Publishing House, India.
5. Chitravadivelu, K. (1993) Shrimp culture. 1st Edition. University of Jaffna Publications.
6. Gautam, A. (1998) Conservation and management of aquatic resources. Daya Publishing House, India.
7. Yadav, B.N. (1997) Fish and fisheries. Daya Publishing House, India.
8. Biswas, K.P. (1996) Harvesting aquatic resources. Daya Publishing House, India.
9. Infante Gil, J. and Durao, C.J. (1990) A color atlas of meat inspection. Wolf publishing Ltd.

## **AGBS 32012 AGRICULTURAL ACAROLOGY (2: 23/15)**

### **Objectives**

To impart knowledge on the pest, predatory, and parasitic habits of mites and their biology. Distribution of pest mites in the plant ecosystem and their damages, Use of predatory and parasitic mites for the management of insect pests and mites

### **Learning outcome**

At the end of the course the students will be able to,

- Classify and identify acari (mites and ticks) exists in crops and storage
- Describe crop damages caused by mites and their etiology
- Describe predatory, parasitic and other mode of living of mites

### **Course contents**

#### **Theory**

Introduction to mites and ticks, Morphology of mites and ticks, classification, feeding habits such as phytophagous, predatory and parasitic life of success, life cycles of mites, Internal anatomy of mites, Types of damages caused by ticks and mites in plants and house hold animals. Diagnosis, Management of mites and ticks.

#### **Practical**

Identification of mite damage, morphology of mites and slide preparation, Rearing techniques of phytophagous mites in various substrates, Rearing of predatory mites, Assessing the potential of mites and ticks, role of spiders and their beneficial role in agriculture, visit to farmers fields to identify mites damage and collection of mites

#### **Recommended Readings**

- 1) Kranz, G. (1997) Hand book of Acarology, Vol.2.
- 2) Sabelis, Maurice, W. and Bruin.jan(ed.) (2010) Trends in Acarology. Springer.

### **AGBS 32022 NEMATOTOLOGY (2:23/15)**

#### **Objectives**

To impart knowledge on pest, and predatory habits of nematodes and their biology, distribution of nematodes in the plant ecosystem and their damages, use of predatory and parasitic nematodes for the management of insect pests

#### **Learning outcome**

- Classify and identify plant parasitic and predatory nematodes

- Describe crop damages caused by nematodes their biology
- Suggest/recommend suitable integrated management practices to control nematodes

## **Course contents**

### **Theory**

Introduction to Nematology, Characteristics of plant pathogenic nematodes, Diagnosis, Isolation and preservation of nematodes, Symptoms caused by nematodes, Interrelationship between nematodes and other plant pathogens, Ecology of nematodes, Gall forming nematodes, entomopathogenic nematodes, Management of phytophagous nematodes.

### **Practical**

Identification of nematode damage, morphology of nematode and slide preparation, Rearing techniques of phytophagous nematodes in various substrates, Rearing of predatory nematodes, Assessing the potential of nematodes in crop ecosystem, role of nematode in agriculture, visit to farmers fields to identify nematode damage and collection of samples

### **Recommended Readings**

- 1) Luc, M., Sikora, R.A. and Bridge, J. (Eds.) (2005) Plant Parasitic nematodes in tropical and subtropical Agriculture. 2<sup>nd</sup> Edition. CABI Publishing.
- 2) Agrios, G. N. (2004) Plant pathology. 5th edition. Academic press.
- 3) Lee, D.L. (2002) The Biology of Nematodes. APS press.

## **ACHS 32012 SOIL PHYSICS FOR SUSTAINABLE AGRICULTURE (2: 23/15)**

### **Objectives**

The course is structured to provide understanding about soil physical properties and processes, in order to manage the soils for agricultural sustainability and environmental quality, to acquire necessary practical skills in soil physics for sustainable agricultural and environmental management.

