

BSc Agricultural Resource Management & Technology (BSc Agric Res Mgt & Tech)

1. Name of the degree

Bachelor of Science in Agricultural Resource Management and Technology (BSc Agric Res Mgt & Tech)

2. Graduate profile

A graduate in B.Sc. Agricultural Resource Management and Technology should be professionals of art and science of crop and livestock production, technology and management with the developed attitudes and ethics to integrate biological and physical resources in environmentally friendly, socially acceptable and economically feasible manner for the production of food, feed, fiber, renewable energy and other agricultural products for the betterment of mankind emphasizing the local, regional, national and international needs.

A graduate in B.Sc. Agricultural Resource Management and Technology should be able to deal with all the aspects of the Agricultural production systems commencing from land exploitation up to the formulation of finite products (farm to fork) to, research, manage and communicate, with a good understanding and skill development to mix indigenous knowledge with new technologies. Further, an Agriculture graduate should be armed with the sound theoretical and practical knowledge in Agriculture as well as other essential skills to achieve the followings.

- Identifying and analyzing issues related to Agriculture.
- Finding acceptable solutions.
- Engaging in the areas of research, management, academia and entrepreneurship.
- Making agriculture as a commercial venture.
- An effective team leader/player with required skills in Information Technology and communication.

3. Admission requirements and registration

3.1. Admission under general admission policy implemented by the University Grant Commission

All applicants for admission to the BSc Agricultural Resource Management & Technology degree programme in the Faculty of Agriculture, University of Ruhuna must satisfy the general University admission requirements for Faculties of Agriculture as laid down by the University Grants Commission of Sri Lanka. However, a separate widow needs to be created by the UGC for the proposed new degree of BSc Agricultural Resource Management & Technology. Students admitted to the Faculty shall register as full-time students and pay any fees as prescribed by the University.

3.2 Admission of foreign students

Foreign students are accepted for the degree programme under the guidelines decided by the University Grant Commission.

4. Structure of the academic programme

4.1. Semester system

The academic programme leading to the degree of BSc Agricultural Resource Management & Technology shall be a full time course organized on a two-semester system, over a period of four academic years. Thus, the degree programme shall consist of 8 semesters. Each course will be taught and evaluated within the semester and end semester examinations which will be held at the end of each semester. The semester (except seventh and eighth semesters) consists of 15 weeks of academic work. Courses will be evaluated under a credit scheme. Eighth semester will be a research programme extending a maximum of six month duration. One credit unit is equivalent to 15 hours of lectures, or 30 hours of practical classes or 45 hours of field works or an equivalent combination of theory, practical, field work, seminars and assignments approved by the Faculty Board.

4.2. Course Notations

Course notation consists of two letters at the beginning representing the relevant department as follows,

- AS – Department of Animal Science
- BL – Department of Agricultural Biology
- CS – Department of Crop Science
- EC – Department of Agricultural Economics and Extension
- EN – Department of Agricultural Engineering
- FS – Department of Food Science and Technology
- SS – Department of Soil Science
- CC – Common Courses
- ID – Inter-Departmental courses

The four digit number represents the year, semester and the course number for the semester of the department.

First Numeral = Year,

Second Numeral = Semester (1 or 2),

Third and fourth = Course number of the semester of the department/combined courses

Eg; CS 2103 (Crop Science, Second Year, First Semester, Third Course offered by the department in the third semester (Second year first semester))

4.3 Basic course structure and credit allocations

The minimum number of total credits required for the degree is 126. Table 4.1 shows the structure of the degree of BSc Agricultural Resource Management & Technology and the credit allocations for each Dept.

Table 4.1 Structure of the degree and the credit allocations for each Dept

| Dept/component | Compulsory course credits | Specialization course credits | Total credits allocated |
|---|---------------------------|-------------------------------|-------------------------|
| Crop Science | 18 | 6 | 24 |
| Animal Science | 17 | | 23 |
| Agric Biology | 16 | | 22 |
| Agric Engineering | 15 | | 21 |
| Agric Economics | 15 | | 21 |
| Soil Science | 8 | | 14 |
| Food Science & Technology | 8 | | 14 |
| Common courses | 11 | | |
| Elective credits (minimum) | 6 | | |
| Specialization credits | 6 | | |
| Industrial Training | No credits | | |
| Research project | 6 | | |
| Total minimum credits required for the degree | 126 | | |

5. Course structure for the new degree of BSc Agricultural Resource Management & Technology

In keeping with the objectives of the curriculum revision many new courses were introduced to the new degree of BSc Agric Res Mgt & Tech. Moreover, many existing courses were restructured and named to make such courses more attractive and more relevant to modern Agricultural development in Sri Lanka. Table 5.1 shows the courses offered by each Department in the proposed new degree of BSc Agricultural Resource Management & Technology.

Table 5.1 Courses offered by each department in the proposed degree structure

| Year and the Semester | Compulsory courses | Elective courses |
|---------------------------|--|------------------|
| First year first semester | CS 1101 Principles of Agronomy (3:15T+30P) EC 1101 Micro Economics (2:30T+00P) FS 1101 Introductory Biochemistry and Food Chemistry (3: 30T+30P) BL 1101 Introductory Crop Botany and Weed Science (2:15T+30P) EN 1101 Farm Power & Mechanization (2:15T+45F) AS 1101 Anatomy and Physiology of Farm Animals (2:15T+30P) CC 1101 Basic Statistics and Mathematics (2:30T+00) | |

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| | Compulsory non-credit courses CC 1102 Computer Awareness (0:15T+30P) | |
| First year second semester | SS 1201 Introductory Soil Science (3:30T+30P) EC 1201 Macro Economics (2:30T+00P) CS 1201 Agroecology and Sustainable Agriculture (2:15T+30P) BL 1201 Fundamentals of Plant Physiology (2:15T+30P) BL 1202 Entomology (2:15T+30P) AS 1201 Forage Crop Production (2:30T+00P) EN 1201 Agro-Meteorology and Applied Hydrology (2:15T+45F) CC 1201 Information and Communication Technology in Agriculture (2:15T+30P) | |
| Second Year First semester | CS 2101 Forest Management (2:15T+30P) BL 2101 Fundamentals of Genetics & Plant Breeding (2:30T+00P) BL 2102 Introductory Plant Pathology (2:30T+00P) SS 2101 Soil Plant Relations and Nutrient Management (3: 30T+30P) EC 2101 Agricultural Development and Policy (2:30T+15P) EN 2101 Postharvest Technology (2: 15T+45F) AS 2101 Genetics and Animal Breeding (2: 30T+00P) CC 2101 Applied Statistics I (2:30T+00P) Compulsory Non-credit courses EN 2102 Engineering Drawing (00:00T+30P) | |
| Second year Second Semester | CS 2201 Fruit Crop Management (2: 15T+30P) EC 2201 Agribusiness Management (3: 30T+30P) FS 2201 Food and Nutrition (3: 30T+30P) EN 2201 Machinery Systems Engineering (2:15T+45F) AS 2201 Animal Nutrition and Feeding (3: 30T+30P) EN 2202 Applied Green Technologies in Agriculture (2: 15T+45F) BL 2201 Introductory Molecular Biology and Biotechnology (2:30T+00P) | |

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| | AS 2202 Non-Ruminant Management (2:30T+00P) | |
| Third year first semester | <p>CS 3101 Export Agricultural Crop Management (2: 15T+30P)</p> <p>CS 3102 Plantation of Crop Management (2:15T+30P)</p> <p>EC 3101 Principles of Communication and Knowledge Dissemination (2:30T+00P)</p> <p>EN 3101 Irrigation and Water Resource Engineering (3:15T+45F)</p> <p>AS 3101 Animal Diseases and Hygiene (2:15T+30P)</p> <p>FS 3101 Food Preservation and Processing Technology (2: 15T+30P)</p> <p>BL 3101 Pest and Disease management (2:15T+30P)</p> <p>SS 3101 Land Resource Management (2:30T+00P)</p> <p>Compulsory non-credit courses</p> <p>CS 3103 Training on Plantation Crops (2 weeks) (00: 00T+45F)</p> | <p>EN 3103 Ergonomics (2:30T+00P)</p> <p>CS 3104 Nursery Management (2:15T+30P)</p> <p>SS 3102 Land Suitability Evaluation (2: 30T+00P)</p> <p>AS 3102 Animal Products for Consumers (2: 30T+00P)</p> <p>BL 3102 Practical Plant Protection (1:00P+30T)</p> <p>FS 3102 Food Biotechnology (2:30T+00P)</p> <p>CC 3101 Database Management Systems (2:15T+30P)</p> |
| Third year second semester | <p>CS 3201 Production Technologies of Field Crops and Vegetables (3: 135F)</p> <p>CS 3202 Floriculture (1: 45F)</p> <p>CS 3203 Protected Agriculture (1: 45F)</p> <p>EC 3201 Social Science Research Methods (2:30T + F + presentations)</p> <p>EC 3202 Agricultural Extension (2: 15T+30P)</p> <p>EN 3201 Field Practices in Agricultural Engineering (2: 90F)</p> <p>AS 3201 Ruminant Management (2:15T+ 30P)</p> <p>AS 3202 Practical Livestock Production (2:90F)</p> <p>BL 3201 Crop Protection and Improvement (2:00T+60P)</p> <p>Compulsory non-credit courses</p> <p>EN 3202 Training in Agricultural Machinery (00:45F)</p> <p>EN 3203 Surveying and Leveling (0:15T+60P)</p> | |
| Fourth year first semester | <p>CC 4101 Applied Statistics II (3:30T+30P)</p> <p>CC 4102 Technical Writing and Presentation Skills (2:20T+10P)</p> | <p>CS 4106 Landscape Gardening (2:15T+30P)</p> <p>CS 4107 Plant Tissue Culture (2:15T+30P)</p> |

