

Draft Lesson Plans of Specialization Programmes  
(Department of Agricultural Engineering and Soil Science)

B.Sc. Hons. Agriculture  
Faculty of Agriculture  
Rajarata University of Sri Lanka

Course name: **Agricultural Engineering Systems Design and Construction**

Course code: **ES 3201 (2/25:10:65)**

Course aim:

This course aims to develop a critical understanding of the practical and theoretical aspects of designing and constructing agricultural engineering systems.

Course capsule:

Concepts of agricultural engineering systems designing; Strength of materials; Equilibrium of a rigid body; Analyses of trusses and beams; Evaluation of engineering structures; Fundamentals of planning farm buildings; Concrete structures; Wood preservation techniques; Road construction and fencing; Greenhouse construction

Course ILOs:

On successful completion of the course, the student will be able to

1. describe the concepts of agricultural engineering systems designing.
2. select the appropriate materials for engineering structures.
3. analyze the engineering structures with their application.
4. design farm buildings and other farm structures.

Course name: **Climate Change and Environmental Sustainability**

Course code: **ES 3202 (2/25:10:65)**

Course aim:

This course enables students to comprehend causes and impacts of climate change and adaptations & mitigation potentials for achieving environmental sustainability.

Course capsule:

Climate and climate system; Greenhouse effect and global warming; Climate change and climate variability; Causes and evidences of climate change; Observed changes of climate system; Impact of climate change on water resources, crops, livestock, fisheries and biodiversity; International organizations and treaties on climate change mitigation and adaptation; Vulnerability assessment; Climate change adaptation & mitigation strategies; Climate modelling: GCM and scenarios;

Course ILOs:

On successful completion of this course, the student will be able to

1. explain the concept of climate change and the causes.
2. describe the impacts of climate change on agriculture and its management.
3. assess the vulnerability of agro-ecosystems for changing climate.
4. propose appropriate climate change adaptation & mitigation strategies for sustainable agro-ecosystems.
5. recognize the future projections of climate change.

Course name: **Computer programming & Engineering Graphics Design**

Course code: **ES 3203 (2/00:60:40)**

Course aim:

This course will enable the students to use computer programming languages and computer aided drawing software to enabling the ICT applications in agricultural engineering.

Course capsule:

Fundamentals of Computer programming; Structure of a computer language application; Steps of developing applications; Introduction to CAD software (AutoCAD/Solid work); 2D drawing with CAD; Development drawings; 3D modelling; Drawing printing.

Course ILOs:

On successful completion of the course, the student will be able to;

1. create programs & applications using high-level, object-oriented programming languages.
2. design and develop databases to retrieve, store, and manage information using a text-based tools.
3. integrate ICT applications with agricultural processes.
4. make complete technical drawings with a CAD software.
5. create development drawings for complex 3D objects.

Course name: **Food Process Engineering**

Course code: **ES 3204 (2/25:10:65)**

Course aim:

This course will enable the students to design food processing methodologies under wide range of factors by understanding current problems and to provide potential solutions.

Course capsule:

Engineering properties of agricultural materials: physical, thermal, aero- & hydro-dynamic, electrical properties, rheology; Unit Operations: mechanical transport, mechanical processing, mechanical separation; Heat transfer: methods, heat exchangers; Material and energy balances; Dehydration: drying theory, drying curves, novel drying methods; Packaging of food; Control of food processes: process parameters, control systems; Handling of processing equipment

Course ILOs:

On successful completion of the course, the student will be able to

1. explain the engineering concepts and unit operations in food processing methodologies.
2. measure engineering properties of agricultural products.
3. compare different food processing control systems.
4. analyze material & energy balance in a food processing system.
5. evaluate optimum conditions for unit operations in food processing.

Course name: **Innovation and Product Development**

Course code: **ES 3205 (2/15:30:55)**

Course aim:

This course will enable the students to understand and apply designing concepts for inventions, innovations, and product development using novel technologies while enhancing manufacturing and process engineering skills.

Course capsule:

Designing process: need assessment, problem identification, information gathering, concept generation, concept selection, communication of the design, detailed design and analysis, prototype development, manufacturing, life cycle assessment; Testing; Safety and product liability; Ergonomics; Intellectual property & patent; Workshop management; Engineering workshop tools and equipment; Workshop practices: cutting, drilling, shaping, metal work, fastening methods, lathe operations; Operation and maintenance of workshop machineries & equipment; Workshop safety; Combined project work

Course ILOs:

On successful completion of the course, the student will be able to

1. explain the concepts of mechanical engineering design.
2. draw a suitable engineering design for a concept identified.
3. demonstrate the safety and safe working practices in an engineering workshop environment.
4. use the workshop tools and equipment for fabrication of a given object
5. create an invention or innovation for product development using novel technology.

Course name: **Integrated management of water resources in Sri Lanka**

Course code: **ES 3206 (2/25:10:65)**

Course aim:

This course will enable the students to comprehend principles and applications of integrated water resources management for ensuring sustainable use of water resources of Sri Lanka.

Course capsule:

Concept and principles of integrated water resources management (IWRM); Development of water resources; Tank cascade systems and their management; Multipurpose water resources development schemes; Groundwater resources, Water quality and pollutant types; Impact of anthropogenic aspects on water pollution and management; Legal enactments of water resources management; Gender perspective in water management

Course ILOs:

On successful completion of the course, the student will be able to

1. explain the concepts and principles of IWRM.
2. review the water resources of Sri Lanka and their present status.
3. discuss the anthropogenic aspects on water pollution and their management through IWRM.
4. evaluate the legal aspects for water resources management.

Course name: **Irrigation Engineering**

Course code: **ES 3207 (2/15:30:55)**

Course aim:

This course will enable the students to design and evaluate irrigation and drainage systems for maximizing yield and water use efficiency.

Course capsule:

Surface and subsurface irrigation methods: design, hydraulics, and evaluation; Water flow on open channels; Water measurement and control structures; Pressurized irrigation systems: components, hydraulics, scheduling, evaluation, system maintenance, and troubleshooting; Chemigation; ICT applications in irrigation and water management; Groundwater exploration and well hydraulics

Course ILOs:

On successful completion of the course, the student will be able to

1. design surface, subsurface, and pressurized irrigation systems for cultivated crops.
2. evaluate water use efficiencies of different irrigation systems.
3. propose solutions for drainage problems in agricultural landscapes.
4. discuss groundwater exploration method for sustainable water management.
5. integrate ICT application concepts in agricultural water management.



Course name: **Mechatronics and Precision Agriculture**

Course code: **ES3208 (2/25:10:65)**

Course aim:

This course will enable the students to comprehend and apply concepts of mechatronics in precision agriculture.

Course capsule:

Fundamentals of mechatronics; Basic elements and components; Sensors , transducers and actuators; Applications of microprocessor based mechatronics projects; Fundamentals of precision agriculture; Applications of GPS and GIS in precision agriculture; Applications of different sensor technologies for collecting data; Grid point sampling; Yield Monitoring systems; Variable Rate Technologies (VRTs) in precision agriculture; Site specific management strategies used in precision agriculture; Mapping of land and crop information using GIS and GPS techniques

Course ILOs:

On successful completion of the course, the student will be able to

1. explain the applications of mechatronic engineering in smart agriculture.
2. define the applications of sensors and site-specific management strategies in precision agriculture.
3. develop mechatronic applications using microprocessor -based control units.
4. apply the principles of precision agriculture on monitoring and managing the spatial and temporal variability in soil, crops and livestock.

Course name: **Remote Sensing and GIS**

Course code: **ES 3209 (2/15:30:55)**

Course aim:

This course enables students to use the software and tools of GIT for efficient information management in agriculture and environment.

Course capsule:

Introduction to Geographic Information Technology (GIT); Fundamentals of Geographic Information System (GIS); Components of GIS; Applications and benefits of GIS; Data models; Basics of cartography; Coordinate systems; Fundamentals of Global Navigation Satellite System (GNSS); Applications of Global Position System (GPS); Fundamentals of Remote Sensing (RS) and its applications; Electromagnetic radiations; Energy interactions; Remote sensing platforms; Characteristics of satellites; Satellite systems; Concepts of spatial, spectral, radiometric and temporal resolutions; Interpreting optical RS images; Emerging trends in geographical technology

Course ILOs:

On successful completion of the course, the student will be able to

1. discuss the components and fundamentals of GPS, GIS, and RS.
2. use GIS and RS in agricultural and environmental resource management.
3. apply methods of data acquisition & analysis in GIS and RS for agricultural development and environmental management.
4. develop maps using precise data for effective interpretations.
5. employ GIS and RS techniques for effective decision making in sustainable management.

Course name: **Renewable Energy Technology and Management**

Course code: **ES 3210 (2/25:10:65)**

Course aim:

This course will enable the students to comprehend the applications of energy production and efficient management techniques in relation to agricultural operations.

Course capsule:

Basic principles and definitions; Different types of direct and indirect energy sources; Importance of renewable energy; Solar power: solar cells, solar dryers; Mini hydro power plants establishment; Wind power: uses, wind mills; Biogas: biogas plants, construction details; Biofuels: biodiesel and bioethanol, bioenergy from biomasses; Other renewable energy; Steam generation; Ocean thermal energy conversion; Calculation on energy conservation; Geo-thermal energy; Combustion of fuel and gasification; Energy losses; Environmental impacts of energy production and use

Course ILOs:

On successful completion of the course, the student will be able to

1. discuss the principles of generation and applications of renewable and non-renewable energy.
2. design mini hydro, wind and solar power generation plants.
3. develop a working package on design, maintenance and management of biogas generation.
4. discuss issues of power generation and management.
5. apply solutions for negative environmental impacts of energy technologies.

Course name: **Management of Degraded Lands**

Course code: **ES 3211 (2/20:20:60)**

Course aim:

This course will enable the students to comprehend the concepts of land degradation and apply sustainable environmental and socio-economic restoration techniques for degraded landscapes.

Course capsule:

Land degradation: causes, traditional, and emerging types; Present status of land degradation in Sri Lanka; Impacts of land degradation on soil environment; Field assessment of degraded lands: physical, chemical and biological characteristics; Soil biodiversity changes in degraded lands; Socio-economic aspects related to land degradation; Effect of land degradation on rural livelihood; Land rehabilitation and restoration; Multidisciplinary approaches in degraded land management; Geospatial technologies for land degradation assessment and management

Course ILOs:

On successful completion of the course, the student will be able to

1. discuss the current status of land degradation in Sri Lanka.
2. describe the main causes and effects of land degradation.
3. assess the natural and anthropogenic land degradation processes in a given degraded land allotment.
4. recommend appropriate management practices to restore the degraded lands.

Course name: **Rice Soil Management**

Course code: **ES 3212 (2/25:10:65)**

Course aim:

This course will enable the students to comprehend the physical, chemical and biological characteristics of rice growing soils for managing towards optimizing productivity and sustainability.

Course capsule:

Hydromorphic soils; Morphology of submerged soils; Physical and chemical characteristics of submerged soils; Microbiology under submergence; Nutrient transformation and availability under submerged conditions; Problems of submerged soils; Different rice growing soils in Sri Lanka; Aerobic rice farming; Sustainable management of rice soils; Amelioration of problem soils; Recent advances in rice soil management

Course ILOs:

On successful completion of the course, the student will be able to

1. explain the morphological characteristics of submerged soils.
2. describe chemical, physical, and biological characteristics of rice soils.
3. discuss major nutrient dynamics in soils of different rice growing environments
4. propose amelioration measures to overcome problems in rice soils.
5. develop skills of identifying soil related problems in rice for proposing best management strategies.

Course name: **Soil and Ecosystems**

Course code: **ES 3213 (2/25:10:65)**

Course aim:

This course will enable the students to comprehend and apply the knowledge on soil dynamics in ecosystems management and environmental sustainability.

Course capsule:

Types of ecosystems; The role of soil in ecosystems; Interactions of soil and ecosystem components; Dynamic nature of bio-geochemical cycles; Soil contaminants; Wetland ecosystems; Nutrient accumulation in aquatic ecosystems; Anthropogenic activities on ecosystem sustainability; Healthy management of ecosystem; Legal enactment of soil and ecosystem management.

Course ILOs:

On successful completion of the course, the student will be able to

1. recognize the role of soil as a main component of an ecosystem.
2. discuss major functions of terrestrial and aquatic ecosystems.
3. explain the dynamics of key elements of soil and relationships of ecological balance.
4. relate impact of anthropogenic activities on soils and ecosystem sustainability.
5. propose remedial measures for soil pollution in different ecosystems.

Course name: **Soil Microbiology**

Course code: **ES 3214 (2/20:20:60)**

Course aim:

This course will enable the students to study the characteristics of soil micro-biota and apply synergistic microbiological relationships for enhancing the soil fertility.

Course capsule:

Microbial environment of soil; Diversity distribution of soil microorganisms; Microbial biomass; Soil-microbial interaction; Mycorrhizae; Influence of microbes for root-rhizosphere signaling: rhizosphere effect, root exudates; Plant growth promoting substances (PGPS); Biodegradation of organic & inorganic substances; Roles of soil microbes on nutrient cycles: microbiology of nitrogen (N<sub>2</sub>) cycle, microbial transformation of phosphorous (P), sulphur (S), iron (Fe), manganese (Mn), zinc (Zn) and copper (Cu); Eco-friendly microbial fertilizers: biofertilizers, biopesticides, biofilmed biofertilizers.