## **Learning Outcomes**

- Describe soil physical properties and processes in relation to agricultural sustainability and environmental quality
- Analyze and interpret physical properties with necessary skills.

## **Course Contents**

### **Theory**

Soil physics, agricultural sustainability and environmental quality. Soil components and phases, soil texture and its uses, soil structure, assessment of aggregation and structure, impact of structural degradation and management of soil structure, soil crusting and crust management, soil moisture content and soil water potential, soil water movement in saturated and unsaturated soil and implications, soil temperature and heat flow, soil air and aeration

### **Practical**

Assessment of extent of aggregation, Assessment of aggregate stability, Assessment of hydraulic conductivity, field capacity, permanent wilting point.

## **Recommended Readings**

1. Brady, N.C. and Weil, R.R. (2002) *The Nature and Properties of soil*. 13<sup>th</sup> edition. Prentice Hall, New Jersey.
2. Singer, M.J. and Munns, D.N. (2002) *Soils An introduction*. 5<sup>th</sup> edition. Prentice Hall, New Jersey.
3. Marshall, T. J. and Holmes, J. W. (1979). *Soil physics*. Cambridge University press, Cambridge, UK.
4. Lal, R. and Shukla, M.K. (2004) *Principles of Soil physics*. Marcel Dekker Inc., New York.

## **ACHS 32022 SOIL CHEMISTRY (2: 23/15)**

### **Objectives**

The course is designed to provide knowledge about soil chemistry to manage agricultural soils, to understand chemistry of submerged soils and the fate of agrochemicals.

### **Learning Outcomes**

- Describe the chemistry of soils including submerged soils
- Describe and distinguish different soil colloids and properties
- Describe and investigate fate of agrochemicals in environment

### **Course Contents**

#### **Theory**

Organic and inorganic colloids in soils, charge characteristics, flocculation and dispersion, ion exchange and adsorption isotherms, soil pH, buffering, soil acidity and alkalinity: development effects and management, redox potential, submerged paddy soils and their effect on environment, fate of agrochemicals in soil and plant, management of polluted soils.

#### **Practical**

Adsorption isotherms, specific surface of soils, buffer capacity, exchangeable sodium percentage, adsorption and leaching of selected pesticides

### **Recommended Readings**

1. Bohn, H.L., Brian, L.M. and George, A. (1985) Soil Chemistry. 2<sup>nd</sup> Edition. John Willey and Sons, Inc.
2. Datta, S.K. (1981) Principles and practices of rice production. Wiley inter science publication.
3. Indraratne, S.P. (2009) Principles and applications of soil Minerology. IRQUE, Faculty of Agriculture, University of Peradeneya.

## **ACHS 32012 FOOD CHEMISTRY (2:23/15)**

### **Objectives**

This course aims to provide the knowledge of individual components of foods, additives, enzymes, adulterants, contaminants, flavours and sensory attributes of food. It also aims to introduce the students about the phytochemicals and nutraceuticals

### **Learning Outcomes**

At the end of the course the student should be able to,

- Describe the concept of water activity and how it influences chemical, biochemical and microbial stability of food
- Discuss and demonstrate the important properties of carbohydrate, protein and fat
- Identify and describe the food additives, colorants, flavours, adulterants and contaminants
- Describe the scientific basis and technologies for functional foods and nutraceuticals

### **Course Contents**

#### **Theory**

Concept of water activity, moisture sorption isotherms, water binding in foods, functional properties of carbohydrates, modified starches, pectin, food lipids and health, thermal decomposition of fats, chemistry of frying, functional properties of proteins, important food proteins, food additives, food colourants, food flavours, adulterants and contaminants in foods, natural antioxidants, enzymes used in the food industry

#### **Practical**

Chemical analysis of pectin of different fruits and vegetables, tests for adulteration, hydrolysis of starch by commercial enzyme, determination of gel consistency of cereal flours, determination of functional properties of carbohydrates and proteins, determination of antioxidants in fruits and vegetables, detection of food additives