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| | <p><u>Specialization Credits</u></p> <p><u>Dept of Agric Engineering</u> EN 4101 Advanced Climatology and Reservoir Hydrology (2: 15T+45F) EN 4102 Advanced Machinery and Processing Engineering (4:30T+90F) EN4103 Computer Aided Drawing and Computer Programming (non credit compulsory) EN4104 GIS and Remote Sensing (compulsory non-credit)</p> <p><u>Dept of Crop Science</u> CS 4101 Aquatic Crop Management (2:15T+30P) CS 4102 Management of Medicinal Plants (1:08T+15P) CS 4103 Cropping Systems (1:08T+15P) CS 4104 Crop Experimentation (2:15T+30P) CS 4105 Floriculture and Landscape Gardening Training (compulsory non-credit)</p> <p><u>Agric Biology</u> BL 4101 Applications of Genetics, Molecular Biology and Physiology (3:30T+30P) BL 4102 Applications of Pest and Disease Management (2:15T+30P) BL 4103 Advances in Plant Improvement (1:15T+00P) or BL 4104 Advances in Plant Protection (1:15T+00P)</p> <p><u>Soil Science</u> SS 4101 Soil Physics (2: 30T+00P) SS 4102 Soil Chemistry (2:30T+00P) SS 4103 Soil Biology and Biochemistry (1: 15T+00P) SS 4104 Techniques in Soil Research (1:15T+00P)</p> <p><u>Food Science & Technology</u> FS 4101 Food Microbiology and Safety (2:30T+00P) FS 4102 Food Chemistry and Analysis (2:30T+00P)</p> | <p>EN 4103 Precision Agricultural Technology (2:30T+00P) EN 4104 Electronics & Instrumentation in Agriculture (2:30T+00P) BL 4105 Indigenous Knowledge Systems in Agriculture (2:30T+00P) CC 4103 Rapid Application Development (2:15T+30P) CC 4104 Bioethics (2:30T+00P) CC 4105 Career Guidance and Development (2:15T+30P) CC 4106 Non-parametric Statistical Methods (2: 30T+00P) FS 4105 Cereal Chemistry and Bakery Product Technology (2:30T+00P) FS 4106 Sanitation and Food Quality Control (1:15T+00P) SS 4105 Land use and Environmental Quality (2: 30T+00P) SS 4106 Soil Fertility Management (2: 30T+00P) EC 4104 Project Management (2:30T+00P) EC 4105 Fisheries Economics & Management (2:30T+00P) AS 4105 Animal Waste Management (2:30T+00P) AS 4106 Care and Management of Companion Animals (2:30T+00P) or AS 4107 Animal Behavior and Welfare (2:30T+00P)</p> |
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| FS 4103 Food Process Engineering (1:15T+00P) FS 4104 Human Nutrition (1: 15T+00P) <u>Agric Economics & Extension</u> EC 4101 Human Resource Development (2:30T+00P) EC 4102 Natural Resource Management (2:30T+00P) EC 4103 Agricultural Marketing (2:30T+00P) <u>Animal Science</u> AS 4101 Recent Advances in Animal Production (2:30T+00P) AS 4102 Aquaculture (1:15T+00P) AS 4103 Livestock Economics and Legislations (2:30T+00P) AS 4104 Wildlife Management (1:15T+00P) | |
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6. Course contents/descriptions

The contents/descriptions of the proposed courses of academic departments for the degree of BSc Agricultural Resource Management & Technology are as follows.

6.1 Dept of Crop Science

6.1.1 Compulsory courses

CS 1101 Principles of Agronomy (3: 15T+30P)

Introduction to Agriculture, Agro-climate of Sri Lanka, Impact of climate on crop production, Crop growth, Growth indices and their value in crop production and yield determination, Principles of land management; Land Use Classification, Fertilizer management in Crops; Principles of farming systems, Importance of propagation and nursery management, Quality parameters of seeds; Seed germination; Plant propagation, Micro propagation; Physical and Chemical plant growth regulation and manipulation.

CS 1201 Agroecology & Sustainable Agriculture (2: 15T+30P)

Introduction to Agroecology, Management of ecosystem & agroecosystem, System thinking approach, Sustainability of farming system, Introduction to Sustainable Agriculture, Management of sustainable ecological farming, Indigenous knowledge used in ecological farming systems, Effective management of soil fertility in ecological farming.

CS 2101 Forest Management (2: 15T+30P)

Introduction to forest (natural and man made), Importance and role of forest on Agriculture and Environment, Establishment of man made forest (species selection, different nursery establishment methods, field planting, aftercare operations, timber volume measurements), Forest conservation practices. Agroforestry – Introduction to Agroforestry, Agroforestry systems, Potential roles and ancillary benefits of Agroforestry systems. Tree-crop interface, Management of tree- crop components, Choice of tree species, Opportunities and problems.

CS 2201 Fruit Crop Management (2:15T+30P)

Introduction, Ecological requirements, Taxonomy, Morphology, Physiology, Propagation methods, Cultivation techniques and post harvest techniques of Banana, Mango, Pineapple, Avocado, Citrus, Rambutan, Grapes, Cashew, Dragon fruit, Papaya, Minor fruit crops (Guava, Jambu, Mangoose, Anoda) etc.

CS 3101 Export Agricultural Crop Management (2: 15T+30P)

Introduction, Ecological requirement, Taxonomy, Morphology, Physiology, Propagation method, Cultivation Techniques and post harvest technique of Export agricultural Crops (i.e. Cinnamon, Pepper, Coffee, Cocoa, Citronella, Cloves, Cardamom, Nutmeg, Betel, Betel nut, Vanilla, Garcenia and Tamarin etc.).

CS 3102 Plantation Crop Management (2: 15T+30P)

Introduction, Ecological requirement, Taxonomy, Morphology, Physiology, Nursery management, Cultivation techniques and post harvest technique of Tea, Rubber, Coconut, Oil palm and Sugarcane.

CS 3201 Production Technologies of Field Crops and Vegetables (3: 135F)

Traditional and modern crop technologies; Crop growth and development; Site and crop selection; Propagation techniques; Nursery management techniques; Crop establishment techniques; Field management; Crop protection; Pests and Disease management; Weeds and weed management strategies; Harvesting techniques and Post harvesting handling.

CS 3202 Floriculture (1: 45F)

Introduction, Principles and methods of species classification, Ecology, morphology and physiological requirement of flowers and foliage crops, Production and post harvest management of cut flowers (Orchids, Anthurium, Roses, Carnation, Gerbera, and Petunia), Cut foliage (Draceana, Dieffenbachia) and other ornamental species. Packing, labelling and marketing of floricultural products.

CS 3203 Protected Agriculture (1: 45F)

Introduction, History and world status of protected agriculture, Present status, potential for expanding and limitation of protected agriculture in Sri Lanka, Different methods of protected Agriculture, Different types of protected houses, Soil less culture/Hydroponics, Quality control and marketing of the production.

CS 4101 Aquatic Crop Management (2:15+30)

Introduction to Seaweed farming, Economically important seaweeds, Geographical distribution, Taxonomy, Biology, Domestication, Farming Techniques, Industrial uses and processing, Economically important micro algae, Geographical distribution, Taxonomy, Biology, Farming Techniques, Industrial uses and Processing, Economically important aquatic plants, Taxonomy, Biology, Farming Techniques, Industrial uses and Processing.