Course ILOs:

On successful completion of the course, the student will be able to

1. identify the microbial diversity and their interactions in a soil environment.
2. determine the importance of microbial biomass and transformations for fertility management in agricultural soils.
3. assess the roles of microbes on rhizospheric relationships of crops.
4. discuss the potential use of eco-friendly microbial fertilizers for sustainable agriculture.
5. develop isolations of microbes with an orientation of producing a biofertilizer.

Course name: **Soil Survey and Classification**

Course code: **ES 3215 (2/20:20:60)**

Course aim:

This course will enable the students to comprehend the features of major soil groups in the world and to study the theoretical and practical aspects of conventional and modern soil survey and classification techniques.

Course capsule:

Historical development and basic concepts of soil survey and classification; Soil survey procedure; Applications of modern geospatial technologies in soil survey and classification; Satellite and proximally sensed data for soil mapping; Detailed soil profile description; Soil Classification: USDA, FAO and Regional, Soil orders in USDA soil taxonomy: Histosols, Alfisols, Inceptisols, Entisols, Ultisols, Oxisols, Alfisols, Vertisols, Andisols, Aridisols, Gelisols, Spodosols and Mollisols

Course ILOs:

On successful completion of the course, the student will be able to

1. describe the process of a systematic soil survey.
2. develop a digital soil classification map for a given land allotment.
3. explain the properties of the soil orders in USDA soil taxonomy.
4. plan an appropriate soil survey approach for a targeted land allotment.
5. interpret the properties and behaviours of an unknown soil in the field.



Course name: **Soils of Sri Lanka**

Course code: **ES 3216 (2/20:20:60)**

Course aim:

This course will enable the students to comprehend the knowledge on the diversity of soils of Sri Lanka while developing hands on skills for sustainable management of major soil groups.

Course capsule:

Historical background and present status of soil studies in Sri Lanka; Physiography and geology of Sri Lanka; Classification of soils of Sri Lanka: World Reference Base (WRB), United State Department of Agriculture (USDA), great soil groups and soil series; Soil diversity of Sri Lanka: wet zone, intermediate zone and dry zone; Behaviour, potentials and limitations of Sri Lankan soils; Sustainable management of Sri Lankan soils.

Course ILOs:

On successful completion of the course, the student will be able to

1. describe geology and physiography of Sri Lanka.
2. distinguish major soil types of Sri Lanka.
3. explain the factors governing soil diversity of Sri Lanka.
4. interpret soil maps and fact sheets of a soil series.
5. recommend the appropriate soil management practices for Sri Lankan soils.

Course name: **Sustainable Land Use Planning for Agriculture**

Course code: **ES 3217 (2/20:20:60)**

Course aim:

This course will enable the students to comprehend the theoretical aspects of land use planning and practice approaches for developing sustainable land use plan for an agricultural land.

Course capsule:

Basic concepts of land use planning in national and international perspectives; Important land qualities and related characteristics in agriculture; Factors considered in farm site selection; Applications of geospatial technology in land use planning; Methods for agricultural land evaluation: land suitability classification and land capability classification; Sustainable Land Management (SLM): concepts, practices and evaluation; Sustainable land use systems in Sri Lanka

Course ILOs:

On successful completion of the course, the student will be able to

1. Explain the concepts of agricultural land use planning.
2. Assess land resources and the suitability of a land allotment for a specified agricultural purpose.
3. Develop a land use map for a given land allotment.
4. Propose the best land use option for an agricultural land.

Course name: **Sustainable Soil Management in Agriculture**

Course code: **ES 3218 (2/20:20:60)**

Course aim:

This course will enable the students to comprehend major soil related problems and sustainable reclamation measures, while acquiring analytical skills in soil evaluation

Course capsule:

Significance of soil management; Characteristics of an ideally managed soil; Major soil constraints on sustainable crop production in Sri Lanka; Distribution and description of problem soils in Sri Lanka; Natural and anthropogenic causes leading to problems; Soil related problems: acidity, alkalinity, salinity, erosion; Impact of agrochemicals on soil environment and crop productivity; Fertilizers and soil degradation; Nutrient enrichment and impoverishment; Strategies for soil fertility improvement; Soil conservation

Course ILOs:

On successful completion of the course, the student will be able to

1. describe the significance of soil management for sustainable crop production.
2. explain the main soil constraints for crop production in Sri Lanka.
3. discuss major soil related problems and soil conservation strategies.
4. propose a reclamation plan for amelioration of degraded soils.
5. acquire analytical skills for problem soil evaluation.

Course name: **Thermodynamics**

Course code: **ES 3219 (2/25:10:65)**

Course aim:

This course will enable the students to acquire knowledge on thermodynamic processes used for energy production and its applications within the natural limits of conversion.

Course capsule:

Zeroth law of thermodynamics; Thermodynamic properties of fluids; Temperature-volume and phase diagrams; Computer-aided software for thermodynamic calculations; Thermodynamics & applications: first and second law; Thermodynamic cycles: power cycles, refrigeration cycles; Psychometrics & applications.

Course ILOs:

On successful completion of the course, the student will be able to

1. explain the thermodynamic equilibrium, different forms of a pure substance, and laws of thermodynamics.
2. discuss thermodynamic laws related to various gas processes and cycles.
3. apply the psychrometric concept in engineering applications.
4. demonstrate the humidifying and dehumidifying processes for cooling and dehydration.
5. use computer-aided software for solving thermodynamic problems.

Course name: **Waste Management**

Course code: **ES 3220 (2/20:20:60)**

Course aim:

This course will enable the students to comprehend solid waste and wastewater management concepts and apply different waste management strategies for ensuring environmental health.

Course capsule:

Waste management concepts: waste generation streams, characterisation of waste; Parameters important in designing and monitoring waste treatment systems; Solid waste: treatment methods, systems; Wastewater treatment: wastewater characteristics, effluent treatment, constructed wetlands; Modern trends in waste management; Legal aspects of waste management.

Course ILOs:

On successful completion of the course, the student will be able to

1. explain the basic principles and concepts of waste management.
2. evaluate different solid waste treatment methods.
3. analyse wastewater samples for environmental impact monitoring.
4. assess different effluent treatment methods and systems.
5. discuss legal enactments for sustainable waste management.

Course name: **Water Quality Assessment and Modelling**

Course code: **ES 3221 (2/15:30:55)**

Course aim:

This course will enable the students to acquire the theoretical knowledge and analytical skills on water quality monitoring, assessment and modelling techniques.

Course capsule:

Water quality: pollutants, parameters, monitoring, control measures; Water quality analysis: methods, instrumentation; Water quality assessment: standards, graphical interpretation, indices; Applications of GIS in water quality assessment; Water quality modelling; Recent advances in water quality assessment.

Course ILOs:

On successful completion of the course, the student will be able to

1. discuss the sources of water pollution and potential control measures.
2. design a water quality monitoring programme for a selected landscape.
3. assess water quality parameters using apropos methods and instruments.
4. propose appropriate tools, criteria, and assessment methods for efficacious water quality evaluation programme.
5. use GIS and modelling applications in water quality assessment.

Course Name: **Watershed Management and Modelling**

Course Code: **ES 3222 (2/25:10:65)**

Course aim:

This course enables the students to acquire the knowledge and skills in assessing, managing and modelling of natural resources for watersheds health.

Course Capsule:

Concept of watershed and watershed management; Watershed characteristics; Delineation of watershed boundaries; Integrated assessment of watershed health; Watershed models and their applications; Soil erosion assessment; Watershed rehabilitation; Soil and water conservation; Pollution prevention in watersheds; Environmental Impact Assessment (EIA); Socio-economic aspects in watershed planning and management

Course ILOs:

On successful completion of this course, students will be able to

1. explain the concepts of watershed, and its management.
2. describe the use of process-based models in watershed assessment and management.
3. discuss the integrated assessment of watershed health.
4. assess the soil erosion in contrasting landscapes of a watershed.
5. propose appropriate methods of soil and water conservation to a given landscape

Course name: **Advanced Agricultural Engineering**

Course code: **ES 4101 (2/25:10:65)**

Course aim:

This course enables the students to apply the theoretical knowledge and practical skills in engineering for resolving agricultural issues and innovate solutions.

Course capsule:

Traction: basic concepts, devices; Testing and evaluation of farm machinery; Machinery management: selection, cost evaluation; Fluid machinery; Planning and designing farm ponds/reservoirs; Reservoirs: classification, headwork, sedimentation; Recent advances in agricultural engineering

Course ILOs:

On successful completion of the course, the student will be able to

1. discuss the concepts of farm machinery management for safe and efficient use.
2. perform the testing and evaluation procedures for farm machinery.
3. employ the planning and design procedures of farm ponds/reservoirs.
4. explain environmental aspects related to design and maintenance of small reservoirs.
5. recognize research and applications of recent advances in agricultural engineering



Course name: **Advanced Analytical Techniques for Environmental Studies**

Course code: **ES 4102 (2/20:20:60)**

Course aim:

This course enables the students to acquire knowledge and develop skills related to advanced analytical techniques to explore practical approaches in environmental studies.

Course capsule:

Sampling techniques for environmental studies; Preparation of soil, plant, water and fertilizer samples; Extraction of nutrients from soil and plant samples; Principles and applications of turbidimetry and potentiometry; Analytical techniques of UV- Visible spectroscopy, Atomic emission spectroscopy and atomic absorption spectroscopy; Elemental analyses of soil, plant, water and fertilizers; Interpretation of analytical data.

Course ILOs:

On successful completion of the course, the student will be able to

1. practice different collecting, preserving, and handling techniques of samples for environmental studies.
2. demonstrate the nutrient extraction procedures for metal and non-metal analyses.
3. describe the advanced spectroscopic techniques used in chemical analyses.
4. perform different spectrometric analysis using high tech instruments.
5. interpret analytical results in environmental studies.

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# Majoring Courses

## Module: Agricultural Economics and Extension

The broader objective of the Agricultural Economics and Extension majoring module is

- to strengthen students' capabilities of identifying and analyzing social, economic and environmental problems in agriculture applying economics, business, and extension knowledge to invent, communicate, and implement effective solutions for stakeholders to stay competitive in the global economy.

### Module ILOs:

On successful completion of Agricultural Economics and Extension module, the students will be able to;

- identify and analyze social, economic, and environmental problems encountered by stakeholders in agriculture.
- apply economics, extension, business, and statistics knowledge to invent and communicate effective solutions for stakeholders to boost their competitiveness sustainably.
- conduct both fundamental and applied research addressing agrarian issues in the sector.

Agricultural Economics and Extension			
Year 3 Semester II			
Course Code	Compulsory Courses	Course Code	Optional Courses
AS 3201	Applied Econometrics	AS 3207	Agricultural Development and Policy
AS 3202	Extension Education	AS 3208	Human Ecology
AS 3203	Food Value Chain Analysis	AS 3209	Human Resource Management
AS 3204	Industrial English	AS 3210	Macroeconomics
AS 3205	Project Management	AS 3211	Natural Resource Economics
AS 3206	Social Research Methodology	AS 3212	Nonparametric and Categorical Data Analysis
		AS 3213	Rural Development and Development Communication

		AS 3214	Rural Sociology
		AS 3215	Time Series Data Analysis
Year 4 Semester I			
AS 4101	English for Scientific Communication		
AS 4102	International Trade and Development		
AS 4103	Statistical Software for Data Analysis		

## Year 3 Semester 2 – Compulsory

Course name: **Applied Econometrics**

Course code: **AS 3201 (2/15:30:55)**

Course aim:

This course aims to develop students' competency in applying econometric techniques in assessing, estimating, and interpreting economic relationships in the agriculture sector.

Course capsule:

Introduction to econometric modelling; hypothesis testing, correlation analysis, Assumptions of linear regression analysis; simple linear regression analysis, multiple linear regression analysis, qualitative response regression analysis. Problems of linear regression; multicollinearity, heteroscedasticity, autocorrelation; Econometric interpretations: regression coefficient, coefficient of determination, odds ratio.

Course ILOs:

On successful completion of the course, the students will be able to

1. explain different steps in econometric modelling.
2. identify violations, problems, and corrective measures in estimating regression models in econometric analysis.
3. apply linear regression models for agri-food industry problems
4. apply qualitative response regression models for behavioural research in agriculture.
5. improve existing knowledge to support agricultural policy

Course name: **Extension Education**

Course code: **AS 3202 (2/25:10:65)**

Course aim:

This course enables the students to understand theories, tools and techniques in extension education in analysing situations and applying to drive behavioural changes in agricultural communities.

Course capsule:

Domains of learning; Phases of learning; Extension learning and teaching process; Adult education; Andragogy vs. Pedagogy; Monitoring and evaluation of extension programmes; Logic model; Agricultural knowledge management system; Urban extension; Information management in value chains; Gender issues in extension; ICT in agricultural extension; Theory of planned behaviour; Transtheoretical model.

Course ILOs:

On successful completion of the course, the student will be able to

1. use extension education principles in teaching and learning process.
2. recognize the role of extension education in agricultural value chain management.
3. discuss gender related issues in agricultural extension.
4. apply the knowledge on urban extension to disseminate information and educate urban communities.
5. analyze different behavioural contexts related to agricultural communities.

Course name: **Food Value Chain Analysis**

Course code: **AS 3203 (2/25:10:65)**

Course aim:

This course enables students to acquire necessary knowledge and skills to understand and analyse agri-food value chains and the distribution of benefits among the actors along the chain.

Course capsule:

Concept of supply chains and value chains; Value and consumer; Value creation process; Dimensions and key elements of value chains; Different types of value chains; perspectives, mapping and analysis. Value chains: upgrading, transformation and governance; Research methods in value chain analysis; Food value chains in Sri Lanka.