### **Recommended Readings**

1. Damodaran, S., Parkin, K.L. and Fennema, O.R. (2008) Fennema's Food Chemistry, 4<sup>th</sup> edition, CRC Press, New York
2. Sikorski, Z.E. (2007) Chemical and functional properties of food components, 3<sup>rd</sup> edition, CRC Press, New York
3. Shubhangini, A.J. (2010), Nutrition and dietetics, 3<sup>rd</sup> edition, Tata McGraw-Hill publishing company limited, New Delhi.
4. Whiteny, E.N. and Sizer, F.S. (1994) Nutrition: Concepts and controversies, 6<sup>th</sup> edition, West publishing company, St Paul.
5. Shi, J., Ho, C.H. and Shahidi, F. (2005) Asian functional foods, CRC Press, New York
6. Sivasanker, B (2002) Food processing and preservation, Prentice-Hall of India private Limited, New Delhi, India
7. Lillian, H.M. (2004), Food Chemistry, CBS publishers and Distributers, Delhi, India.
8. Apenten, R.O. (2004). Introduction to Food Chemistry, CRC Press.

### **ACHS 32022 FOOD MICROBIOLOGY (2:23/15)**

#### **Objectives**

This course provide knowledge of microorganisms that are associated with food (bacteria, yeasts and moulds), methods used to determine the microbial populations, sources of microorganisms, microbial applications in food fermentation, food biotechnology and food borne illnesses in human.

#### **Learning Outcomes**

- Recognize names and groups of important bacteria and have an understanding of their capacities
- Propose and describe suitable detection and enumeration method for a particular microbial sample
- Describe the spoilage patterns of various food commodities and food borne illnesses

- Identify hazards, critical control points and good manufacturing and agricultural practices in food manufacture
- Identify potential intervention strategies used in the production, manufacture or processing of various foods in order to prevent or delay contamination, spoilage and food borne illness

## **Course Contents**

### **Theory**

General microbiology, Major groups of microorganisms and their action on foods, Sources of microorganisms, Detection and enumeration of microorganism in food, Characteristics of psychrotrophic and thermophilic microorganisms, Microbial spoilage of foods, Microorganisms associated with fermentation of foods, Food born infection and intoxication, mycotoxins, Food sanitation, HACCP, GMP, GAP, Indicator organisms, Food biotechnology, Beneficial and detrimental effects of genetically modified organisms

### **Practical**

Introduction to laboratory safety, use of equipment, culture media and sterilization techniques, Quantification of microbes in food, fermented food products and water (sampling, serial dilution and counting), culture techniques using standard plates, pure culture isolation techniques

### **Recommended Readings**

1. Bohra, A. and Parihar, P. (2006), Food microbiology, Agrobios, India
2. Bell. C., Neaves, P. and Williams, A.P. (2005) Food microbiology and laboratory practice, Blackwell publishing, UK
3. Sikorski, Z.E. (2007) Chemical and functional properties of food components, 3<sup>rd</sup> edition, CRC Press, New York.
4. Ray, B. and Bhunia, A. (2008) Fundamental food microbiology, 4<sup>th</sup> edition, CRC Press, New York
5. Banwart, G.J. (2004) Basic Food Microbiology, CBS publishers and Distributors, India
6. Frazier, W.C. and Westhoff, D.C. (2004) Food microbiology, 4<sup>th</sup> edition, McGraw Hill book company, New york, U.S.A

7. Shewfelt, R.L. (2009) *Introducing food science*, CRC Press, New York
8. Sivasanker, B. (2002) *Food processing and preservation*, Prentice-Hall of India private Limited, New Delhi, India.