CS 4102 Management of Medicinal Plants (1: 08T+15P)

Medicinal plants as an important Bio-resource – status and scope, domestic and global market, Relation between biodiversity and cultural diversity, Contemporary relevance of traditional knowledge related to medicinal plants, Traditional Sri Lankan Healthcare systems and their contemporary relevance, Botanical overview of medicinal plants resources of Sri Lanka, Current conservation scenario of medicinal plants in Asia, Existing threats to medicinal plants populations, Need for conservation, Methods for conservation (*insitu* gene banks, Ethno medicinal gardens, Sustainable harvest and conservation education facilities, Development of multi-disciplinary databases for medicinal plants conservation), Propagation as a tool for conservation, Cultivation and management systems of important medicinal plants.

CS 4103 Cropping Systems (1:08T+15P)

Introduction, Classification, Monocropping and Multiple cropping, Advantages and disadvantages of monocropping and multiple cropping, Factors affecting selection of components of multiple cropping, Different cropping pattern used in different agro-climatic zones. Productivity improvement of lands by using different multiple cropping models.

CS 4104 Crop Experimentation (2:15T+30P)

How to increase the precision of an experiment, Soil heterogeneity, Systematic designs, Nested designs, Missing data analysis, Competition effects, Multi locational and multiseasonal trials.

CS 4105 Floriculture and Landscape Gardening Training (compulsory non-credit)

6.1.2 Elective courses

CS 3103 Nursery Management (2: 15T+30P)

Definition of nursery, Factors affecting for area and site selection for a nursery, Nursery structures, Propagators, Shade Houses, Nursery types, Mother plant selection and management, Bud wood nursery, Root stock nursery, Sand beds, Different propagules used for the propagation (Cuttings, Soft wood cuttings, Semi hard wood cuttings, Hard wood cuttings, Layering, Budding and Grafting, Pruning), Nursery feeding, Organic fertilizer, Chemical fertilizer, Potting of nursery plants, potting media, Labelling of potted plants, Containers used for potting, Characteristics of potting mixtures, Pest and disease control of a nursery.

CS 4106 Landscape Gardening (2:15T+30P)

Introduction (historical concepts and landscape tradition of Sri Lanka, Evaluation of modern landscape gardening, technical aspects of Landscape designing, Ecological and Environmental concern on designing of landscape gardening. Introduction of soft landscaping, selection of plants and classification of plant material, Brief introduction to hard landscape material.

CS 4107 Plant Tissue Culture (2: 15T+30P)

Introduction, History of plant tissue culture, Laboratory organization and maintenance, Culture condition, Preparation of stock solutions, Plant growth regulators in tissue culture, Micro-propagation, Cell and Callus culture, Germplasm preservation, Artificial seed production.

6.2 Dept of Soil Science

6.2.1 Compulsory courses

SS 1201 Introductory Soil Science (3: 30T+30P)

Soil as a renewable natural resource, Importance and functions, Minerals, Rocks and Weathering, Physical Properties of Soils, Mineralogical and Chemical Properties of Soils, Biological Properties of Soil, Soil Genesis, Soil Taxonomy, Soils of Sri Lanka.

SS 2101 Soil-Plant Relations & Nutrient Management (3 :30T+30P)

Soil-plant-water relations, Soil organic matter: plant residue decomposition and nutrient release, mineralization and immobilization of nutrients, Plant nutrients and nutrient cycles, Managing soil fertility and plant nutrients: soil fertility evaluation, inorganic fertilizers, composts and other organic amendments.

SS 3101 Land Resource Management (2: 30T+00P)

Land as a natural resource, Use of land for agriculture and forestry, Soil survey and mapping: interpretation and land use planning, Managing soil physical fertility: soil erosion and conservation, soil aggregation, Problem soils and their management: salt-affected soils, acid sulphate soils, reclamation of saline and other problem soils, Land degradation and desertification: causes, on site and off site effects.

SS 4101 Soil Physics (2: 30T+00P)

Soil physical properties: texture and structure of soils, soil densities, particle size distribution, Soil physical processes: Soil water and air flow, Soil water potential, Water movement in soils, Solute transport, Wetting and non-wetting properties of soils, Surface free energy of soils, adhesion vs. cohesion, tillage and soil structure management, Soil compaction, Importance of Soil water management, Erosion and sediment control, Water shortages & conservation, Monitoring and maintaining Soil Moisture.

SS 4102 Soil Chemistry (2: 30T+00P)

Minerals in soil environments: silicates and non-silicates, clay minerals, origin of clay minerals, Atomic structure of clay minerals, types of clay minerals, properties and identification of clay minerals, Acidity and alkalinity, metal toxicity, chelation and complexation, phase interactions, water quality, soil solution, precipitation - dissolution reactions, oxidation and reduction reactions, charge characteristics and surface chemistry, retention of organic molecules.

SS 4103 Soil Biology & Biochemistry (1: 15T+00P)

Concept of energy flow and functions of ecosystems, Role of soil in the ecosystem, Components of the soil ecosystem, Microbial life and the soil ecosystem, Soil food web, chemical composition of soil organic matter, Decomposition of plant/crop residues and stabilization of organic matter, Characterization of SOM, Carbon cycle, Soil management for carbon sequestration, pools of SOM and introduction to modeling, Nutrient cycling in forest and agricultural ecosystems: Nitrogen, Phosphorus, Potassium and Sulfur cycles.

SS 4104 Techniques in Soil Research (1:15T+00P)

Selection of sampling sites and field data collection, Sampling, Preparation and storage of soil for research, Techniques in soil and plant analysis: Elemental composition, extraction of nutrient fractions, Soil organic matter and biological properties: Total organic matter and fractions, Soil microbial biomass, Soil respiration, Instruments used in soil analyses: Colorimeter, Spectrophotometer, Atomic absorption spectrometer, Techniques and instrumentation in soil physical properties, Use of isotopes in soil research. Application of GIS and remote sensing in soil research.

6.2.2 Elective courses

SS 3102 Land Suitability Evaluation (2: 30T+00P)

Aims, Nature and principles of land evaluation, Land utilization and land use types, Land suitability and capability, Land suitability classification, Soil parameters of agricultural significance, Standards of evaluating soil parameters, Methods and techniques of evaluating soils: drainability tests, infiltration, compaction, depth, Crop requirements from soils properties perspective, Crop selection for a land based on soil properties. Limitations and improvements of land qualities.

SS 4105 Land Use and Environmental Quality (2: 30T+00P)

Soil and the environment: land use and cover change, Greenhouse effect and global warming: Soils as source of greenhouse gases, Ozone depletion, Carbon sequestration in soils, Atmospheric pollution: Types of air pollutants Land use and environmental pollution: Soil and water pollution due to agricultural activities, Eutrophication, chemical pollution of soil & water, Landfills in garbage disposal; Remediation of polluted soils, Monitoring, Assessment and control of air, Water and soil pollution.

SS 4106 Soil Fertility Management (2: 30T+00P)

Concept of soil fertility, Mechanisms of nutrient uptake by plants: Ion concentration in the soil solution, Mass flow and diffusion, Rhizosphere: Carbon supply and microbial activity in the rhizosphere, Soil fertility evaluation: Interpretation of results of soil and plant analysis, Critical nutrient concentration, Critical nutrient range, Diagnosis and recommendation, Introduction to tropical soils and major soil groups in Sri Lanka, Wetland rice growing soils, Nutrient management practices of tropical soils and rice soils.

6.3 Dept of Animal Science

6.3.1 Compulsory courses

AS 1101 Anatomy and Physiology of Farm Animals (2: 15T+30P)

Anatomy and physiology of the digestive systems and physiology of digestion in farm animals, Anatomy of the male reproductive systems, Reproductive physiology, Anatomy and physiology of female reproductive systems of farm animals, Estrous cycle, Heat detection, Artificial insemination, Physiology of parturition, Anatomy of mammary glands, Lactation physiology, Reproductive endocrinology, Anatomy in relation to minor surgery.

AS 1201 Forage Crop Production (2: 30T+00P)

Introduction, Pasture production systems in Sri Lanka, Agronomy of grasses and legumes, Pasture establishment, Soil fertility and fertilization of forages, Role of the legume, Pasture management Defoliation, grazing and pasture conservation techniques, Herbage quality, Measurement of pasture production.