Course ILOs:

On successful completion of the course, the student will be able to

1. discuss main concepts of value chain analysis.
2. explain value chain methodology in agri-food sector.
3. analyze value chain performances and competitiveness of actors.
4. evaluate different agri-food value chains for cost effectiveness.
5. design inclusive value chains to foster local agriculture development.

Course name: **Industrial English**

Course code: **AS 3204 (2/15:30:55)**

Course aim:

This course focuses on improving students' English language competencies to sustain effectively in an industrial environment.

Course capsule:

Technical vocabulary; Workplace communication; Writing for work; Reading comprehension; Listening comprehension; Verbal communication skills; Interview skills; Meeting skills

Course ILOs:

On successful completion of this course, the students will be able to

1. choose appropriate vocabulary, grammar, and language structures required for the world of work.
2. develop competencies in presenting themselves confidently at industrial forums.
3. apply effective communication skills in workplace interactions.



Course name: **Project Management**

Course code: **AS 3205 (2/20:20:60)**

Course aim:

This course aims to enable the students to apply the concepts, techniques, and principles of project management, following a standard process and focusing on both holistic and integrative approaches to bring projects to completion.

Course capsule:

Overview and importance of project management; Role of the project manager; Project stakeholders and governance; Project life cycle; Project management process; Project scope, time, cost, quality, human resources, and communications management; Risk, procurement, and stakeholder management; Use of computer programmes for project management.

Course ILOs:

On successful completion of the course, the student will be able to

1. review the historical development of project management as a profession.
2. evaluate the process of project management using standard tools.
3. develop a project schedule applying the 10 key functions of project management.
4. apply computer software and tools for the process of project management.

Course name: **Social Research Methodology**

Course code: **AS 3206 (2/20:20:60)**

Course aim:

This course aims to provide students a comprehensive understanding of each phase of a research process along with the methodological framework to develop and manage social science research projects.

Course capsule:

Introduction; qualitative, quantitative and mixed-methods social science research; Identifying research topics; Formulating research questions and objectives; Literature review; Formulating conceptual framework and hypothesis; Analytical methods for social science research; Use of statistical software; Results interpretation; Bibliography vs. Reference list; Ethics in social research.

Course ILOs:

On successful completion of the course, the student will be able to

1. compare qualitative, quantitative, and mixed-methods research.
2. develop social science research designs applying the basic research concepts.
3. formulate a coherent research proposal for an identified research problem.
4. undertake a research project with minimum supervision.
5. use written or verbal communication methods effectively to communicate research findings to both scientific and general community.

## Year 3 Semester 2 - Optional

Course name: **Agricultural Development and Policy**

Course code: **AS 3207 (2/20:20:60)**

Course aim:

This course enables the students to use development economic principles and formulate policies in upgrading social and economic position of the stakeholders in the agriculture sector.

Course capsule:

Economic development: income and growth, evolution of development thought, development and underdevelopment, structural features; Role of agriculture in development; Theories of economic development; New growth theories; Inequality and development; Role of health, education, and trade on development; Agricultural policies: formulation, implementation and assessment of impacts; Agricultural policies in Sri Lanka; Social and economic wellbeing of farming communities.

Course ILOs:

On successful completion of the course, the students will be able to

1. compare development, underdevelopment, and their characteristics.
2. review different concepts of development.
3. evaluate different theories of economic development.
4. propose agriculture-based development strategies for developing countries.
5. evaluate the impact of national agricultural policies on the development of the sectors and the economy.

Course name: **Human Ecology**

Course code: **AS 3208 (2/25:10:65)**

Course aim:

This course enables the students to understand the interactions between people and their natural & agricultural environment for finding better solutions for the issues in agriculture.

Course capsule:

Ecological perspective of human population; Human interventions in agricultural landscapes; Perceptions of nature; Interaction between social systems and agroecosystems; Cultural aspects in agroecosystem management; Human dimension of major-agroecological issues; Natural resources and food systems; a gendered perspective; Agriculture and human wellbeing; Societal adaptations to environmental stresses; Social transformations for sustainable food systems; Agricultural and environmental ethics; Pro-environmental behaviour; Contemporary issues in human ecology; Human ecology research in agriculture

Course ILOs:

On successful completion of the course, the student will be able to

1. explain behaviour of individuals and communities in response to their natural and agricultural environment.
2. examine the roles of social, cultural, and psychological factors in the maintenance or disruption of ecosystems
3. assess the societal transformations for sustainable coexistence between agriculture and nature
4. propose solutions for the issues in agroecological systems using concepts of human ecology.

Course name: **Human Resource Management**

Course code: **AS 3209 (2/25:10:65)**

Course aim:

This course aims to provide students a systematic and rational understanding of managing human resources for effective management of organizations.

Course capsule:

Human resource management; Human resource planning; Job analysis and job design; Recruitment and selection; Training and development; Employee management: motivation, compensation, appraisal, career planning, diversity, ethics, training; Performance management; Rewards management; Health and safety management; Industrial relations; Industrial labour law

Course ILOs:

On successful completion of this course, the student will be able to

1. explain the nature and scope of human resources and their effective management in organizations.
2. assess the importance of different tools used in forecasting and planning human resource needs.
3. analyze the key issues related to administering the human elements in a given organizational context.
4. formulate effective human resource management strategies to be compatible with a business plan of an organization.
5. propose recommendations for addressing existing human resource related issues in a given organization.

Course name: **Macroeconomics**

Course code: **AS 3210 (2/25:10:65)**

Course aim:

This course aims the students to understand and examine macroeconomic concepts and theories, functioning of the economy, contemporary domestic and international macroeconomic issues, and policies.

Course capsule:

Overview of macroeconomics; Gross Domestic Production (GDP); Economic growth; Unemployment; Inflation; National Income (NI) accounting; Growth theory; Neoclassical models; Aggregate Demand (AD) and Aggregate Supply (AS) model; Money; Exchange rate and interest rate; Goods market and fiscal policy; Money market and monetary policy; IS-LM model; Contemporary macroeconomic issues.

Course ILOs:

On successful completion of the course, the student will be able to

1. explain key relationships between macroeconomic aggregates and current economic observations using theoretical models and tools.
2. discuss contemporary macroeconomic problems and possible solutions in improving current policies and practices.
3. evaluate the effects of fiscal and monetary policies and their impacts on the economy.
4. use macroeconomic data and information in analyzing and interpreting given macroeconomic scenarios.

Course name: **Natural Resource Economics**

Course code: **AS 3211 (2/25:10:65)**

Course aim:

This course aims to develop a critical understanding on classification of natural resources and economic principles relevant to management and their valuation of natural resources.

Course capsule:

Environment and natural resources; Classification of natural resources; Necessary and sufficient conditions for economic efficiency, externalities, property rights; Public goods; Allocation and management of different types of resources; Recycling of resources; Valuation methods: travel cost method, hedonic pricing, contingency valuation; Software applications in natural resource valuation

Course ILOs:

On successful completion of the course, the student should be able to

1. explain the key concepts and principles related to natural resource economics.
2. apply natural resource economic concepts and tools in in resource management.
3. review applicability of alternative instruments and institutions for sustainable management of natural resources.
4. develop a project proposal on valuation and management of natural resources and amenities.

Course name: **Nonparametric and Categorical Data Analysis**

Course code: **AS 3212 (2/15:30:55)**

Course aim:

This course aims to develop broad understanding on nonparametric and categorical data analysis techniques and applying these methods for analysing research data collected from various fields.

Course capsule:

Introduction to parametric and nonparametric statistical procedures; single samples inference based on Wilcoxon signed-rank and sign statistics; inferences based on two sample using the Mann-Whitney test; inference based on k-sample using Kruskal Wallis test and Friedman test; Multiple comparison procedures for nonparametric data; Independence between ordinal variables: Tests based on Kendall's tau and spearman's rho; Nonparametric regression; Simple linear regression and multiple linear regression using the Wilcoxon fit; Inference procedures for single population proportion; Two population proportion; Measures of association between categorical variables using chi-square test, Loglinear models for contingency tables; Loglinear-logit models for ordinal variables; Analysing binary variables using logistic regression; Analysing count data using Poisson regression.

Course ILOs:

On successful completion of the course, the student will be able to

1. choose most relevant nonparametric and categorical data analysis techniques for statistical inference.
2. analyze and the nonparametric and categorical data coming from experiments using appropriate procedures.
3. draw conclusion based on results of data analysis.



Course name: **Rural Development and Development Communication**

Course code: **AS 3213 (2/25:10:65)**

Course aim:

This course enables the students to understand and analyze the methodologies of the rural development and development communication on multi sectorial & territorial strategies and policies at community, national, and international level.

Course capsule:

Overview of rural sector; Rural poverty and demography; Economic growth theories, Planning and implementation of rural development projects; Past and present rural development projects in Sri Lanka; Analysis of rural development programs in the Asian region; Role of communication in development; Participatory communication; Journalism and media use; Communication strategies in agriculture and national development; Planning and implementation of communication programmes for development

Course ILOs:

On successful completion of the course, the student will be able to

1. discuss application of economic growth theories with respective to the rural development context.
2. evaluate the importance of development programmes in addressing rural developmental issues.
3. design communication programmes for addressing problems of agrarian rural communities.
4. assess community development programmes designed for development issues both locally and globally.

Course name: **Rural Sociology**

Course code: **AS 3214 (2/25:10:65)**

Course aim:

This course aims the students to acquaint main sociological streams and their variants and structure of agricultural sociology for dealing with issues of agrarian social structure and social life.

Course capsule:

Sociological perspective; Culture and its implications, Socialization; Social interaction and social structure; Social inequality: class, stratification; Social institutions; Social movements and social change; Sociological aspects of agricultural development; Analysis of agrarian social problems; Designing and management of agrarian settlements; Sociological investigation

Course ILOs:

On successful completion of the course, the student will be able to

1. explain concepts of sociology, interaction, and structure of a rural society
2. interpret current societal events and issues through the applications of theoretical concepts.
3. propose solutions using sociological principles for problems/issues related to rural agriculture, food, and environment.
4. evaluate rural social problems of settlement schemes in the dry zone and their consequences.

Course Name: **Time Series Data Analysis**

Course Code: **AS 3215 (2/15:30:55)**

Course aim:

This course aims to develop broad understanding of the practical and theoretical aspects of time series data analysis enabling to extract information in time series data for decision making

Course Capsule:

Introduction to time series data analysis and forecasting; Smoothing techniques; Time series model building; Time series models: Moving Average (MA) models, Autoregressive models (AR), Autoregressive Integrated Moving Average (ARIMA) models; Seasonal ARIMA models; ARIMA modelling using expert systems; Transfer function models; Intervention analysis and outlier detection; Forecasting with time series models; Causality analysis; Data base handling in time series.

Course ILOs:

On successful completion of the course, the students will be able to

1. explain the fundamental concepts and theories of time series data analysis.
2. demonstrate the skills in utilizing the statistical software packages for time series data analysis.
3. draw conclusion based on results of time series data analysis.
4. predict trends and patterns for forecasting environmental and economic variables.
5. design research studies for selecting appropriate time series models.

## Year 4 Semester 1 – Compulsory

Course name: **English for Scientific Communication**

Course code: **AS 4101 (2/15:30:55)**

Course aim:

This course enables students to develop English language proficiency in communication for both scientific and general audiences.

Course capsule:

Academic writing styles; Formal communication; Reading comprehension: synthesis, skimming, paraphrasing, summarizing academic reports; Listening comprehension; Reviewing literature; Referencing; Research writing: for academic audience and lay audience; Presentation skills; Science communication to lay audience

Course ILOs:

On successful completion of this course, the students will be able to

1. practice English language principles in effective academic writing.
2. formulate effective scientific documentation for undergraduate studies.
3. present scientific information to technical and lay audiences.
4. apply scientific communication competencies for producing deliverable research outputs.

Course name: **International Trade and Development**

Course code: **AS 4102 (2/25:10:65)**

Course aim:

This course aims to develop the knowledge of students on international trade theories, various trade policy options, applications, and analysis of the appropriateness of these policies to achieve national objectives of and development.

Course capsule:

Trade and development linkage; Trade theories; The Ricardian model and the Specific factors model, The Heckscher-Ohlin and the Standard trade models; Gains from trade; Trade barriers; Analysis of tariff in a small open economy; Analysis of tariff in a large economy; Analysis of import and export quotas; Non-tariff barriers; Analysis of Trade policies; Current trade issues; International trade agreements; Introduction to Gravity model of trade.

Course ILOs:

On successful completion of the course, the student will be able to

1. describe the nexus between trade and development.
2. discuss global pattern and direction of international trade.
3. analyze the key concepts of international trade and trade theories.
4. evaluate the distributional and welfare impacts of different types of trade policy instruments.
5. discuss important trade issues facing developed and developing countries.

Course name: **Statistical Software for Data Analysis**

Course code: **AS 4103 (2/15:30:55)**

Course aim:

This course aims to provide students with the knowledge and skills on analyzing research data using statistical software for interpreting and concluding.

Course capsule:

Introduction to statistical software (SAS, MINITAB, R); Summarizing data sets (numerically and graphically); One sample and two sample t-test; Analysis of variance models for single factor and factorial experiments; Analysis of data from unbalanced designs; Regression analysis; Non-parametric data analysis; Categorical data analysis

Course ILOs:

On successful completion of the course, the student will be able to

1. summarize datasets using appropriate numerical and graphical methods.
2. analyze research data using appropriate statistical procedures.
3. interpret outputs and results for drawing valid conclusions.
4. discuss the results of data analysis in scientific communications.