## **AENS 32012 IRRIGATION AND WATER MANAGEMENT (2:23/15)**

### **Objectives**

The aim of the course is to learn the importance of water management for efficient application of irrigation water and optimizing crop output, to obtain knowledge on watershed management for strengthening of irrigation water quantity and quality management, to be aware of basic design of each irrigation method and to enable to evaluate the all irrigation system and to emphasize the development of yield-irrigation water models

### **Learning Outcomes**

- Apply the knowledge on water management and watershed management to increase the efficiency of the system
- Estimate the irrigation design parameters of different irrigation methods.
- Estimate the quantity and quality of water for crop irrigation
- Asses crop response and crop yield loss due to shortage and poor quality of irrigation water

### **Course content**

#### **Theory**

Irrigation system development, History and development of irrigation system, Selection criteria for different irrigation system, Merits and demerits of border, basin, furrow, sprinkler and drip irrigation, Basic design of border irrigation, basin irrigation, Furrow irrigation, Sprinkler irrigation, Drip irrigation, lift irrigation, Crop response to irrigation water, Watershed management, crop and water inter relationship.

## **Practical**

Measurement of design parameters of Irrigation, Field installation of Drip and Sprinkler irrigation, Setting of layout, Measurement of Irrigation efficiency and Irrigation structures.

## **Recommended Readings**

- 1) Sankara Redid, G.H. and Yellamanda Reddy. T. (2003) Efficient use of irrigation water. Kalyani Publishers, New Delhi.
- 2) Bredero, T.J. (1991) Crop water management research. Oxford and IBH publishing co.pvt.ltd., New Delhi.
- 3) Giriappa, S. (1991) Water use efficiency in Agriculture. Oxford and IBH publishing co.pvt.ltd., New Delhi.
- 4) Mitchell, B. (1992) Integrated water management. CBS publishing and distributors' pvt ltd., New Delhi.
- 5) Mandal, R.C. and Jana, P.K. (1998) Water Resource utilization and micro irrigation. Kalyani publisher, New Delhi.
- 6) Lenka, D. (1999) Irrigation and Drainage. Kalyani publisher, New Delhi.
- 7) Michal, A.M. (1996) Irrigation Theory and practices. Vikas publishing house pvt.ltd., New Delhi.

## **AENS 32032 Farm Machinery Testing and Evaluation (15/30)**

### **Objectives**

To make the students practically viable in the testing and evaluation procedures of various farm machines like 4WT, 2WT, seeders, planters combine harvester, water pumps, thresher, reapers and sprayers.

### **Learning Outcomes**

- Test and evaluate machineries
- Select appropriate brand of a machine for particular operation
- Evaluate the condition of a machine to make possible repairs well in advance to increase their durability
- Handle an engine without efficiency loss in running conditions

- Acquire full knowledge on working principles of engines and troubleshooting spares and their maintenance
- Aware of safety precaution on handling of machines without any field accidents

### **Theory**

Introduction to testing and evaluation of farm machinery, basic definitions and calculations related to capacity of farm machines, importance of testing and evaluation, use of 4WT and 2WT in farm operation, 2WT and 4WT maintenance, Diesel engines and their operations, power points of 2WT and 4WT, components and functions of reapers, threshers, pumps, combine harvester, seeder, and planter.

### **Practical**

Testing and evaluation of 2WT, 4WT, knapsack sprayer, power sprayer, seeder, planter, blowers and dusters, reapers, threshers and harvesting loss calculation, Testing & evaluation of combine harvester, primary tillage tool, and secondary tillage tool, Tutorial:- Field problem / Case study

### **Recommended readings**

1. Metha, M.L., Verma, S.R., Mishra, S.K. and Sharma, V.K. (1995). Testing and Evaluation of Agricultural Machinery, National Agricultural Technology Information Centre, Ludhiana.
2. Smith, D., Sims, B.G. and O'Neill, D.H. (1994) Testing and Evaluation of Agricultural Machinery and Equipment- Principle and Practice. FAO Agricultural Services Bulletin 110.
3. Khurmi, R.S. and Gupta, J.K. (2002) Theory of mechanics. Eurasia publishing house pvt ltd, New Delhi.
4. Shigley, J.E. and Mischke, C.R. (2003) Mechanical engineering design. 6<sup>th</sup> edition Tata Mcgraw hill publishing company ltd, New Delhi.
5. Donaldson, C., Lecain, G.H. and Goold, V.C. (2002) Tool design. Tata Mcgraw hill publishing company ltd, New Delhi.