AS 2101 Genetics and Animal Breeding (2: 30T+00P)

Domestication and origin of farm animals, growth and development, Principles of genetics, Nature of gene and heredity, Maternal chromosome, Their evolution and conservation, Cytogenetics, New technology in animal breeding, Genetic polymorphism, Population genetics, Relationship, Repeatability, Relationship, inheritance of economic traits, Genetics and phenotypic variance, Population genetics, Heritability and repeatability and their estimation, Selection, Basis of selection, Selection methods, Breeding systems: Inbreeding and cross breeding, Heterosis, Genetic improvement, Improvement of livestock with special reference to situation in Sri Lanka.

AS 2201 Animal Nutrition and Feeding (3:30T+30P)

Nutrients and feedstuffs, Classification of nutrients, water and dry matter in animal nutrition, Carbohydrates, proteins and amino acids, Lipids, Minerals, Vitamins in animal nutrition and feeding; Sources, Functions, Deficiency symptoms, Requirements, Toxicities, Interactions, Growth promotants, Digestion metabolism of carbohydrates and proteins in ruminants and non ruminants, Utilization of NPN and fibrous feeds, Classification of livestock feeds, evaluation of livestock feeds, Ration formulation principles for ruminants and non ruminants, Nutrition and feeding of dairy cattle, Swine, Poultry, Goat, Fish and Companion animals.

AS 2202 Non-Ruminant Management (2: 30T+00P)

Swine Management (Terminologies, Potentials & advantages and constraints of swine industry, Selection of site for piggery, Swine breeds, Pig production systems, Swine management operations, Selection of a Sow/Gilt, Management of gilts, Selection of a boar, Management of boar, Management of pregnant animals, Baby pig management, Management of fatteners, Planning of a piggery, Sow productivity), Poultry Management (Technical terms and definitions in poultry management, Classification, Different breeds of poultry, Structure of an egg, Incubation, Incubators, Brooding, Grower management, Layer Management, Housing, Moulting, Culling in poultry, Broiler management, Management of ducks, Broiler processing).

AS 3101 Animal Diseases and Hygiene (2: 15T+30P)

Principles of animal hygiene and diseases, Causative organisms of diseases, Clinical examinations and disease diagnosis, Common diseases of cattle, Swine, Poultry, Goat and other farm animals, Their symptoms, Diagnosis, Prevention and control, Important zoonotic diseases.

AS 3201 Ruminant Management (2: 30T+00P)

Introduction to ruminant management, Dairy production, Present situation, Statistics of milk production, Breeds of dairy cattle, Principles of ruminant management, Farm animal and environment, Housing for ruminants, Dairy herd management, Dairy cow management, Care of the dam at parturition, Management of heifers, Management of bull, Calf management, Different systems of calf management, Buffalo management, Small ruminant management, Buffalo management (Introduction, Population, distribution and production statistics, Buffalo breeds, Advantages and problems associated with buffalo management, Buffalo production systems, Crop-buffalo interactions in crop-livestock systems, Contribution of buffaloes to rural development, Uses of buffalo management, Routine management practices, Management of new born calves up to weaning, weaning to 6 months of age, six months to conception, management of pregnant animals, Management at parturition, Lactating herd, Breeding bull and management of draught herd).

AS 3202 Practical Livestock Production (2:90F)

On farm training in practical livestock production: Poultry management, Ration formulation, mixing and feeding, Day old chick management, Management of broilers, Layers, Litter management, Slaughtering and processing, Feeding of ruminants, Pasture Production and Conservation, Clean milk production, General clinical examination of farm animals, Pregnancy diagnosis, Artificial insemination, Farm housing, Livestock economics and farm planning, Farm records, Designing and planning of dairy, Swine, Poultry, Goat unit.

AS 4101 Recent Advances in Animal Production (2:30T+00P)

Animal Feed technology, Advanced topics in animal product technology (dairy, meat, Fish and Egg, Micro livestock.

AS 4102 Aquaculture (1:15T)

Inland fisheries sector of Sri Lanka (Past, Present and Future development), economically important aquatic resources of Sri Lanka, Principles of food fish culture, Ornamental fish farming, Aquatic weeds and aquatic plant production, integrated animal-fish mixed cropping systems.

AS 4103 Livestock Economics and Legislation (2:30T+00P)

Present situation of the global and Sri Lankan livestock industry, Factors affecting the profitability of the livestock operations, Special features of livestock commodities, Acts related to livestock industry in Sri Lanka, Ethical issues related to animal industry, Ethical evaluation of animal experiments.

AS 4104 Wildlife Management (1:15T+00P)

Biodiversity(Definition, Present Situation in Sri Lanka, Importance, Threats, Conservation, Current issues), Eco-systems(Definitions, Importance, Different eco systems with special emphasis in Sri Lanka), Wildlife on Sri Lanka (Present situation, Issues, Potentials, Principles of conservation and management), Conservation of wildlife with special emphasis on elephant as a flagship species, human elephant conflicts, etc., Range management: requirements of different species; carrying capacities, stocking rate, etc., population dynamics of selected species, Research methodologies, field techniques, appropriate analysis methods, etc., Eco-tourism: Concepts, Potentials, Strategies & constraints, Government policies & legal aspects, International conventions

6.3.2 Elective courses

AS 3101 Animal Products for Consumers (2:30T+00P)

Dairy (Introduction to dairy science & technology, General characteristics of milk, definition of milk, major and minor constituents of milk, Factors influencing the composition, Properties of milk, Effect of heat on milk properties, Food value of milk, Milk contamination and prevention of contamination, Milk testing, Milk processing), Meat (Introduction, Structure and composition of muscle, Conversion of muscle to meat, Eating quality of meat, Factors affect on meat consumption level, Nutritive value

of meat, Slaughtering of farm animals, Meat colour, Carcass evaluation, Basic techniques in meat processing).

AS 4105 Animal Waste Management (2:30T+00P)

Livestock waste as a resource, The harmful effect of animal wastes on the environment, Effect of animal waste on human health, Characteristics of animal wastes, The techniques to minimize the detrimental effects of livestock waste on the environment, Livestock waste composting, The biogas generation from animal manure, Livestock waste water treatment principles, Aerobic, anaerobic and wetland treatments.

AS 4106 Care and Management of Companion Animals (2: 30T+00P)

Breeds of cats and dogs, Common diseases of companion animals, Zoonotic diseases and vaccination programs, Breeding management of companion animals.

AS 4107 Animal Behavior and Welfare (2: 30T+00P)

Introduction to Animal Behavior and Welfare (animal behavior, impotency of animal behavior, animal Welfare, Behavior as an indicator of welfare, Welfare terminologies and concepts, understanding of abnormal behaviors) History and Evolution of the topic Animal Welfare (Religious development and legal development, Some welfare movements in the past, Brambell committee recommendations, Animal Ethics), The 5 Freedoms in Animal Welfare (Definitions and measurements of 5 Freedoms)The Animal Welfare Act 1999, Domestication and associated welfare issues, Welfare issues associated with different animal species; Cattle, poultry, pigs, sheep/goat and zoo animals.

6.4 Dept. of Agricultural Engineering

6.4.1 Compulsory courses

EN 1101 Farm Power & Mechanization (2: 15T + 45F)

Indigenous Farm Technology, Tractors, Prime movers and Transmission of power, Appropriate Mechanization, Basic Engineering Mechanics- Statics.

EN 1201 Agro-Meteorology and Applied Hydrology (2: 15T+45F)

Precipitation, Occurrence and Causes, Measurement of rainfall, Interpretation of Rain-gauge data, Graphical Representation of Rainfall, Infiltration, Factors affecting for runoff, Estimation of runoff, Hydrograph, Unit hydrograph , Practical usage of hydrograph , Hydrological cycle, Clouds formation, Clouds classification.

EN 2101 Post Harvest Technology (2:15T+45F)

Post harvest systems, Loss and damage, Physical characteristics of food materials, Mechanism of heat transfer, Temperature measuring devices, Food dehydration & drying, Refrigeration, Controlled atmosphere storage, Modified atmosphere storage, Packaging.

EN 2102 Engineering Drawing (00:00T+ 30P)

Introduction to engineering drawing, Geometrical constructions, Orthographic drawing, Isometric drawing, Sectioning

EN 2201 Machinery Systems Engineering (2:15T+45F)

Soil dynamics for tillage, Farm Production Engineering, Machinery for land preparation, Primary tillage implements, Secondary tillage implements, Sowing and planting machines, Plant protection machines, Fertilizer distributors, Harvesters and threshers, Water lifting Devices, Agricultural Soil Mechanics, Traction mechanics, Testing and Evaluation of Agricultural Machinery.