## Module: Agricultural Systems and Management

The broader objective of the Agricultural Systems and Management module is

- to facilitate students with comprehensive learning and training opportunities in diverse areas in agriculture and food systems management enabling them to face the challenges encountered locally and globally.

### Module ILOs:

On successful completion of Agricultural Systems and Management module, the students will be able to;

- identify sustainability issues in agriculture and food systems.
- apply the knowledge and competencies to improve, manage and develop location specific sustainable agricultural and food systems.
- assess demanding and trending research needs to undertake relevant research and studies in agriculture and food systems.
- apply agricultural technologies to address the global challenges in food production systems.

Agricultural Systems and Management			
Year 3 Semester II			
Course Code	Compulsory Courses	Course Code	Optional Courses
AS 3216	Climate Smart Agricultural Systems	AS 3221	Agro-ecotourism
AS 3217	Food Security Assessment	AS 3222	Designing and Analysis of Agricultural Systems
AS 3218	Global Food Systems	AS 3223	Quality Management in Agricultural Systems
AS 3219	Evolution of Technologies in Agricultural Systems	AS 3224	Regenerative Agriculture and Innovations
AS 3220	Sustainable Agriculture	AS 3225	Risk Management in Agricultural Systems
Year 4 Semester 1			
AS 4104	Contemporary Developments in Agricultural Systems		

## Year 3 Semester 2 – Compulsory

Course name: **Climate Smart Agricultural Systems**

Course code: **AS 3216 (2/25:10:65)**

Course aim:

The aim of this course is to provide knowledge on climate change impacts on agriculture and food security and develop skills related to adaptation and mitigation strategies for climate vulnerable agricultural systems.

Course capsule:

Climate change and global warming; Impact of climate change on agriculture and food security; Adaptation and mitigation; Climate-smart agriculture: Basic principles, characteristics; Climate-smart crop and livestock production practices and technologies; Sustainable soil and land management for climate-smart agriculture; Water management options for climate resilience; Systems approach to address climate change issues in Sri Lanka

Course ILOs:

On successful completion of the course, the student will be able to

1. describe the principles, causes and effects of climate change.
2. discuss principles of climate smart agriculture to mitigate the climate change issues.
3. apply the systems approach to address climate change cause and effects in Sri Lanka.
4. propose climate resilient strategies for vulnerable agricultural systems.



Course name: **Food Security Assessment**

Course code: **AS 3217 (2/20:20:60)**

Course aim:

The aim of this course is to provide students knowledge and skills for assessing food security at various levels and evaluating the contribution of household food production systems to food security.

Course capsule:

Concept of food security; Criteria used for defining food security; Household, national and global food security issues; Strategies for improving food security; Assessment tools and methods; Household food production systems: home-gardening, urban gardening, low/no space gardening, organic farming, permaculture, community gardening; Food processing and value addition; Contribution of food supply and value chains to food security

Course ILOs:

On successful completion of the course, the student will be able to

1. describe the concepts of food security and food systems.
2. discuss the limitations of present food systems.
3. apply different assessment methods to evaluate food security at various levels.
4. evaluate the different food production systems in achieving food security.
5. develop skills on teamwork, negotiation, and communication.

Course name: **Global Food Systems**

Course code: **AS 3218 (2/25:10:65)**

Course aim:

The aim of this course is to provide a broad overview of global food systems, their sustainability and food policy perspectives.

Course capsule:

Concept of food system; Forces shaping the global food systems; Trends and behaviour of global food systems; Transformations of food systems: Small- and large-scale food systems, Role of small-scale farming systems in the global food production; Towards sustainable food systems; Global food policy perspectives

Course ILOs:

On successful completion of the course, the student will be able to

1. discuss the concept and characteristic of a food system.
2. evaluate issues of global food systems and their impacts on future agricultural development.
3. describe the role of various agencies working on global food systems.
4. apply knowledge and skills in searching solutions for the issues in present food systems for sustainability.

Course name: **Evolution of Technologies in Agricultural Systems**

Course code: **AS 3219 (2/25:10:65)**

Course aim:

The aim of this course is to provide students knowledge on evolution of agricultural technology in Sri Lanka and integrate compatible traditional technologies for proposing solutions to present-day agricultural and environmental issues

Course capsule:

Concept of traditional knowledge; Ten commandments of traditional society of Sri Lanka; Historical developments in Sri Lankan agriculture; Traditional agricultural technologies; Traditional food technologies; Traditional disaster management technologies; Green revolution and its impacts on agriculture and environment; Modern Agricultural technologies; Sustainability of traditional and modern agricultural technologies; Predicting of future agricultural technologies

Course ILOs:

On successful completion of the course, the student will be able to

1. discuss the evolution of agricultural technologies in Sri Lanka.
2. explain different traditional agricultural practices in Sri Lanka with their scientific basis.
3. compare the sustainability aspects of traditional and modern agricultural technologies
4. integrate compatible traditional knowledge to increase efficiency of present-day agriculture.

Course name: **Sustainable Agriculture**

Course code: **AS 3220 (2/20:20:60)**

Course aim:

The aim of this course is to provide knowledge and skills for improving sustainability of agricultural systems through managing agricultural and non-agricultural resources

Course capsule:

Sustainable development; Agricultural sustainability; Sustainable Development Goals; Three pillars of sustainable development; Sustainable management of farm resources: lands, energy, water, other inputs; Biodiversity and sustainability; Green accounting for sustainable development; Sustainability assessment methods; Policies related to sustainable agricultural development

Course ILOs:

On successful completion of the course, the student will be able to

1. discuss the concepts of sustainable agriculture.
2. apply knowledge and skills of sustainability for agricultural development.
3. analyze sustainability of agricultural systems using appropriate techniques.
4. propose solutions for sustainability issues in agricultural systems.

## Year 3 Semester 2 - Optional

Course name: **Agro-ecotourism**

Course code: **AS 3221 (2/15:30:55)**

Course aim:

The aim of this course is to provide theoretical and practical knowledge to plan, coordinate and implement successful agro-ecotourism ventures.

Course capsule:

Overview of tourism and agro-ecotourism; Agro-ecotourism: different types, infrastructure; Managing a destination; Potential agro-ecotourism destinations in Sri Lanka; Landscape planning and designing for agro-ecotourism; Tourist satisfaction; Uses of digital technologies in promoting agro-ecotourism, Supportive policies and institutes for agro-ecotourism development in Sri Lanka

Course ILOs:

On successful completion of the course, the student will be able to

1. differentiate tourism, ecotourism and agro-ecotourism.
2. assess the feasibility of potential ventures for agro-ecotourism in Sri Lanka.
3. develop a sustainable agro-ecotourism plan for a selected tourist destination.
4. analyze sustainable strategies for agro-ecotourism development on Sri Lanka.

Course name: **Designing and Analysis of Agricultural Systems**

Course code: **AS 3222 (2/15:30:55)**

Course aim:

The aim of this course is to provide an understanding and practical skills on modern applications of modelling and simulation in agricultural systems for optimizing management.

Course capsule:

Agricultural systems modelling and simulation concepts and principles of linear programming; Linear programming and simulation for production planning; Crop growth modelling; APSIM model; Blockchain technology; Use of information systems in managing farming systems

Course ILOs:

On successful completion of the course, the student will be able to

1. explain the importance of scientific decision-making in agricultural systems.
2. develop a model based on inputs, processes, and outputs for optimizing an agricultural system.
3. apply the linear programming and the blockchain techniques for sustainable management of agricultural resources.
4. use appropriate software for modelling and simulation in making precise decisions.

Course name: **Quality Management in Agricultural Systems**

Course code: **AS 3223 (2/25:10:65)**

Course aim:

The aim of this course is to make students capable of overseeing all the tasks and activities that must be accomplished to maintain the desired level of excellence in agricultural systems

Course capsule:

Quality management: Definition, Evolution, Principles and Components; Quality management issue in agricultural systems; Quality management systems; International and national quality organizations; Agriculture related quality policies; Standardization and technical regulations; Standards on agricultural systems and global trade; Conformity systems and assessment; Authentication and source verification of agricultural commodities; Strategies of Quality improvement; Impact of quality management in agricultural systems on rural development

Course ILOs:

On successful completion of the course, the student will be able to

1. describe the importance of quality management for the sustainable development in agricultural systems.
2. explain the current scope of quality management in both local and international agriculture sectors.
3. analyze different quality management strategies that can be applicable to agricultural systems.
4. summarize current constraints and opportunities for successful quality management in Sri Lankan agricultural systems.
5. evaluate the potential impacts of quality management systems in agriculture on the rural development.

Course name: **Regenerative Agriculture and Innovations**

Course code: **AS 3224 (2/20:20:60)**

Course aim:

The aim of this course is to provide students a comprehensive understanding of the principles and apply regenerative agriculture and related innovations in agricultural systems for sustainable production.

Course capsule:

Concept and principles of regenerative agriculture; Regenerative agricultural practices: conservation agriculture, organic farming, biodynamic farming, regenerative grazing, agroforestry systems; Innovation in regenerative agriculture: forest farming, floating gardens; World agricultural heritage systems and regeneration of resources; Sustainability aspects of regenerative agriculture; Business potentials in regenerative farming

Course ILOs:

On successful completion of the course, the student will be able to

1. explain the concept and principles of regenerative agriculture.
2. analyze sustainability aspects and economic potential of regenerative agriculture.
3. plan innovative agricultural systems following regenerative agricultural approaches.
4. discuss regenerative agricultural practices for sustainable production.



Course name: **Risk Management in Agricultural Systems**

Course code: **AS 3225 (2/25:10:65)**

Course aim:

The aim of this course is to provide knowledge and develop skills for assessing and managing risks in agricultural systems

Course capsule:

Concept of risk and uncertainty; Different risk factors in agriculture: production risks, market risks; environmental risks; Strategies to manage production, market, financial, environmental, human resource-related risks; Quantitative techniques in agricultural risk management; Importance of building resilience in agriculture; Climate resilient farming systems; Decision support system for agricultural risk management

Course ILOs:

On successful completion of the course, the student will be able to

1. discuss different sources of risks in agricultural systems.
2. assess production, market and environmental risks in agricultural systems.
3. propose measures to minimize, and mitigate, agricultural risks.
4. evaluate the resilience build-up in farming systems against risks and uncertainty.

**Majoring Courses**  
**Year 4 Semester 1**  
**Agricultural Systems and Management**

Course name: **Contemporary Developments in Agricultural Systems**

Course code: **AS 4104 (2/20:20:60)**

Course aim:

This course enables the students to analyze the contemporary developments and related issues in agricultural systems and plan for counteractive measures.

Course capsule:

Problem tree analysis: identifying main problems, causes and effects, formulation of manageable objectives, propose strategies; Contemporary developments and related issues in agricultural systems: trade, climate change, capital, epidemics, technology advancements, lands and environment, e-Agriculture, social aspects; Agricultural systems research for solving contemporary agricultural issues

Course ILOs:

On successful completion of the course, the student will be able to

1. apply problem tree concept for identification of main problems, causes and effects of emerging developments in agriculture.
2. analyze the agricultural systems to recognize contemporary developments
3. propose possible strategies for solving the issues of contemporary developments in agricultural systems.
4. plan agricultural systems research for contemporary issues in agriculture.

Draft Lesson Plans of Specialization Programmes  
(Department of Animal and Food Sciences)

B.Sc. Hons. Agriculture  
Faculty of Agriculture  
Rajarata University of Sri Lanka

## Module: Animal Production Technology

Semester	Course code	Course name	Hrs. & credits
3200 (Compulsory)	AF 3201	Animal Genetics and Breeding	(2/25:10:65)
	AF 3202	Dairy Processing Technology	(2/20:20:60)
	AF 3203	Meat and Egg Product Technology	(2/20:20:60)
	AF 3204	Applied Animal Nutrition	(2/20:20:60)
	AF 3205	Inland Fisheries and Ornamental Fish Culture	(2:20/20/60)
	CC 32xx	Research Methodologies and Scientific Writing	
3200 (Optional)	AF 3206	Integrated Micro Livestock Systems	(2/25:10:65)
	AF 3207	Wildlife Conservation and Management	(2/25:10:65)
	AF 3208	Disease Management in Farm Animals	(2/25:10:65)
	AF 3209	Fish Processing Technology	(2/25:10:65)
	AF 3210	Advances in Animal Production	(2/25:10:65)
	AF 3217	Food Microbiology	(2/20:20:60)
	AF 3218	Food Packaging Technology	(2/25:10:65)
	AS 32xx	Human Resource Management	
	AE 32xx	Agricultural Waste Management	
	PS 32xx	Organic Farming	
Semester	Course code	Course name	Hrs. & credits
4100 (Compulsory)	AF 4101	Farm Animal Welfare	(2/25:10:65)
	AS 41xx	Statistical Software for Data Analysis	
	EG 41xx	English	

## Module: Food and Postharvest Technology

Semester	Course code	Course name	Hrs. & credits
3200 (Compulsory)	AF 3211	Food and Nutrition	(2/25:10:65)
	AF 3212	Food Chemistry	(2/25:10:65)
	AF 3213	Postharvest Technology of Perishable Crops	(2/20:20:60)
	AF 3214	Postharvest Technology of Grains, Oil Seeds and Spices	(2/20:20:60)
	AF 3215	Food Preservation	(2/25:10:65)
	CC 32xx	Research Methodologies and Scientific Writing	
3200 (Optional)	AF 3202	Dairy Processing Technology	(2/20:20:60)
	AF 3203	Meat and Egg Product Technology	(2/20:20:60)
	AF 3209	Fish Processing Technology	(2/25:10:65)
	AF 3216	Food Product Development and Sensory Evaluation	(2/20:20:60)
	AF 3217	Food Microbiology	(2/20:20:60)
	AF 3218	Food Packaging Technology	(2/25:10:65)
	AF 3219	Food Analysis	(2/15:30:55)
	PS 32xx	Biotechnology	
	AS 32xx	Human Resource Management	
	AE 32xx	Food Process Engineering	

Semester	Course code	Course name	Hrs. & credits
4100 (Compulsory)	AF 4102	Food Safety, Regulation and Quality Management	(2/25:10:65)
	AS 41xx	Statistical Software for Data Analysis	
	EG 41xx	English	

Course name: **Animal Genetics and Breeding**

Course code: **AF 3201 (2/25:10:65)**

Course aim:

This course will enable the students to understand the fundamentals of animal genetics and breeding and use a variety of concepts and skills necessary for the genetic improvement of farm animals.