6. Roth, L.D. and Field, A.E. (1996) Introduction to Agricultural Engineering. 2<sup>nd</sup> edition CBS publisher and distributors, New Delhi.
7. Srivastava, D.S. (1995) Elements of farm machinery. Oxford and IBH publishing co. pvt. ltd, New Delhi

### **AECS 32012 AGRICULTURAL POLICY ANALYSIS (2:30/00)**

#### **Objectives**

To provide students with the knowledge to analyze policies that address the level and stability of farm incomes, marketing, structural adjustment and trade problems, with particular emphasis on food policies and also to provide students with clear understanding of the political economy of agricultural policy to illustrate the limitations of our standard economic tools to analyze agricultural policy.

#### **Learning Outcomes**

- Develop a critical knowledge in the agricultural policy environment, the policy formulation process and the institutions or groups involved in agricultural policy making.
- Assess current farm programs, evaluate emerging food policy and trade policy issues.
- Identify the main elements of the major challenges faced by the agricultural policy makers
- Explain the neoclassical framework for economic policy analysis.

#### **Course content**

##### **Theory**

Policy analysis: Framework, Policy analysis: Economics, Agricultural policies ; Price policy, Marketing policy, Input policy, Credit policy, Land reform policy, Irrigation policy, Food policy and security, Quantitative analysis of agricultural policy

#### **Recommended Readings**

- 1) Price Gittinger, J. (1972) Economic Analysis of Agricultural Projects. Economic development institute, USA.

- 2) Boardman, A.E., Greenberg, D.H., Vining, A.R. and Weimer, D.L. (2006) Cost-Benefit Analysis: Concepts and Practice. Pearson, Prentice Hall.

## **AECS32022 NATURAL RESOURCE AND ENVIRONMENTAL ECONOMICS (2:23/15)**

### **Objectives**

To provide solid background knowledge of resource and environmental economics by briefly outlining the fundamental characteristics for an economic approach to environmental analysis and the origins of the sustainability problem by discussing economy environment interdependence, introducing some principles from environmental science, and by investigating the diverse environmental impact, pollution targets and pollution taxes.

### **Learning Outcomes**

- Explain the standard models used in natural resource economics so as to understand the underlying key environmental processes and services, ecosystem management and management of renewable and non-renewable resources.
- Apply economic analysis to the issue of environmental degradation;
- Evaluate alternative policy approaches to the amelioration of environmental damage;
- Apply basic principles behind the economics of natural resource use,

### **Course content**

#### **Theory**

An Introduction to natural resource and environmental economics, Ethics of environmental conservation and concepts of sustainability, Welfare economics and environment, Pollution control, Valuing the environment, International environmental problems, Environment and the developing countries, The efficient and optimal use of natural resources, The theory of optimal non-renewable resource extraction, Stock pollution problems.

#### **Practical**

Visiting to the Environmental authority and related institutions, Identifying and Monitoring the Vulnerable areas around Sri Lanka specially around the Northern province, Performing a simple Environmental Impact assessment.

**Recommended Reading**

- 1) Perman, R., Ma, Y., McGilvray J. and Common, M. (2003) *Natural Resource and Environmental Economics*. Pearson, Addison Wesley.
- 2) Pearce, D.W. and Turner, R.K. (1990) *Economics of Natural Resources and the Environment*. Harvester Wheatsheaf.
- 3) Callan, S. and Thomas, J.M. (2006) *Environmental Economics and Management: Theory, Policy and Application*. Thomson south-western.