EN 2202 Applied Green Technologies in Agriculture (2:15T+45F)

Concepts of green technology, Application of green technology to agriculture towards sustainability, Concepts of sustainability, Green technology and rural environmental concerns, Inputs in agriculture, selection of technology, Energy basis, solar energy, Wind energy, Bio mass energy, Hydro power energy, Geo-thermal energy, Tidal/wave energy, etc; Environmental pollution and agriculture, Impacts of wastes, Classification of wastes, Properties of agricultural wastes, Effect of agricultural wastes on natural resources, Effect of agricultural wastes on environmental pollution, Objectives of agricultural waste management(AWMS), Planning of AWMS, Different methods of organic waste management, Composting technology, Biogas technology, etc. Impacts of green technologies.

EN 3101 Irrigation and Water Resource Engineering (3: 30T+45F)

Water movements in conduits, Bernullie Theory, Venturi meter, Orifice meter, Open channel flow, Hydraulics and fluid mechanics, Measurements of water flows, Current meter, Weirs, Flumes, Tracer method adopted in flow measurements, surface and ground water resources, Soil waster movements under saturated and unsaturated conditions, Darcy's law, Hydraulic conductivity, Permeability, Ground Water Availability, Ground Water Movements, aquifers, Quality of Ground Water, Ground Water Pollution. Soil water relationships in relation to the irrigation, Soil moisture constants, Determination of soil moisture, Water requirements of crops, Estimation of ET, Irrigation scheduling, Irrigation systems, Problems related with irrigation, Surface irrigation methods, Uncontrolled flooding, Border, Check basin and Furrow irrigation, Sub surface irrigation, Sprinkler irrigation, Drip irrigation, Water quality for agriculture, Drainage, factors affecting water logging, Drain design, Determination of drain spacing, Drainage methods.

EN 3201 Field Practices in Agricultural Engineering (2: 90F)

Farm machinery performance, Machine capacity, Field efficiency, Tractor performance test, Calibration of plant protection equipment, Usage of work shop tools and welding process demonstration , Identification of farm implement , Evaluation of power operated water pumps, Measurement of soil parameters that related with irrigation and land preparation, Aggregate analysis, True density, Bulk density and Porosity, Field capacity, Water infiltration method, Atterberg limit , Permeability coefficient, Standard Proctor compaction test , Measurement of soil moisture and development of soil moisture calibration curves.

EN 3202 Training in Agricultural Machinery (00:45F)

Maintenance and repair of farm implements, Training in two wheel tractor and two wheel tractor attached farm implements.

EN 3203 Surveying and Leveling (0:15T+60P)

Introduction to surveying and leveling, Surveying methods; Chain Surveying, Plane table surveying (Radiation & Intersection), Leveling; Contouring & Profile leveling.

EN 4101 Advanced Climatology and Reservoir Hydrology (2: 15T+45F)

History of the climate classification, Agro-Climate classification, Sources of water and Availability of water, Wetland conservation and River Basin Management, Climate change and their impacts of Agriculture, Hydrology of a farm reservoir.

EN 4102 Advanced Machinery and Processing Engineering (4:30T+90F)

Mathematical principles and application in food processing, Material and Energy balances, Heat transfer, Thermal process calculation, Emerging technologies in food processing, Process control in food processing, Separation, Mixing emulsification and size reduction in food processing, Engine performance maps, Two wheel tractor for wetland farming , Machinery for , lowland rice cultivation, Harvesters and Threshers (Grain, Forage crops, Root crops, Fruit and vegetable crops, Tropical crops (Sugar cane, Cotton, Ground nut, Coffee)), Farm water systems, Grain conveyance systems, Production of coir yarn (Dry milling and wet milling), Testing and evaluation of farm machinery, Precision farming.

EN 4103 Computer-aided Drawing and Computer Programming (0: 60T+00P)

Geometrical constructions, Orthographic projection, Sectioning, Isometric drawing, Screw threads, Helices and Fasteners, Computer Aided Drawing (CAD) (Auto CAD and Solid Works), Three dimensional modeling, Introduction to programming languages , Introduction to variable types , Introduce programming environment in Visual Basic , Defining, Declaring, Initializing variables in Visual Basic , Sub programmes in Visual Basic, Control constructors in Visual Basic, Debugging a programme, Error handling in Visual Basic.

EN 4104 GIS and Remote Sensing (0: 15T+30P)

Introduction to GIS, Maps and Spatial Data Management, Spatial data, characteristics and models, Spatial data analyses in GIS, Concepts of Remote sensing, Sensors and Platforms, Interpretation of Satellite Images and Air Photos, Applications of Remote Sensing.

6.4.2 Elective Courses

EN 3102 Ergonomics (2: 30T+00P)

Definition, The application of ergonomic principles, Development in Ergonomics, Ergonomic Model, The Nature of Basic Human Factors involve in performing the task, Ergonomic Research, Parts of Ergonomic Research, Anthropometry, Application of Anthropometric Data Design Consideration, Main body types, Body measurement categories, Use of Anthropometric Data, Body motions, Terms used in Body

movement, Body Movement Classification, Energy Expenditure in Physical Activities, Working posture, Seat designing for tractor, Seat Design parameters, Controls of the machine, Typical tractor seat position, Controls relative to the seat, Work-Space Layout, Operator Exposure to Environmental Factors, Thermal Comfort in Operator Enclosures, Noise and Vibration in Off-Road Vehicles, Roll-Over Protection, Accidents and safety in agriculture, Types of Accidents, Factors causing accidents.

EN 4105 Precision Agricultural Technology (2: 30T+00P)

Guidelines for adopting precision Agricultural practices, Management of information relevant to Precision Agriculture: Basic, strategies and tools, Potential application of remote sensing, Collection of crop, field data and mapping, Procedure for accurate yield mapping, Yield map interpretation, Data layer smoothing and interpolation in yield mapping and interpretation, Mapping of land and crop information using GIS techniques, Variable Rate Technology (VRT) in precision Agriculture, Site specific management strategies used in precision agriculture, Adoption and economics of precision agriculture technologies, Site specific management of crop and land parameters , Techniques for conducting field scale research with precision agriculture tools.

EN 4106 Electronics & Instrumentation in Agriculture (2: 30T+00P)

Introduction to General Electronic Instruments and Devices, Static and Dynamic Performance of Instruments, Diodes Applications and Power Supply, Potentiometer Circuit and the Wheatstone Bridge, Transistors and Amplifiers, Applications of OP AMP Digital Techniques in Instrumentation, Measurement Displacement, Velocity and Acceleration, Measurement Temperature, Moisture, Humidity and Radiation, Measurement of Force and Torque, Measurement of Flow and Pressure, Measurement of Vibration and Noise, Recording Instruments, Data Acquisition and Processing.

6.5 Dept of Agric. Economics & Extension

6.5.1 Compulsory Courses

EC 1101 Micro Economics (2: 30T+00P)

Nature, Definitions, Scope and importance of economics, Economics as a science, Basic micro-economic concepts, Theories of consumption, Production and markets, Pricing of products and factors of production, Profit maximization and cost minimization, Introduction to welfare economics, Mathematical approach of economic analysis.

EC 1201 Macro Economics (2: 30T+00P)

Definitions, National income accounting, IS-LM analysis of macro-economic models, Equilibrium in dynamic system, Classical, Keynesian and post-Keynesian theories of output and employment, Theories of money and prices, International trade, Money and Banking, Role of international and regional economic agencies.

EC 2101 Agricultural Development and Policy (2: 30T+00P)

Institutional setting, Inter-sectoral forward and backward linkages, Political and economic factors and agriculture, Models of agriculture development (Karl Mark, Rostow, Schultz, Jorgenson, FEI, Mellor, Todaro and Boserup), Development problems in Sri Lankan agriculture and South Asia, Agricultural finance, World agricultural trade and WTO, Importance of agricultural policies with special reference to Sri Lanka, Policies of price, Research, Land, Credit, Irrigation and Insurance, Improving food and nutrition security, Increasing Competitiveness, Increasing Investments, Export and Marketing development, and Institutional and Management Reforms, Analytical tools for agricultural policies, New economic order, IPR and International trade policies, Sustainability of Development.

EC 2201 Agribusiness Management (3: 30T+30P)

Introduction to farm business management, Theories of farm management, Managerial decision making, Gross margin analysis, Financial statement analysis, Financial intermediation in agriculture, Management control system, Budgeting Techniques and General procedures, Measuring Risk and Returns, Cost Accounting, Linear and non linear programming techniques in farm and business planning.

EC 3101 Principles of Communication and Knowledge Dissemination (2: 30T+00P)

Introduction, Definitions, Needs of communication, Nature of communication, Communication models, The two way communication process, Communication Barriers, Communication in agriculture, Communication skills, Level of Communication, Communication and Diffusion, Elements of Diffusion, The innovation decision process, Perceived Attributes of an Innovation, Rate of Adoption, Innovation Decisions, Consequences of Innovation, Adopter Categories, Opinion leaderships, The Change agent, Communication channels, Adoption index, Change management and attitudes change, Barriers to change.