Course capsule:

Domestication of farm animals; Animal genetic resources: conservation of animal genetic resources; Concepts of quantitative and qualitative genetics; Branches of genetics: Mendelian inheritance; Population genetics: Hardy Weinberg equilibrium; Genetic relationships; Inbreeding; Estimation of genetic parameters; Genetic models; Heritability; Repeatability; Animal selection and breeding: principles of selection, response to selection, breeding values and selection methods; Breeding methods: outbreeding and crossbreeding; Animal breeding policies in Sri Lanka.

Course ILOs:

On successful completion of the course, the student will be able to

1. describe the animal genetic resources in Sri Lanka and the importance of their conservation.
2. discuss the different aspects of genetic theories and concepts of population genetics.
3. explain the principles of heritability, repeatability, genetic models and their uses.
4. analyze the different selection and breeding methods of farm animals.
5. propose improvements for animal breeding programmes and policies in Sri Lanka.

Course name: **Dairy Processing Technology**

Course code: **AF 3202 (2/20:20:60)**

Course aim:

This course will enable the students to discuss the production processes of different dairy products and use of food additives during processing to improve the quality.

Course capsule:

Physical and chemical properties of milk; Microbial spoilage of milk; Unit operations in milk processing; Dairy starter cultures; Fermented dairy products; Beneficial effects of fermented dairy products; Use of stabilizers in dairy products; Processing of yoghurt, curd, cheese, butter, whey and ice cream; Production of dried milk products; Quality standards; Defects of dairy products; Current trends in dairy technology.

Course ILOs:

On successful completion of the course, the student will be able to

1. explain the factors affecting the quality and safety of dairy product processing.
2. demonstrate the unit operations of selected dairy products.
3. discuss the quality standards of different dairy products.
4. evaluate the quality parameters to ensure consumer safety and acceptance.

Course name: **Meat and Egg Product Technology**

Course code: **AF 3203 (2/20:20:60)**

Course aim:

This course aims students to acquire and apply knowledge & skills for the safe production of meat, eggs and meat processing technology.

Course capsule:

Antemortem and post-mortem inspection; Carcass evaluation; Abattoir design; Biology and composition of muscle; Conversion of muscle to meat; Quality attributes of meat; Meat and meat products; Secondary processing of meat; Advances in meat quality assessment and authentication; By-product utilization and value addition; Meat safety and zoonosis; Structure of an egg; Egg defect detection and quality assessment; Egg sorting and grading; Egg processing.

Course ILOs:

On successful completion of the course, the students will be able to

1. explain the ante mortem and post-mortem practices on meat quality and safety.
2. demonstrate procedures used in egg sorting, grading, and processing.
3. discuss suitable ingredients and processing methods for meat and meat-based products.
4. design an abattoir according to the standards and regulations.
5. assess the quality parameters of meat and eggs.



Course name: **Applied Animal Nutrition**

Course code: **AF 3204 (2/20:20:60)**

Course aim:

This course will enable the students to develop knowledge and skills on feeding farm animals, formulating feed rations and evaluating the formulated stock feed in enhancing production performances of farm animals .

Course capsule:

Acts and regulations for animal feeds;, Estimation of nutrient requirements: energy, protein, minerals and vitamins of farm animals; Balancing ration; Feeding standards; Methods of formulating feed mixtures; Evaluation of feedstuffs for livestock: proximate analysis, fiber analysis, feedstuff energy, protein , physical evaluation of feedstuff; Feeding trials: digestion and metabolism trials.

Course ILO's:

On successful completion of the course, the student will be able to

1. describe the present situation of the animal feed industry in Sri Lanka.
2. compare the dietary requirements of farm animals.
3. demonstrate the methods available for feed analysis.
4. formulate feed ration for a given livestock species.
5. design feeding trials for farm animals.

Course name: **Inland Fisheries and Ornamental Fish Culture**

Course code: **AF 3205 (2/20:20:60)**

Course aim:

This course will enable students to comprehend the concepts, acquire and apply skills on inland and ornamental fish production and management.

Course capsule:

Capture and culture-based fisheries; Inland fisheries production and management: available species, fish breeding, fisheries organization, fish marketing network, laws and regulations, stock assessment and yield prediction, management and restoration, use of biotechnology; Ornamental fish industry; Common ornamental fish and aquatic plant species; Breeding and larval rearing of selected ornamental fishes; Feed and feeding management; Water quality management; Health management; Planning and designing an ornamental fish farm

Course ILO:

On successful completion of the course, the student will be able to

1. explain the present status of fish production in Sri Lanka.
2. select suitable culture practices in inland and ornamental fish production.
3. describe different fish breeding techniques for commercially cultured species.
4. discuss management aspects related to ornamental fisheries.
5. design an ornamental fish farm for wholesale production.

Course name: **Micro-livestock and Integrated Systems**

Course code: **AF 3206 (2/25:10:65)**

Course aim:

This course will enable the students to use different micro-livestock species suitable to be reared with the conventional livestock in integration, and their importance to the farm/farm family and indigenous genetic resources.

Course capsule:

Importance of micro-livestock industry; Constraints and potentials of non-traditional farm animals; Miscellaneous poultry production: village chicken, ducks, muscovy, geese, turkeys, guinea fowls, pigeons, quails; Other micro-livestock species farming: micro cattle, rabbit, guinea pig, deer, crocodile; Production systems: elements in a system, sustainable agriculture; Integrated farming systems: agro-silvo pastoral, livestock and livestock, duck cum fish cum rice, Kandyan forest garden with micro-livestock; Methods to promote uses of non-conventional animal products.

Course ILOs:

On successful completion of the course, the student will be able to

1. explain the importance of micro-livestock industry for human nutrition and economy.
2. discuss the management practices of different micro-livestock species.
3. propose methods to promote non-conventional animal products.
4. select suitable strategies to overcome constraints pertaining to popularize micro-livestock farming.
5. design micro-livestock units as a component of an integrated farming system.

Course name: **Wildlife Conservation and Management**

Course code: **AF 3207 (2/25:10:65)**

Course aim:

This course enables students to identify and apply the major strategies to manage and conserve wildlife in their respective ecosystems.

Course capsule:

Principles in wildlife conservation and management; Major types of ecosystems; Ecological pyramids; Animal biodiversity; Important wildlife fauna and flora in Sri Lanka; Physical and behavioural adaptations in wildlife; Invasive fauna; Regulatory aspects of wildlife conservation; Human-animal conflicts; Wildlife and agriculture trade-offs; Wild relatives of farm animals; Potentials and limitations of wildlife management.

Course ILOs:

On successful completion of the course, the student will be able to

1. Explain the biodiversity and ecology of wildlife
2. assess the trade-offs between wildlife and agriculture.
3. discuss the regulatory mechanisms of wildlife conservation in Sri Lanka.
4. propose solutions for mitigating the human-animal conflicts in Sri Lanka.
5. [ILO -

Course name: **Disease Management in Farm Animals**

Course code: **AF 3208 (2/25:10:65)**

Course aim:

This course aims to improve students' knowledge on various disease conditions related to farm animals, develop the required skills to identify disease conditions and to propose preventive measures.

Course capsule:

Common diseases of farm animals: Bio-security measures for farm animal disease control and prevention; Diseases caused by bacteria, virus, protozoa, parasites; Metabolic disorders and nutritional deficiencies; Disease diagnosis; Basic epidemiological principles in diseases: investigation, immunity, transmission; Clinical signs, pathogenesis; Treatments of major diseases in livestock & fisheries

Course ILOs:

On successful completion of the course, the student will be able to

1. identify common diseases of farm animals.
2. design a feeding programme to avoid metabolic disorders and nutritional deficiencies of farm animals.
3. plan a bio-security programme for disease prevention and control.
4. apply basic diagnostic procedures to prevent transmission of farm animal diseases.

Course name: **Fish Processing Technology**

Course code: **AF 3209 (2/25:10:65)**

Course aim:

This course enables students to improve their knowledge on handling, processing and value addition of fish for satisfying the market demand.

Course capsule:

Economic importance of fisheries; Nutritional value of marine and inland fish; Physical and chemical composition of fish muscle; Fish spoilage: enzymatic, microbial; Handling of fish; Large scale fish processing; Pathogenic organism related with fish and fish products; Hygiene and sanitation during processing; Value addition of fish produce; Quality control of processed fish; Waste handling in fish processing.

Course ILOs:

On successful completion of the course, the student will be able to

1. describe the nutritional value of fish and fish-based products.
2. explain the factors affecting postharvest losses of fish.
3. propose appropriate measures to minimize quality losses of harvested fish.
4. discuss the safety and quality control aspects in fish processing.
5. demonstrate the processing of value-added fish products.

Course name: **Advances in Animal Production**

Course code: **AF 3210 (2/30:00:70)**

Course aim:

This course will encourage students to explore advanced developments in farm animal production and analyze their effects in relation to human, animal, ecosystem, and current contexts.

Course capsule:

New trends in feeding livestock: precision feeding, dietary manipulation; Advances in animal biotechnology; Advances in dairy production and technology; Advances in meat processing; Advances in aquaculture; Precision livestock farming: principles, elements, sensors and automation in cattle, poultry, and pig

Course ILOs:

On successful completion of the course, the student will be able to

1. propose feeding strategies to optimize farm animal production assuring ecosystem health.
2. discuss advanced animal breeding practices for producing elite in farm animals.
3. explore novel techniques and tools in detecting diseases in farm animals.
4. combine modern and precise management approaches to acquire higher performances in farm animals.

Course name: **Food and Nutrition**

Course code: **AF 3211 (2/25:10:65)**

Course aim:

This course is designed to provide a strong understanding of the role of food and lifestyle factors on human nutrition. Upon completion of this course, the student will gain the knowledge and skills necessary to understand the relationship between choice of food, lifestyle, health and wellbeing.

Course capsule:

Food, diet and nutrition; Nutrients and their impact on human health: carbohydrates, proteins, fats, vitamins, minerals, their recommended daily intakes, deficiency symptoms, disorders related to excess intakes and impact on human health; Assessing the nutritional status and nutritional requirements: methods in nutritional assessment, overnutrition and undernutrition, nutritional requirements of infants, adolescents, adults, pregnant and lactating women, elders; Lifestyle factors and their impact on human health: diet and dietary patterns, physical activity and other lifestyle factors, overweight/obesity, hypertension, type 2 diabetes, dyslipidemia; Planning a balanced diet: calculating energy requirements of individuals, basal metabolism, meal planning.

Course ILOs:

On successful completion of the course, the student will be able to

1. describe basic concepts of nutrition, the role of nutrients in the body and the food sources.
2. explain the current nutritional issues.
3. demonstrate the nutritional assessment methods.
4. discuss different nutritional requirements of individuals and the relationship between lifestyle factors and nutritional/health disorders.
5. apply the concepts of nutrition in diet planning.



Course name: **Food Chemistry**

Course code: **AF 3212 (2/25:10:65)**

Course aim:

This course aims to develop the competenc of the students to identify and control chemical changes infoods during processing and storage.

Course capsule:

Properties and role of water in foods; Properties, functions and chemical reactions of foods; Carbohydrates: Maillard browning, caramelization, starch gel formation; Proteins: racemization, cross-link formation; Lipids: lipolysis, autoxidation; Enzymes in foods; Pigments; Flavours; Food additives; Changes in foods during storages.

Course ILOs:

On successful completion of the course, the student will be able to

1. describe the key chemical compounds in foods.
2. explain the major chemical reactions in foods during processing and storage.
3. discuss the role of water and the stability of foods upon freezing.
4. propose appropriate methods to improve food quality and shelf life.
5. apply knowledge of food chemistry to improve the quality and safety of foods.

Course name: **Postharvest Technology of Perishable Crops**

Course code: **AF 3213 (2/20:20:60)**

Course aim:

This course aims to impart the students to minimize postharvest losses and extend the postharvest life of perishable crop commodities to manage and manipulate the postharvest quality.

Course capsule:

Postharvest losses and causative factors; Pre-harvest factors affecting post-harvest quality; Functional values; Maturation and maturity indices; Harvesting; Physiology and biochemistry; Preparation for the fresh market: sorting, grading, waxing, curing, packaging, cooling, storage and transportation of fresh produce including fruit, vegetable, root and bulb crops; Fruit ripening and artificial ripening agents; Postharvest pest and disease management; Supply chain management of fresh produce; Processing of perishable crops.

Course ILOs:

On successful completion of the course, the student will be able to

1. explain the importance of postharvest technology to support food security.
2. describe physiology and biochemistry of harvested fresh produce.
3. discuss factors contributing to postharvest losses.
4. describe ways and means to minimize postharvest losses.
5. propose appropriate solutions to overcome the issues of supply chain management of fresh produce.