EC 3201 Social Science Research Methods (3: 30T + F + presentations)

Definitions, Social science research process, Social science research ethics, Variable and measurements, Research designs, Preparation of research proposals, Hypothesis development and testing, Types of data, Different methods of data collection, Questionnaires and schedules, Sampling techniques, Parametric and non-parametric statistical tools for social science research, Preparation of research reports, Presentation skills, Field surveys.

EC 3202 Agricultural Extension (2: 15T+30P)

Introduction (Origin of extension, Definitions, Extension process, Need of extension, Agricultural Supporting Services, Extension Organization, Level of extension) Historical development of extension system in Sri Lanka, Principles of Agricultural Extension (Philosophy, Function, Scope, Principle, Extension process, Objectives of Agricultural Extension, Extension fundamentals, Basics of Effective Extension) Agricultural Growth Potential Areas, Task of Agricultural Extension, Extension agent in rural community and role of extension agent, Extension education (Extension teaching learning process, Formal and Non-formal education, Extension teaching methods, Teaching aids), Extension approaches (The scheme approach, The

commodity approach, The technical change approach, Target category approach, The functional group approach, The farm group approach, The cost sharing approach, The institutional approach, The project approach, The farmer field approach) Programme planning and evaluation, Extension administration and operation system in Sri Lanka.

EC 4101 Human Resource Development (2:30T+00P)

Introduction to HRM (HRM function in Organization, Leadership, Management style and team work, Decision making) Strategic HRM (Role of HRM function for strategic formulation, Competence of HR Manger, Acquiring Human Resources (HR planning recruitment and placing), Developing Human Resources (Motivation, Training, Employee development and career management), Performance Management (Job Evaluation, Assessing work, performances appraisal, managing employee Benefit), Managing Internal and External Environment (Legal Environment and employee Relation, working condition, Health and safety), Counseling.

EC 4102 Natural Resource Management (2:30T +00P)

Nature and scope of production relations, Concepts of production functions, Optimal product and input combinations, Market economic systems, Market failure, Concepts of welfare economic, Property right, Public goods and Common property resources, Economics of renewable resources, Fisheries, Forest, Water resources, Non-renewable resources, Land and Labour management, Strategies to control resource overuse and pollution.

EC 4103 Agricultural Marketing (2:30T +00P)

Introduction, Evolution of marketing, Production approach, Product approach, Sales approach, Market approach, Societal marketing approach, Understanding the market place and customer needs, Marketing mix – 7 Ps, Understanding customers, Cultural factors, Social factors, Psychological influences on consumer behaviour, Consumer decision making, Stimulus response model, Theory of Planned behaviour model, Buyer decision process, Customer driven marketing, Strategic marketing, International marketing, Globalization, Online marketing (B to B, B to C, E-commerce).

6.5.2 Elective Courses

EC 4104 Project Management (2:30T +00P)

Introduction to the project planning and management cycle, Project management process and strategic context of projects, Project planning and management cycle, Feasibility analysis and Appraisal of projects, Organizational design for project management, Project planning and management information system, Project monitoring, Evaluation and control, Interpersonal dynamics in the management of projects and the cultural elements, New prospects of projects planning and management.

EC 4105 Fisheries Economics and Management (2:30T +00P)

Introduction to fisheries and aquaculture sector (Aquaculture and capture fishery, Fresh water, brackish water, and marine fishery, Reservoir fishery, Possible aquatic species, Fishing crafts and gears, Introduction to Fisheries Economics (Basic bio –

economic model, Open access fishery, (MSY, MEY, OAE), Fishing vessel economics, Yield and stock effect of fishing, Fisheries management (Growth of fish stock, Catch and effort management, Catch control – taxation. License, TAC), Post harvest technology (Post harvest techniques, Marketing), Socio – economic issues in fisheries (Risk, Vulnerability, Access to capital, Fisheries governance), Future of the fishery (Fish based farming systems, Issues, prospects, and challenges).

6.6 Dept. of Food Science & Technology

6.6.1 Compulsory Courses

FS 1101 Introductory Food Chemistry and Biochemistry (3: 30T+30P)

The water molecule, Physical properties of Water and Ice, Water activity and relative vapor pressure, Moisture sorption isotherms, Structures and chemical reactions of Monosaccharides, Disaccharides, Oligosaccharides and Polysaccharides, Introduction to lipids, Nomenclature of fatty acids, Classification of food lipids, Physical and chemical properties of lipids, Introduction to proteins, Structure and physicochemical properties of amino acids, Protein structure, Protein denaturation, Functional and nutritional properties of proteins, Introduction to vitamins, Bio-availability of vitamins, Water-soluble vitamins, Fat-soluble vitamins, Optimization of vitamin retention, Principles of mineral chemistry, Nutritional aspects of minerals, Mineral composition of foods, Chemical and functional properties of minerals in foods, Introduction to enzymes, Enzyme nomenclature, Rates of enzyme catalyzed reactions.

FS 2201 Food & Nutrition (3: 30T+30P)

Functions of Food, Fate of ingested aliments, Introduction to metabolism Carbohydrate metabolism, Lipid metabolism, and Protein metabolism, Integration of metabolic cycle, Endocrine regulation, Diseases and disorders with a nutritional component.

FS 3101 Food Preservation and Processing Technology (2: 15T+30P)

Introduction of food spoilage, Methods of food preservation, Preservation of fruits, Vegetables, Dairy products meat, Fish etc., Food storage and losses, Food processing at ambient temperature, Processing by application and removal of heat, Post processing operations, (coating, packaging, filling and sealing).

FS 4101 Food Microbiology and Safety (2:30T+00P)

History of microorganisms in foods, Role and significance of microorganisms in foods, Intrinsic and extrinsic parameters of food that affect microbial growth, Determination of microorganisms and/or their products in foods, Properties of psychrotrophs, thermophiles and radiation-resistant bacteria, Molecular Biotechnology of microorganisms in foods, Fermentation and fermented foods, Indicator organisms of food safety and quality.

FS 4102 Food Chemistry and Analysis (2:30T+00P)

Introduction to Food Chemistry, Societal role of food chemists, Properties of water and ice, Water activity, Moisture sorption isotherms, Monosaccharides and

monosaccharide reactions, Non-enzymatic browning, Polysaccharides and polysaccharide reactions, Gelatinization of starch, Nomenclature, Physical aspects and chemical aspects of lipids, Lipolysis, autooxidation and thermal decomposition of lipids, Effect of processing, cooking and storage environment on proteins, Pigments, Food flavours, Food Enzymes, Food additives, Introduction to Food Analysis, Sampling techniques used in food analysis, Chemical analytical methods for carbohydrates, Lipids and Proteins in food, Instrumental analytical methods; Colourimetry, Chromatography, Spectroscopy, Spectrophotometry, Flame photometry, Refractometry and Polarimetry, Enzymatic methods used in food analysis, Interpretation and presentation of analytical results, Analysis of additives and contaminants in foods.

FS 4103 Food Process Engineering (1:15T+00P)

Physical characteristics of food materials, Units and dimensions, Material and energy balance, Fluid flow, Heat transfer, Water activity, Size reduction, Mechanical separations, Heat Processing Techniques, Psychrometry, Evaporation and concentration, Extrusion cooking, Microwave technology, Refrigeration and freezing systems, Food dehydration and drying equipments, Modified Atmosphere (MA) and Controlled Atmosphere (CA) Storage Techniques.

FS 4104 Human Nutrition (1:15T+00P)

Functions of food, Dietary requirements, Absorption, digestion, transport and excretion of nutrients, Protein homeostasis, Energy balance and weight control, Nutrition during pregnancy and lactation, Nutrition from infancy to adolescence, Nutrition and ageing, Nutritional deficiency disorders, Eating disorders, Other disorders with a nutritional component, Nutrition health and national development.

6.6.2 Elective Courses

FS 3102 Food Biotechnology (2:30T+00P)

Introduction to food biotechnology, Brewing and fermentation of foods and beverages, Enzymatic and microbial production of sweeteners, Flavors and colors, Food proteins and proteases, Lipases, Emulsifiers, Stabilizer and flavors, Enzyme infusion technology, Application of molecular biological methods, To improve quality of foods, Biotechnological methods in food analysis and quality control, Consumer knowledge and concern on biotechnology products, molecular farming.