Course name: **Postharvest Technology of Grains, Oil Seeds and Spices**

Course code: **AF 3214 (2/20:20:60)**

Course aim:

This course aims to develop an understanding of theoretical and practical aspects of postharvest technology of grains, oilseeds and spices to maintain the postharvest quality.

Course capsule:

Introduction; Postharvest losses and causative factors; Composition, nutritional value and utilization; Physical properties; Quality parameters; Sampling techniques and analysis; Primary processing: harvesting, threshing, cleaning, drying, parboiling, rice milling; Storage and warehouse management; Stored product pests; Secondary processing: flour, other value additions.

Course ILOs:

On successful completion of the course, the student will be able to

1. describe good postharvest management practices of grains and oil seeds.
2. measure grain quality parameters to extend the postharvest life with optimum quality.
3. explain the importance of stored product pests and pest management.
4. demonstrate primary and secondary processing of grains, oil seeds and spices.
5. propose strategic measures to overcome postharvest losses in the grains and oilseed industry.

Course name: **Food Preservation**

Course code: **AF 3215 (2/25:10:65)**

Course aim:

This course aims to develop a critical understanding of the practical and theoretical aspects of food preservation.

Course capsule:

Food deterioration; Historical development of food preservation; Microbial kinetics of destruction; Thermal preservation: high-temperature preservation, low-temperature preservation; Non-thermal preservation: drying & dehydration, chemical, fermentation, irradiation; Effectiveness of combining preservation techniques; Novel food preservation techniques.

Course ILOs:

On successful completion of the course, the student will be able to

1. discuss factors affecting the deterioration of foods.
2. explain the principles of different food preservation techniques.
3. apply available food preservation techniques for specific situations.
4. propose different food preservation techniques to minimize nutritional losses.

Course name: **Food Product Development and Sensory Evaluation**

Course code: **AF 3216 (2/20:20:60)**

Course aim:

The aim of this course is to enhance the knowledge, critical thinking and practical skills related to food product development and a sensory evaluation by applying recommended scientific methodologies.

Course capsule:

Overview of food product development; Unit operations; Food product development phases and consumer preference; New trends in food product development and practical exposure; Importance of sensory evaluation; Sensory attributes; Conducting sensory trial: sensory laboratory, panel selection, sample preparation, presentation and ballot sheets preparation, serving, sensory test methods, analysis and interpretation of sensory test data.

Course ILOs:

On successful completion of the course, the student will be able to

1. discuss the phases of new food product development.
2. explain the major unit operations in the food industry.
3. develop a novel food product based on current consumer demand.
4. select appropriate sensory evaluation techniques for evaluating food products.
5. interpret the sensory profile of a newly developed food product.

Course name: **Food Microbiology**

Course code: **AF 3217 (2/20:20:60)**

Course aim:

This course aims to develop students' critical understanding of the theoretical and practical competencies on microbiology of food preservation, microorganisms of foodborne illnesses and methods for the microbiological examination to assure the microbiological quality of foods.

Course capsule:

History of food microbiology; Microorganisms in foods; Factors affecting microbial growth; Sources of microbial contaminations; Foodborne diseases, signs and symptoms; Estimation of the microbial population in foods: bacteria, yeast and moulds; Control of spoilage microorganisms; Use of microorganisms in the food industry: fermentation, food bio-preservatives, food ingredients, enzymes.

Course ILOs:

On successful completion of the course, the student will be able to

1. discuss interactions between microorganisms and the food environment, and factors affecting microbial growth.
2. explain the beneficial and detrimental effects of microorganisms on foods.
3. assess the microbiological quality of foods using appropriate laboratory methods.
4. propose recommendations to ensure food quality and safety.

Course name: **Food Packaging Technology**

Course code: **AF 3218 (2/25:10:65)**

Course aim:

This course aims the student to explore the concepts of food packaging technologies and how they can be implemented in the selection of suitable packaging materials and packing techniques for different foods.

Course capsule:

Food packaging: functions, materials and barrier properties, forms; Shelf-life and quality of packaged products; Modern trends in food packaging; Design and development of packaging for different products: fruits, vegetables, fruit and vegetable-based products, cereals and cereal-based products, flesh foods and dairy products, and confectionery and beverages.

Course ILOs:

On successful completion of the course, the student will be able to

1. explain the importance of food packaging in the food industry.
2. discuss the factors affecting shelf-life and quality of packed fresh and processed foods.
3. choose appropriate packaging materials for different food applications based on their barrier properties.
4. design suitable transport packaging for different types of foods.

Course name: **Food Analysis**

Course code: **AF 3219 (2/15:30:55)**

Course aim:

The aim of this course is to develop a critical understanding of the principles of different analytical techniques in food analysis and to develop the required practical skills.

Course capsule:

Introduction; Sampling procedures; Determination of pH and acidity, total solids; Determination of proximate composition: moisture, ash, protein, fat, fibre, and carbohydrate; Chromatography: paper, thin layer, partition, liquid and gas; Spectroscopy; Immunoassay; Colour analysis, microscopy and imaging techniques; Routine quality analysis.

Course ILOs:

On successful completion of the course, the student will be able to

1. select appropriate sampling procedures for food analysis.
2. explain the principles of different analytical techniques in foods.
3. demonstrate practical proficiency in food analysis.
4. choose the best analytical technique to analyse different parameters.
5. interpretation of different laboratory test results.



Course name: **Farm Animal Welfare**

Course code: **AF 4101 (2/25:10:65)**

Course aim:

This course will enable the students to apply the knowledge and demonstrate skills to improve by recognizing the importance of animal welfare in a farming environment.

Course capsule:

Importance of farm animal welfare; Concepts of farm animal welfare; Five freedoms in farm animal management; Indicators of welfare: physiological, behavioural, production; Welfare issues associated with farm animal species; Farm animal welfare certification; Assessment of farm animal welfare; Ethical considerations in animal experiments.

Course ILOs:

On successful completion of the course, the student will be able to

1. explain the concepts of farm animal welfare
2. assess the welfare conditions of farm animals using physiological, behavioural, and production-related indicators.
3. propose remedial measures to overcome welfare-related issues in farm animals.
4. design an experiment to evaluate the welfare issues of farm animals.

Course name: **Food Safety, Regulation, and Quality Management**

Course code: **AF 4102 (2/25:10:65)**

Course aim:

The aim of this course is to enable the students to acquire and apply knowledge and skills on food quality and safety-related activities, approved local and international regulations, management systems, and code of practices in the food sector.

Course capsule:

Overview of food safety and regulations; Food hazards: allergies, toxicology, adulterations, contaminants; Principles of food quality controlling; Food quality and safety management systems: HACCP, ISO; Quality standards and certifications for foods: SLS and Codex, Good manufacturing practices (GMP), Laboratory accreditation; Food regulation; Hygienic management of foods; Cleaning & sanitizing of food soils; Water quality in food safety; Designing food processing plant: equipment, site selection, building designing, Public health aspects in foods.

Course ILOs:

On successful completion of the course, the student will be able to

1. explain food safety and quality principles and management requirements in the food industry.
2. apply quality control tools in a food processing plant for maintaining hygiene.
3. discuss local and international laws and regulations related to food safety and quality management.
4. propose safety guidelines and measures for food and related industries

Draft Lesson Plans of Specialization Programmes  
(Department of Plant Sciences)

B.Sc. Hons. Agriculture  
Faculty of Agriculture  
Rajarata University of Sri Lanka

**Department of Plant Sciences**  
**Crop Science Module**

<b>Compulsory</b>		<b>Optional</b>	
<b>Year III Semester II</b>			
PS 3201	Crop Physiology (2)	PS 3205	Organic Farming (2)
PS 3202	Floriculture & Landscape Horticulture (3)	PS 3206	Forest Conservation (2)
PS 3203	Controlled Environment Agriculture (2)	PS 3207	Agro-ecology (2)
PS 3204	Advanced Field Crop Production (3)	PS 3208	Weed Science (2)
PS 3225	Academic and Business English	PS 3209	Cottage Farm Enterprises (2)
CC XX	Research Methodologies and Scientific Writing	PS 3213	Biotechnology (2)
		PS 3214	Plant Tissue culture (2)
		PS 3211	Climate change & crop production (2)
		PS 3210	Plantation Forest Management (2)
		ES 3212	Remote Sensing and GIS in Agriculture
<b>Year IV Semester I</b>			
<b>Compulsory</b>		<b>Optional</b>	
PS 4101	Plantation Crop Technology (2)		

Course name: **Crop Physiology**

Course code: **PS 3201 (2/25:10:65)**

Course aim:

This course will enable students to explore conceptual physiological basis of plants and crops and responses in communities and how it can be applied for better management of crops in current and changing future environments.

Course capsule:

Importance of crop physiology for yield improvement; Methods of crop yield improvement through manipulation of radiation interception and conversion; Determination of crop development by temperature and photoperiod; Partitioning of photosynthates and harvest index; Physiology of crop quality; Postharvest physiology; Physiological response of crops to environmental stress; Recent advances and future for trends in crop physiology

Course ILOs:

On successful completion of the course, the student should be able to

1. describe and measure fundamental physiological and agronomical processes determining rates of dry matter accumulation of crops.
2. demonstrate abilities of solving agronomic and physiologic processes quantitatively by accounting the resources and conditions.
3. analyse the physiological basis of crop yield reduction caused by limiting factors and environmental stresses.
4. generalise crop physiology to changing environments and growing conditions.
5. summarize the recent advances of crop physiology.

Course name: **Floriculture and Landscape Gardening**

Course code: **PS 3202 (3/30:30:90)**

Course aim:

This course enables students to comprehend knowledge and acquire skills on floriculture and landscape gardening for ornamental plant production and designing of aesthetic landscapes.

Course capsule:

Overview on ornamental horticulture industry; Commercial cultivation of major ornamental species; Potted plant production; Floricultural value chain; Value addition for cut flowers and foliage: postharvest physiology, handling and senescence, flower drying techniques; History, principles and elements of landscaping; Home landscaping; Common landscaping plants: identification and ecological requirements; Landscape drawing; Hard landscaping; Cost estimation of landscape projects; Indoor gardening; Urban landscaping; Research and future trends.

Course ILO's:

On successful completion of the course, the students will be able to

1. identify major ornamental plant species and their varieties on common use.
2. apply optimum establishment, management, harvest, and postharvest practices for major cut flower and foliage species in Sri Lanka.
3. select suitable plants for sustainable man-made landscapes.
4. create aesthetically and ecologically sound landscape designs using different soft and hard landscape materials.
5. develop team working skills by executing a mini landscape project.

Course name: **Controlled environment agriculture**

Course code: **PS 3204 (2/15:30:55)**

Course aim:

This course aims to develop students with the knowledge and required skills in technology-based controlled environmental crop production.

Course capsule:

Present status and future scope of controlled environment agriculture (CEA); Types and modifications of protected structures; Construction of protected structures; Microclimate control in greenhouses; Soil-less crop production system: hydroponics, aeroponics and aggregate methods; Nursery techniques, fertigation systems, and pest and disease management in protected cropping; Protected cultivation of high-value crops; Recent trends in CEA.

Course ILOs:

On successful completion of the course, the student will be able to

1. explain the present status of controlled environment agriculture in the local and global scenario
2. describe the requirements for successful crop production in greenhouses
3. suggest possible solutions to overcome issues in controlled environment agriculture
4. perform high-value commercial crop cultivation in a polytunnel
5. enhance socio-emotional skills related to entrepreneurial management of protected cropping

Course name: **Advanced Field Crop Production**

Course code: **PS 4101 (3/40:10:100)**

Course aim:

The course aims to comprehend students on advance physiological aspects of growth, yield formation, quality, and advanced production techniques of important field crops to ensure food security of the future.

Course capsule:

Advanced aspects of field management: rice, tropical cereals, pulses, root and tuber crops, tobacco and narcotics, sugarcane and oil crops; Crop specific physiology of yield determination: source and sink relationship, vegetative and reproductive growth transition, nutrition physiology, postharvest physiology; Crop specific processing: rice, sugarcane, tobacco; Avenues of crop yield improvement: quantitative qualitative; Integrated management of field crops; Breeding for future environments

Course ILOs:

On successful completion of the course, the student will be able to

1. explain the physiological basis of yield determination of tropical field crops.
2. relate the growing environment conditions for quantitative and qualitative yield determination.
3. analyse responses of tropical field crops to changing environments.
4. construct avenues of crop improvements for future environments.
5. integrate current knowledge of field crops to ensure food security in future.



Course name: **Academic and Business English**

Course code: **PS 3225 (1/00:30:20)**

Course aim:

This course will enable students to enhance the practice of English language in academic and business environments by motivating them for life-long learning with modern language learning tools and approaches.

Course capsule:

Root causes for inappropriate use of English; English as a foreign language and linguistic map space; Personalized English learning; Toolkit for learning English: English cinema, social media, online courses, apps; Avoid cross-translation; Think and express in English; Self-directed learning blended with listening, reading, writing and speaking; Movie/documentary night; Reading and writing camp; Public debate

Course ILOs:

On successful completion of the course, the student will be able to

1. summarize information by listening to English speakers from different accents
2. comprehend knowledge by reading English publications from various sources
3. develop competence in public speaking in academic and business settings
4. formulate written documents in English for academic and business forums

Course Name: **Organic Farming**

Course Code: **PS 3205 (2/25:10:65)**

Course aim:

This course aims the students to comprehend theoretical and practical aspects to carryout sustainable organic agricultural production.

Course Capsule:

Principles and concepts; Present status, existing potentials and constraints; Legislative and regulatory procedures, certification and transition to organic farming; Soil fertility and nutrient management; Crop protection in organic farming; Concepts of organic animal husbandry; Biodynamic farming; Research perspectives in organic farming

Course ILOs:

On successful completion of the course, the student will be able to

1. explain concepts of organic farming in sustainable agriculture.
2. discuss the legal& regulatory policies, and certification procedures for organic farming.
3. describe the role of macro & microorganisms for successful organic farming.
4. apply appropriate nutrient, weed, pest, and disease management techniques in organic agriculture.
5. design an optimized organic production approach for crops and livestock.

Course name: **Forest Conservation and Restoration**

Course code: **PS 3204 (2/25:10:65)**

Course aim:

This course will enable students to evaluate the challenges for forest conservation and develop effective forest landscape restoration plans following the Restoration Opportunities Assessment Methodologies.

Course capsule:

Overview on forest conservation and restoration ; Challenges for forest conservation: habitat destruction & fragmentation, landscape change, overharvesting, invasive species, climate change impacts on tropical forests; Forest conservation: conservation planning & priorities, roles of people in conservation; Forest restoration: ecological succession, overview of restoration ecology, Restoration Opportunities Assessment Methodology (ROAM), restoration tools & techniques, success stories of forest restoration in tropics.

Course ILOs:

On successful completion of the course, the student will be able to

1. describe forest conservation and restoration in tropical forest ecosystems.
2. evaluate challenges for restoring destroyed and degraded ecosystems in tropical forest regions.
3. integrate ICT tools for monitoring and planning of effective restoration programmes.
4. formulate conservation priorities for a selected natural ecosystem in Sri Lanka.
5. develop a conservation plan for restoring a degraded forest/man-made ecosystem in Sri Lanka.

Course name: **Agroecology**

Course code: **PS 3207(2/25:10:65)**

Course aim: The course aims to broaden the students' understanding on agroecosystems for sustainability of both agriculture and nature, which leads through a succinct case for an alternative understanding of agricultural and food systems as opposed to formulaic methodologies.

Course capsule:

Case for fundamental change in agriculture; Three vignettes: setting the stage, lessons; Agroecology and the agroecosystem concept; Autecological perspectives: Abiotic factors, biotic factors, environmental complex, interactions; Population ecology of agroecosystems; Agroecosystem diversity; Competition and facilitation among crops: intercropping, crop rotation, weeds, invasion, tillage; Species interactions in crop communities: herbivory, disease ecology, biological control; Agriculture, society and environment; Toward sustainability: from sustainable agroecosystems to a sustainable food system

Course ILOs:

On successful completion of the course, the student will be able to

1. distinguish abiotic, biotic, and system behaviours and interactions of common agro ecosystems.
2. explain principles, theories, and laws of ecology with respective to agro ecosystems.
3. compose agroecological perspectives for redesigning common agroecosystems of Sri Lanka,
4. analyse sustainability of agroecosystems.
5. integrate agroecological concept to transform current cropping systems to sustainable food system.

Course name: **Weed Science**

Course code: **PS 3208 (2/25:10:65)**

Course aim:

With the successful completion of this course the students will be able to describe the characters of weeds and impacts of weeds on agriculture and other ecosystems and design suitable integrated weed management practices according to the context.

Course capsule:

Overview on weed science; Characters of noxious weeds; Weeds of global and national significance; Weed: biology, competition; Weed management: manual, mechanical, cultural, biological, chemical, integrated weed management; Herbicides: history, herbicide formulations, classification, mode of action, herbicide toxicity; Fate of herbicides in plant and soil: herbicide absorption by plants, effects of environmental factors on herbicide activity, resistance development; Herbicides usage: precautions, first aids and antidotes; Global and Sri Lankan scenario of herbicide industry, herbicide registration.

Course ILOs:

On successful completion of the course, the student will be able to

1. describe the characteristics and biology of weeds.
2. explain the impact of weeds on agriculture and other ecosystems. .
3. comprehend knowledge on herbicides, their activities, and usage
4. apply appropriate weed management strategies for a given situation

Course name: **Cottage Farming Enterprise**

Course code: **PS 3210 (2/ 15:30:55)**

Course aim:

The aim of the course is to develop students' technical and managerial skills related to mushroom culture, beekeeping and nursery management in commercial level and to empower students towards entrepreneurship.

Course capsule:

Mushroom culture; Biology and production of mushrooms; Spawn production; Substrate preparation; Pest and disease management in mushrooms; Harvesting and postharvest handling of mushrooms; Beekeeping: honeybee species, biology and behaviour of honeybees, beekeeping tools, management practices, swarming and absconding, capturing, establishment, dividing of colonies; Nutritive benefits of bee honey; Commercial products derived from beekeeping; Nursery management: establishment of nursery as an enterprise, general management practices in a commercial plant nursery, nursery plant stock management; Initiating a selected cottage farming enterprise

Course ILOs:

On successful completion of the course, the student will be able to

1. describe the biology and production basics of commonly grown mushroom species.
2. explain the biology, ecology, and behaviour of honeybees in Sri Lanka.
3. practice mushroom culture, beekeeping, and nursery management as a profitable venture through a collective approach.
4. incorporate production and economic aspects for long-term success in self-employment.
5. develop entrepreneurial and career skills

Course name: **Biotechnology**

Course code: **PS 3213 (2/20:20:60)**

Course aim:

This course aims to develop students' professional practice in global biotechnology industry and abilities to contribute to the development of science.

Course capsule:

Eukaryotic chromosome architecture; Central dogma; Genome structure: transposable genetic elements, syntenic and repetitive regions; PCR and gel electrophoresis; Overview on molecular markers; Gene expression: structure of genes and transcripts, operons and RNA processing; Gene regulation and RNAi technology; Sequencing techniques: Sanger sequencing, introduction to next generation sequencing & RNAseq technologies; rDNA technology: restriction enzymes, cloning vectors, gene transformation and screening of recombinants; Protein extraction and quantification Application of biotechnology in agriculture and industry: transgenic crop production, edible vaccines, antibiotics, fermentation and bioreactors.

Course ILOs:

On successful completion of the course, the student will be able to

1. describe the steps involved in DNA replication and protein synthesis
2. explain the role of rDNA technology in agriculture
3. discuss different molecular markers and their applications in agriculture
4. evaluate the applications of modern sequencing technology platforms in plant sciences
5. assess the application of biotechnology in agriculture and industry

Course name: **Plant Tissue Culture**

Course code: **PS 3214 (2/15:30:55)**

Course aim:

The aim of this course is to comprehend knowledge on plant tissue culture and develop skills related to its applications.

Course capsule:

Overview on plant tissue culture; Organization of a plant tissue culture laboratory; Aseptic environment and explants' surface sterilization; Plant tissue culture media; Micro-propagation; Tissue culture systems: callus culture, suspension culture, somatic embryogenesis, protoplast culture, haploid production; Somaclonal variation; Production of disease free plants: thermotherapy, chemotherapy, meristem & callus cultures, micro grafting and virus indexing; Secondary metabolite production in *in vitro*; *In vitro* germplasm conservation; *In vitro* flowering and tuberization; Application of plant tissue culture in research and commercial purposes.

Course ILOs:

On successful completion of this course, the student will be able to

1. discuss general theoretical backgrounds of plant cell and tissue culture.
2. explain different tissue culture regeneration systems and their applications.
3. design plant tissue culture experiments for analyzing results with supported literature.
4. apply plant tissue culture techniques in research and commercial purposes.
5. design an *in vitro* protocol to establish an unknown plant species.



Course name: **Climate Change, Agriculture and Food security**

Course code: **PS 3211 (2/25:10:65)**

Course aim:

The aim of this course is to foster an understanding of climate change, its effect in global and regional scale of crop production, agriculture and food security while letting them to formulate and implement climate resilient adaptations in Sri Lanka

Course capsule:

Definitions, predications, risks and possibilities; Global agriculture and climate change; Dynamics, food security and economics; Crop response to elevated CO<sub>2</sub> and temperature; Changes in secondary metabolism; Disease and weed epidemics under climate change; Climate Change Effects on Insects; Development of climate resilient crops; Breeding for adaptations; Abiotic stresses and agricultural sustainability; Impacts vulnerability and adaptation

Course ILOs:

On successful completion of the course, the student will be able to

1. describe how the broad features climate are changing in future and strategies for mitigating negatives
2. discuss eco-physiological changes of major crops in changing climate under recent and future climates that threaten the food security
3. apply climatological and physiological knowledge to understand the basis for climate resilient crops and future breeding programmes
4. evaluate threats to future food security and agricultural sustainability under different scenarios of representative concentration pathways
5. assess climate change mitigation adaptation in agricultural context in real world application example

Course name: **Plantation Forest Management**

Course code: **PS 3210 (2/25:10:65)**

Course aim:

The aim of the course is to foster an understanding on the sustainable management of plantation forests to satisfy timber and fuel-wood demand, while enhancing the carbon sequestration and rural economy.

Course capsule:

Overview on plantation forestry; Species selection; Seed collection and management of forest nursery; Planning and implementation of plantation forests; Silvicultural treatments and stand manipulation; Regeneration techniques; Protection of forest plantations from biotic and abiotic threats; Forest mensuration; Harvesting and processing of timber; Saw milling technology; Wood seasoning and preservation; Timber utilization; Agro-forestry and social forestry for rural development.

Course ILOs:

On successful completion of the course, the student shall be able to

1. identify plantation forest species in Sri Lanka.
2. describe the significance of silvicultural treatments and stand manipulation.
3. evaluate the importance of wood seasoning and preservation in timber industry.
4. apply forest mensuration techniques to quantify timber volume in a forest stand.
5. assess the impact of agro-forestry and social forestry on rural development.

**Department of Plant Sciences**  
**Agricultural Biology Module**

Year III Semester II			
Compulsory		Optional	
PS 3212	Plant Breeding Techniques (2)	PS 3218	Applied microbiology(2)
PS 3213	Biotechnology (2)	PS 3219	Advanced Techniques in Molecular biology (2)
PS 3214	Plant Tissue culture (2)	PS 3208	Weed science (2)
PS 3215	Applied and Economic Entomology (2)	PS 3220	Bioinformatics (2)
PS 3216	Clinical plant pathology(2)	PS 3221	Germplasm conservation (2)
PS 3225	Academic and Business English	PS 3222	Stored product and structural pest management (2)
CC XX	Research Methodologies and Scientific Writing	PS 3223	Advanced Phytopathology (2)
		PS 3224	Insect ecology and behavior (2)
		PS 3209	Cottage farm enterprises (2)
		ES 3212	Remote Sensing and GIS in Agriculture (2)
Year IV Semester I			
Compulsory		Optional	
PS 4102	Integrated Plant Protection Technology (2)		

Course name: **Plant Breeding Techniques**

Course code: **PS 3212 (2/ 25:10:65)**

Course aim:

The aim of this course is to enrich students' knowledge on advanced techniques in plant breeding towards improving qualitative and quantitative aspects of crops.

Course capsule:

Overview to genetics and breeding; Genetic basis of crop improvement; Modes of reproduction: self- and cross-pollinated crops, pollination control; Classical breeding techniques; Advanced breeding techniques: mutation breeding, transgene in plant breeding, molecular plant breeding; Molecular plant breeding: gene editing, breeding for enhanced value and composition, breeding for abiotic and biotic resistance; Breeding for enhanced value and composition; Designing plant breeding trials

Course ILOs:

On successful completion of the course, the student will be able to

1. describe different plant breeding techniques.
2. explain the use of phenotypic and genotypic selection techniques for advancing plant genotypes.
3. apply different molecular breeding approaches for abiotic and biotic stress tolerance.
4. discuss recent advances in plant breeding for crop improvement.

Course name: **Biotechnology**

Course code: **PS 3213 (2/20:20:60)**

Course aim:

This course aims to develop students' professional practice in global biotechnology industry and abilities to contribute to the development of science.

Course capsule:

Eukaryotic chromosome architecture; Central dogma; Genome structure: transposable genetic elements, syntenic and repetitive regions; PCR and gel electrophoresis; Overview on molecular markers; Gene expression: structure of genes and transcripts, operons and RNA processing; Gene regulation and RNAi technology; Sequencing techniques: Sanger sequencing, introduction to next generation sequencing & RNAseq technologies; rDNA technology: restriction enzymes, cloning vectors, gene transformation and screening of recombinants; Protein extraction and quantification Application of biotechnology in agriculture and industry: transgenic crop production, edible vaccines, antibiotics, fermentation and bioreactors.

Course ILOs:

On successful completion of the course, the student will be able to

6. describe the steps involved in DNA replication and protein synthesis
7. explain the role of rDNA technology in agriculture
8. discuss different molecular markers and their applications in agriculture
9. evaluate the applications of modern sequencing technology platforms in plant sciences
10. assess the application of biotechnology in agriculture and industry

Course name: **Plant Tissue Culture**

Course code: **PS 3214 (2/15:30:55)**

Course aim:

The aim of this course is to comprehend knowledge on plant tissue culture and develop skills related to its applications.

Course capsule:

Overview on plant tissue culture; Organization of a plant tissue culture laboratory; Aseptic environment and explants' surface sterilization; Plant tissue culture media; Micro-propagation; Tissue culture systems: callus culture, suspension culture, somatic embryogenesis, protoplast culture, haploid production; Somaclonal variation; Production of disease free plants: thermotherapy, chemotherapy, meristem & callus cultures, micro grafting and virus indexing; Secondary metabolite production in *in vitro*; *In vitro* germplasm conservation; *In vitro* flowering and tuberization; Application of plant tissue culture in research and commercial purposes.