FS 4105 Cereal Chemistry and Bakery Product Technology (2: 30T+00P)

Introduction, Role of raw materials in bakery industry, Quality control of raw materials for bakery products, Bread, Buns, Cakes and Pastry manufacturing processes, Maintenance of GMP in a bakery, Problems associated with bakery products.

FS 4106 Sanitation and Food Quality Control (1:15T+00P)

Introduction to sanitation and quality control, Good manufacturing practices (GMP), Hygienic design principles of food plants, Cleaning compounds and sanitizers used in food plants, CIP and COP cleaning techniques, Application of HACCP systems in the food industry, ISO quality management systems in food industry.

6.7 Dept of Agric. Biology

6.7.1 Compulsory Courses

BL 1101 Introductory Crop Botany and Weed Science (2: 15T+30P)

Plant Systematics/ Taxonomy (Plant classification, How to draw floral diagram and how to write floral formula, How to write a key, Use of Plants by humans, Plant description, Modifications of plant parts, Categories of inflorescence), Economic Botany (Economic plant communities, The economical and sustainable management for the environment for the production of plants to enhance human life), Botany/Morphology and special characters of Agricultural Plants, Common Weeds, Ornamental value of tropical plants, Crops with Miscellaneous Uses.

BL 1201 Fundamentals of Plant Physiology (2: 15T+30P)

Fundamentals of plant physiology (photosynthesis, respiration, transpiration, nutrition, translocation and development) will be emphasized.

BL 1202 Entomology (2: 15T+30P)

Introduction to insects (Place of insects in the living world, characteristic features of arthropods and insects, Different orders of insects and their ecological significance (27 orders)), Biology of insects, Anatomy, Physiology and development of insects and behavior (Basic features of the common insect orders, Behavior and ecology of major insect orders) , Practical entomology (Classification, nomenclature, identification, collection, preservation etc.).

BL 2101 Fundamentals of Genetics and Plant Breeding (2:30T+00P)

Development and scope of Plant Genetics, Fundamentals of Plant Genetics (Mendel's laws of inheritance, Gene interactions, Chromosome theory of inheritance, Chromosomal aberrations, Linkage), Principles of Plant Breeding (Historical perspective and importance of plant breeding, Evolution of cultivated crops, Objectives of plant breeding, Plant Introduction and domestication, Reproductive systems in crops, Plant breeding methods based on crop reproductive systems) .

BL 2102 Introductory Plant Pathology (2: 30T+00P)

Overview of science of plant pathology, Plant Disease, Major groups of plant pathogens, Principles of disease development, Plant disease epidemics, Principles of management of plant diseases.

BL 2201 Introductory Molecular Biology and biotechnology (2:30T+00P)

Molecular nature of the gene, DNA structure and organization, DNA function, Mechanisms of microbial genetic exchange, Introduction to molecular biology based biotechnology.

BL 3101 Pest and Disease Management (2:15T+30P)

Introduction to crop protection (concepts of crop protection, IPM, IPVM, Ecosystem based crop protections, tools and methods of crop protections), Plant diseases of agricultural importance, Pests of agricultural importance, Weeds of agricultural importance, Chemicals in plant protection.

BL 3201 Crop Protection and Improvements (2:00T+60P)

Practical aspects of pest, Disease and weed management; Preventive methods, monitoring systems, Intervention methods for pest and disease management Identification of common pests and diseases and weed flora, Physiological disorders of crops, Crop breeding programme.

BL 4101 Applications of Genetics, Molecular Biology and Physiology (3:30T+30P)

Mendelian Genetics, Population genetics, Genetic basis of selection, Quantitative genetics, Genomic and cDNA libraries, Molecular tools in analysis of crop genetic variation, Transgenic plant production and their applications, Developmental Physiological processes and their applications (Flowering and its applications, principles related to production by crop canopies, solutions to problems of crop yield and quality, Dormancy and seed physiology, physiology of plant movements), Stress physiology (emphasis on salinity and drought), Stomatal physiology under adverse environment.

BL 4102 Applications of Pest and Disease Management (2:15T+30P)

The biological basis of agricultural biology, Crop production and protection, and ecosystem management, Abundance, Diversity and distribution of invertebrates, Non-insect arthropods, Insects in agro-ecosystems; Functional relationships among different groups (Including mollusca, oligochaeta), Functional relationships of spiders (araneae), Mites (acari), Isopoda, Earthworms, and Other important phyla in agricultural ecosystems, Biology, Importance and Management of, Termites, Wasps, Ants and Bees, Indicators of sustainability; Diversity of natural systems, Conservation areas, Molecular biological applications and Genetic engineering in plant protection, Industrial plant pathology and entomology, Forensic Plant Pathology and forensic entomology. Use of bio control agents and other techniques in modern agriculture, Modern techniques in identification and diagnosis of plant pathogens and pests, Computer modeling and pests and disease forecasting, Use of modern telecommunications in pests, Diseases and weeds diagnosis.

BL 4103 Advances in Plant Improvement (1:15T+00P)/BL 4104 Advances in Plant Protection (1:15T+00P)

Course content will be decided on the research area selected by the student.

6.7.2 Elective courses

BL 3102 Practical Plant Protection (1:00T+ 30P)

Practical concepts of plant pathology, Pesticide application technologies; calibration and maintenance of spray equipments, Pesticide evaluation technologies and protocols, Evaluation of pest and disease damage in the field; Sampling, Identification and risk Assessment *etc.*

BL 4105 Indigenous Knowledge System in Agriculture (2:30T+00P)

Indigenous knowledge in irrigation, Pest and disease control, Farming systems, Farm machinery, Post harvest technology.

6.8. Common Courses

CC 1101 Basic Statistics and Mathematics (2:30T+00P)

Equations of straight lines, Circle and parabola, Counting techniques, Common mathematical series, Set theory, Derivatives of functions and differentiation, Integration, Application of differentiation and integration in agriculture.

CC 1102 Computer Awareness (0: 15T+30P)

Introduction to Computer Systems, Concepts and Applications of Operating Systems, Introduction to Word Processing Applications, Introduction to Spreadsheet Applications, Introduction to Presentation Applications.

CC 2101 Information and Communication Technology (2:15T+30P)

Computer Maintenance, Introduction to Computer Hardware, Introduction to Network, Applications, Word Processing Applications in Advance, Spreadsheet Applications in Advance, Presentation Applications in Advance, Introduction to Database Management Applications, Internet & Emails.

CC 3101 Database Management Systems (2:15T+30P)

Introduction to Database Systems, Databases and Database Users, Database System Concepts and Architecture, Data Modeling Using the Entity-Relationship (ER) Model, The Relational Data Model and Relational Database Constraints, Relational Database Design by ER to Relational Mapping, Introduction to Structured Query Language (Oracle/My SQL).

CC 2101 Applied Statistics I (2:30T+00P)

CC 4101 Applied Statistics II (3:30T+30P)

Experimental designs (Complete randomized designs, Randomized complete block designs, Latin square designs, Split plot designs, Incomplete block designs, Confounding designs, Fractional factorial design) Mean separation methods, Data transformation methods, Covariance techniques, Multiple regression analysis and introduction to non- linear regression, Introduction to time series analysis.

CC 4102 Technical Writing and Presentation Skills (2:20T+10P)

Planning research, elements of research, Writing materials and methods and references, Preparation of tables and figures, Grammar and editing.

CC 4103 Rapid Application Development (2:15T+30P)

Introduction to programming languages, Concepts of RAD, Visual Basic – Foundation Level, Develop reusable modules, Database handling using Visual Basic.

CC 4104 Bioethics (2:30T+00P)

History and philosophy of science; Bioethics and the ethics of science and technology, Making choices, Autonomy, justice, beneficence and non-maleficence, Diversity and bioethics, Ethics in history love of life, Moral agents, Environmental ethics, Ecology and life, Biodiversity and extension, Ecological ethics, Sustainable development, Energy crisis and resources and management, The earth centre initiative, Ethics of genetic engineering, Genetically modified food, Genetic privacy and information, The human genome project, Human gene therapy, Universal Declaration on Human Genome and Human Rights, International Declaration on Human Genetic Data, Ethical aspects of research involving human subjects, Ethics in animal subjects, History and evolution of animal experiments, Uses of animals in research, Arguments for and against animal experiments, three R concept, Animal pain, Welfare of animals in experiments, Research ethic issues, Authorship, Plagiarism, Peer review, Conflicts of interest, Data management, Research misconduct, IPR.