Course ILOs:

On successful completion of this course, the student will be able to

6. discuss general theoretical backgrounds of plant cell and tissue culture.
7. explain different tissue culture regeneration systems and their applications.
8. design plant tissue culture experiments for analyzing results with supported literature.
9. apply plant tissue culture techniques in research and commercial purposes.
10. design an *in vitro* protocol to establish an unknown plant species.

Course name: **Applied and Economic Entomology**

Course code: **PS 3215 (2/20:20:60)**

Course aim:

This course aims to provide students with comprehensive knowledge on taxonomy, physiology and economic importance of insects enabling them to demonstrate necessary skills and techniques in related fields.

Course capsule:

Insect phylogeny and taxonomy; Insect identification: use of keys and reference collections, preparation of specimens; Economical importance of insects: pests, beneficial insects, commercial products derived from insects; Molecular techniques in entomology; Bioinformatics in entomology; Nitrogenous excretion in insects; Effect of environmental factors on physiology of insects; Insect diapause and aestivation; Pheromone biology; Chemoreceptors, mechanoreceptors, visual receptors; Effector organs, sensory input and effector output; Post-embryonic development; Plant parasitic nematodes; Acarines

Course ILOs:

On successful completion of the course, the student will be able to

1. discuss the concepts of insect phylogeny and classification.
2. practice different techniques used in insect, nematodes, and acarine identification and sample preparation.
3. explain the advanced concepts of different physiological systems of insects.
4. analyze the impact of environmental factors on the physiology of insects.
5. discuss the economic importance and commercial products derived from insects

Course name: **Clinical Plant Pathology**

Course code: **PS 3209 (2 / 15:30:55)**

Course aim:

This course aims to provide students with comprehensive knowledge and skills on clinical aspects of plant disease diagnosis and management

Course capsule:

Overview of clinical plant pathology; Sterilization of plant pathological tools and equipment; *In vitro* cultures of plant pathogens: isolation, inoculation, identification, confirmation, and maintenance; Quantification of fungal and bacterial inocula; Conventional and molecular biological techniques in diagnosing plant pathogenic microorganisms and nematodes; Management of plant pathogens: chemical and biological; Systematic approach for plant disease diagnosis

Course ILOs:

On successful completion of the course, the student will be able to

1. explain clinical approach of plant diseases identification.
2. apply novel techniques and tools for diagnosing of plant diseases.
3. design a protocol for successful management of plant diseases.
4. organize a plant disease clinic for local farmer community.
5. develop communication skills for disseminating plant pathological aspects to a wider community.



Course name: **Academic and Business English**

Course code: **PS 3225 (1/00:30:20)**

Course aim:

This course will enable students to enhance the practice of English language in academic and business environments by motivating them for life-long learning with modern language learning tools and approaches.

Course capsule:

Root causes for inappropriate use of English; English as a foreign language and linguistic map space; Personalized English learning; Toolkit for learning English: English cinema, social media, online courses, apps; Avoid cross-translation; Think and express in English; Self-directed learning blended with listening, reading, writing and speaking; Movie/documentary night; Reading and writing camp; Public debate

Course ILOs:

On successful completion of the course, the student will be able to

5. summarize information by listening to English speakers from different accents
6. comprehend knowledge by reading English publications from various sources
7. develop competence in public speaking in academic and business settings
8. formulate written documents in English for academic and business forums

Course name: **Applied Microbiology**

Course code: **PS 3218 (2/20:20:60)**

Course aim:

This course enables the students to understand the importance of microbiological techniques and develop skills related to applications of microbes in agriculture and agriculture-based industries.

Course capsule:

Macro molecular interactions; Membrane transport; Actions of antibiotics; Regulation of prokaryotic gene expression; Microbial stress response; Quorum sensing; Biofilms, biosensors and biochips; Plant–microbe interactions: endophytes, biological nitrogen fixation, mycorrhizal symbiosis; Biofertilizers and biopesticides; Bioremediation and bio-deterioration; Plant defense mechanisms; Immunity to bacteria and virus; Antibodies and immunoglobulins; Industrial applications of microbes.

Course ILOs:

On successful completion of the course, the student will be able to

1. explain the regulation of prokaryotic gene expression and quorum sensing in microbial communication.
2. describe the mechanisms of antibiotics in microbial control.
3. discuss the application of antibodies in disease diagnosis
4. evaluate the potential use of biological nitrogen fixation, biofertilizers and biopesticides in sustainable agriculture.
5. apply advanced microbiological techniques in agro-based industries.

Course name: **Advanced Techniques in Molecular Biology**

Course code: **PS 3219 (2/20:20:60)**

Course aim:

This course provides students a comprehensive understanding and applications of advanced molecular biological techniques used in plant sciences.

Course capsule:

Overview on advanced molecular biological techniques; Genomics: next generation sequencing techniques and different PCR types; Transcriptomics and gene expression: RNA sequencing and gene expression analysis by RT-qPCR; Gene regulation: mutagenesis, functional complementation of genes, clustered regularly interspaced short palindromic repeats and CRISPR-associated protein 9 (CRISPR-cas9) gene editing system, and gene silencing by RNAi; Proteomics: protein over expression, detection of protein-protein interactions, and fluorescence protein studies.

Course ILOs:

On successful completion of the course, the student will be able to

1. discuss advanced tools, resources and techniques in plant molecular biology
2. explain the use of advanced molecular techniques in studying gene and protein functions in cellular and whole plant level
3. assess novel molecular techniques applied in advanced research in plant sciences
4. propose appropriate technique/s for a given research based on available resources

Course name: **Weed Science**

Course code: **PS 3208 (2/25:10:65)**

Course aim:

With the successful completion of this course the students will be able to describe the characters of weeds and impacts of weeds on agriculture and other ecosystems and design suitable integrated weed management practices according to the context.

Course capsule:

Overview on weed science; Characters of noxious weeds; Weeds of global and national significance; Weed: biology, competition; Weed management: manual, mechanical, cultural, biological, chemical, integrated weed management; Herbicides: history, herbicide formulations, classification, mode of action, herbicide toxicity; Fate of herbicides in plant and soil: herbicide absorption by plants, effects of environmental factors on herbicide activity, resistance development; Herbicides usage: precautions, first aids and antidotes; Global and Sri Lankan scenario of herbicide industry, herbicide registration.

Course ILOs:

On successful completion of the course, the student will be able to

5. describe the characteristics and biology of weeds.
6. explain the impact of weeds on agriculture and other ecosystems. .
7. comprehend knowledge on herbicides, their activities, and usage
8. apply appropriate weed management strategies for a given situation

Course name: **Bioinformatics**

Course code: **PS 3220 (2/20:20:60)**

Course aim:

This course aims to provide a comprehensive knowledge and skills of computational methods for critically evaluating data related to plant biology.

Course capsule:

Overview on bioinformatics; Biological databases; Web resources for bioinformatics; Exploring the genome with genome browsers; DNA and protein databases: tools for pair-wise sequence alignments, multiple sequence alignments; Molecular phylogenetics: phylogenetic tree construction programs; Prediction of protein structure and functions; Genome annotation & comparative genomics.

Course ILOs:

On successful completion of the course, the student will be able to

1. explain basic concepts of bioinformatics and its significance in biological data handling.
2. demonstrate the use of standard computational methods for handling data in bioinformatics.
3. discuss the uses of analysing the genome, protein, and sequence data.
4. describe applications of bioinformatics in plant biological studies.

Course name: **Germplasm Conservation**

Course code: **PS 3221 (2/25:10:60)**

Course aim:

This course aims to provide a comprehensive understanding of plant genetic resources and their conservation and management.

Course capsule:

Plant genetic resources (PGR); Exploration techniques; Importance of germplasm conservation; Germplasm collection principles and methods; Concept of valuation and rationale for valuing PGR; Characterization and evaluation of PGR; Morphometric, biochemical and molecular characterizations; Phylogenetic analysis; Fundamentals of PGR conservation; *In-situ* and *ex-situ* conservations; Institutions involved in PGR conservation

Course ILOs:

On successful completion of the course, the student will be able to

1. explain the importance of germplasm conservation of plant resources.
2. describe *in-situ* and *ex-situ* germplasm conservation methods of plant genetic resources.
3. plan germplasm conservation strategies for agricultural crops and their wild relatives.
4. select appropriate procedures for the collection of plant germplasms.
5. evaluate the methods available for characterization and regeneration of conserved germplasm.

Course Name: **Stored-product and Structural Pest Management**

Course Code: **PS 3222 (2/15:30:55)**

Course aim:

This course enables the students to acquaint with knowledge on insects infesting stored agricultural produce and different structures and develop skills on appropriate management strategies for a given situation.

Course Capsule:

Overview on stored-product pest management; Groups of organisms in food stores, identification, their salient features, biology and ecology; Insect infestation of stored/processed products and in storage facilities; Quantitative and qualitative losses; Pest in stored food and processing facilities: detection, sampling of insects, conventional and novel methods used for management; Strategies for the management of a given pest infestation.

Course ILOs:

On successful completion of this course students will be able to

1. describe the different types of losses caused by insects to stored agricultural produce.
2. identify species of insects that infest stored products & storage structures and their salient features.
3. compare existing management methods and latest innovations in stored-product protection.
4. design appropriate strategies for the management of pests in stored food in different settings.
5. apply appropriate management strategies in managing stored-product pests.

Course name: **Advanced Phytopathology**

Course code: **PS 3214 (2/25:10:65)**

Course aim:

This course aims to provide students a comprehensive knowledge including novel techniques in the field of phytopathology for diagnosis and effective management of plant diseases.

Course capsule:

Overview of phytopathology; Bacteria, fungi, and virus: morphology, genetics, replication, infection, transmission, signs & symptoms; Significance of phytoplasma and parasitic plants; Plant-pathogen interactions; Effects of pathogens on plant physiology; Genetic basis of resistance and virulence, induced and systemic acquired resistance; Secondary pathways; Epidemiology; Disease forecasting & modeling; Novel plant disease diagnostic tools & techniques; Integrated disease management; Biotechnology approaches in plant pathology; Current trends in phytopathology.

Course ILOs:

On successful completion of the course, the student will be able to

1. distinguish infection mechanisms of different disease-causing organisms.
2. discuss novel techniques used in phytopathology for disease diagnosis.
3. explain the genetic basis of host plant resistance and virulence of a pathogen in a pathosystem.
4. propose appropriate control measures for managing given plant diseases.



Course name: **Insect Ecology and Behaviour**

Course code: **PS 3224 (2/25:10:65)**

Course aim:

This course provides students the principles and concepts on insect ecology, behaviour, and their interactions to comprehend the ecological and economic importance of insects.

Course capsule:

Relationships among insects, plants and physical environment; Insect behaviour: orientation, dispersal, feeding, locomotion, defense, sound production, mating ; Visual and chemical communication; Insect semiochemicals, intraspecific and interspecific communication; Air movement, dispersal and migration of insects; Insect population dynamics; Ecological effects of light; Intra- and inter-specific competition; Predation and parasitism; Insect-plant coevolution; Seasonal effects on conspecific insect behaviour

Course ILOs:

On successful completion of the course, the student will be able to

1. explain different types of behaviour of insects.
2. discuss inter- and intra-specific interactions of insects and environment.
3. describe the impact of abiotic and biotic factors on the insect population dynamics.
4. Relate biological functions of insects to ecosystem services.
5. propose population management strategies using ecological and behavioural features of insects.

Course name: **Cottage Farming Enterprise**

Course code: **PS 3210 (2/ 15:30:55)**

Course aim:

The aim of the course is to develop students' technical and managerial skills related to mushroom culture, beekeeping and nursery management in commercial level and to empower students towards entrepreneurship.

Course capsule:

Mushroom culture; Biology and production of mushrooms; Spawn production; Substrate preparation; Pest and disease management in mushrooms; Harvesting and postharvest handling of mushrooms; Beekeeping: honeybee species, biology and behaviour of honeybees, beekeeping tools, management practices, swarming and absconding, capturing, establishment, dividing of colonies; Nutritive benefits of bee honey; Commercial products derived from beekeeping; Nursery management: establishment of nursery as an enterprise, general management practices in a commercial plant nursery, nursery plant stock management; Initiating a selected cottage farming enterprise

Course ILOs:

On successful completion of the course, the student will be able to

6. describe the biology and production basics of commonly grown mushroom species.
7. explain the biology, ecology, and behaviour of honeybees in Sri Lanka.
8. practice mushroom culture, beekeeping, and nursery management as a profitable venture through a collective approach.
9. incorporate production and economic aspects for long-term success in self-employment.
10. develop entrepreneurial and career skills

Course name: **Integrated Plant Protection Technology**

Course code: **PS 4102 (2/15:30:55)**

Course aim:

This course enables the students to apply the concepts and latest innovations in different pest management strategies in an integrated manner to ensure effective plant protection

Course capsule:

Emergence of pest problems; Evolution of pest management; Pest surveillance; Decision making in pest management; Ecological aspects of pest management; Host plant resistance; Pest management techniques: biological, microbial , sterile insect technique; cultural, physical, mechanical regulator, chemical; Pesticides: classification formulations, chemistry, modes of action; Pesticide regulation; Case studies on integrated pest management (IPM)

Course ILOs:

On successful completion of the course, the student will be able to

1. distinguish the basic steps and tools used in integrated pest management.
2. select suitable pest management methods for a given situation.
3. discuss pesticide technology, classification, formulation, mode of action, applicators, and safe use of pesticides in plant protection.
4. propose integrated pest management programme for a given pest problem to achieve sustainable plant protection.
5. demonstrate effective communication skills on the correct use of integrated plant protection techniques.