CC 4105 Career Guidance and Development (2:15T+30P)

Career literature (concept, techniques, tools and processes) , Linking theoretical and empirical research with practical lifelong skill development, Self assessment, Working styles, Interest, Personality, Career pathways and communication, Identification and assessment of factors related to career decision making, Including needs values, Interests, Aptitudes, Strengths, and Goals, Changing workplace and skill needed to be successful, Participation in workshops and presentations, Use of appropriate recourses for career information research and decision- making.

CC 4106 Non-parametric Statistical Methods (2:30T+00P)

Importance of non- parametric statistical tools, Different types of measurements, Ranking scores, Rank and permutation tests of one, Two and k samples, Application of non parametric tests in different scenarios.

7. Elective courses

Elective courses will be offered in the third year first semester and final year first semester only. The minimum number of elective credits a student shall follow to qualify for award of the degree is 06.

Elective courses offered in each semester will be announced at the beginning of the semester. To offer an elective course a minimum of five students should be registered for the course. Students can select elective courses within first two weeks of the semester. Elective courses can be

changed (deleted or added) within the first four weeks of the semester with the permission of the respective coordinators of the course.

First year students are not allowed to follow elective courses. From the second year onwards students may select optional courses within the prescribed limits of number of credits per semester after consultation with the academic staff.

8. Examinations and evaluations

8.1 Evaluation procedure

Courses shall be evaluated on the basis of different components as tabulated below. Limits of marks for each component are given in the Table 8.1.

Table 8.1 Contribution of each component to the final grade

| Component | Marks |
|--|--------------|
| End Semester Examination | 50 % - 80 % |
| Mid Semester Examinations | 00 % - 25 % |
| Practical / field Work / field books etc | 00 % - 40 % |
| Assignments / Seminars | 00 % - 25 % |
| Oral Examinations (End Semester) | 00 % - 10 % |

End semester examination is compulsory for each course and should be conducted according to a common prescribed timetable. Mid semester examinations, if any, also should be conducted within the prescribed period. In addition to the end semester examination, evaluation of each course shall contain at least one other component. Student should obtain a minimum of 40 % for each component in end semester examination to pass the examinations.

The final year research project shall be evaluated on the basis of proposal presentation, supervisors' evaluation reports, final presentation, draft final report and the submission of bounded copy of the report. Limits of the marks for each component are given in the Table 8.2.

Table 8.2 Evaluation of the final year research project

| Component | Marks |
|---|--------------|
| Proposal presentation | 10 % - 15 % |
| Supervisors' evaluation reports, Laboratory/field evaluation etc. | 25 % - 40 % |
| Final presentation / Oral examination | 20 % - 30 % |
| Evaluation of draft report | 20 % - 30 % |
| Quality of the final bounded copy | 10 % |
| Total | 100 % |

The results of the research project will be finalized after completion of all the components.

8.3 Grade and Grade Point Average for courses

Grades and Grade points shall be assigned for each course according to the overall marks obtained for all components for the course.

Table 8.3.1 Grades and Grade points for overall marks

| Marks (%) (Out of 100) | Grade | Grade Points | Remarks |
|------------------------|-------|--------------|------------------|
| ≥85 | A+ | 4.0 | Distinction |
| 80 – 84 | A | 4.0 | Excellent |
| 75 – 79 | A- | 3.7 | Very good |
| 70 – 74 | B+ | 3.3 | Good |
| 65 – 69 | B | 3.0 | |
| 60 – 64 | B- | 2.7 | |
| 55 – 59 | C+ | 2.3 | Satisfactory |
| 50 – 54 | C | 2.0 | |
| 45 – 49 | C- | 1.7 | |
| 40 – 44 | D | 1.3 | Conditional pass |
| 40> | F | 0 | Fail |

8.4 Calculation of Semester Grade Point Average (SGPA)

Semester Grade Point Average (SGPA) is calculated using following formula and students will have a grade based on their performance for the semester (SGPA).

$$SGPA = \sum C_i G_i / \sum C_i$$

Where C_i is the number of credits for i^{th} course

G_i is the grade point obtained for the i^{th} course

Table 8.4.1 Semester Grade Point Average (SGPA) and award of grades

| SGPA | Grade |
|-------------------------|--|
| $SGPA \geq 3.70$ | First class |
| $3.30 \leq SGPA < 3.70$ | Second class upper division |
| $2.70 \leq SGPA < 3.30$ | Second class lower division |
| $2.00 \leq SGPA < 2.70$ | Pass |
| $SGPA < 2.00$ | Scholastic probation if the OGPA is less than 2.00 |

8.5 Calculation of Overall Grade Point Average (OGPA)

The Overall Grade Point Average (OGPA) will be calculated at the end of each semester using the formula;

$$OGPA = \sum C_{ij} G_i / \sum C_{ij}$$

Where, C_i is the number of credits for the i^{th} course in the j^{th} semester.

G_i is the grade point obtained for the i^{th} course.

The student should maintain the Overall Grade Point Average (OGPA) at the level of 2.0 or above. The student should repeat the courses with less than D grade at the next earliest opportunity and the student can obtain a maximum of C grade. If the student has obtained C- or D grades for a course he/she has alternatives either to repeat the course or to keep the grade as it is if he/she can maintain the minimum OGPA requirement. Students who have OGPA of less than 2.0 will come under Scholastic Probation until the OGPA is raised to 2.00 by repeating failed courses and/or doing more elective courses.

For non credit compulsory courses, students should obtain a minimum of C- grade to pass the course. Students who fail to achieve a minimum of C- grade for a non-credit compulsory course should repeat the examinations at the next earliest opportunity.

Students who failed to sit for the end semester examination but have fulfilled all other requirements and also have obtained concessionary approval from the faculty board can sit for the final examination at the next earliest opportunity and can obtain a maximum of A- grade. The students who got failed marks for final examination and successfully completed all other requirements can obtain a maximum of C grade at the next attempt.

9. Scheme for awarding BSc Agricultural Resource Management & Technology degree

Subject to appropriate by-laws, a candidate who has completed all the requirements of the BSc Agricultural Resource Management & Technology degree and fulfilled the proficiency requirements (minimum of level I of the proficiency in English conducted by the University of Ruhuna) in English may be awarded First Class Honours, Second Class Honours (Upper or Lower Division) or a Pass.

To award the degree the student should complete all the compulsory courses including specialization research/training project and also shall complete a minimum of 120 course credits. To obtain a degree with a class, the student should complete the credit requirement within a period of four years unless special approvals have been obtained from the Senate.

Table 9.1 Overall Grade point average and award of classes

| OGPA | Results |
|-------------------------|--|
| $OGPA \geq 3.70$ | First class honors |
| $3.30 \leq OGPA < 3.70$ | Second class upper division honors |
| $2.70 \leq OGPA < 3.30$ | Second class lower division honors |
| $2.00 \leq OGPA < 2.70$ | Pass |
| $1.70 \leq OGPA < 2.00$ | Certificate of participation (If the student has completed all the requirements of the degree program including 130 course credits within the stipulated period of time, on recommendation of the Faculty Board and the Senate will consider to offer a Certificate for completion of the study program) |

10. Final year specialization programme

Students can apply for the field of specialization at the end of 3-2 semester based on their performance and preference. Only those students who have OGPA of more than 2.7 by the end of 3-1 semester will be given the specialization field at the end of the sixth semester based on their preference. Other students will be allocated by the Faculty Board among the departments based on the student's performances, their preference and resources available in the departments for the specialization programme. In the 4-1 semester (Seventh semester) students should study specialization modules of the respective department, all the compulsory common courses and optional courses as directed by the respective Heads of the department subjected to maximum credit limits per semester. The length of the seventh semester has been reduced to 12 weeks in order to facilitate the Depts to send students for the Industrial Training.

In the eighth semester student should undertake a research/training project as directed by the supervisor and the respective Head of the department. After completion of the project the student shall submit a letter from the project supervisor indicating that the project report is ready to be evaluated at the examination along with a completed draft project report to the Head of the department of study at least a week before the final examination. Such candidate shall have a minimum of 45% marks obtained for the conduct of project report and preparation of the project report prior to appearing for the examination. Failure to fulfill above requirements shall disqualify a candidate from sitting the examination.

In the event of project supervisor being not available to evaluate the project report, the Head of the department or a person designated by supervisor and/or Head of the department shall evaluate the project report.

11. Industrial Training

All the students will be sent to selected outside public or private intuitions for a 8-week Industrial Training immediately before commencement of the final year research project. This component will not contribute to the total credit requirement of the degree. However, all the students shall obtain a satisfactory "S" grade for this component. This component will be evaluated on the basis of attendance, supervisors' report and final report submitted by the student. The Depts may opt to combine the Industrial Training and the research project and send the students to outside institutions if the case permits.