Third Year First Semester Courses

No.	Code	Title	Credits
1.	AG 31012	Horticulture II	2:15/30/55
2.	AS 31013	Management of Non Ruminants and Aquaculture Technology	3:30/30/90
3.	AB 31013	Plant Protection	3:30/30/90
4.	AB 31022	Agricultural Biotechnology	2:23/15/62
5.	SS 31013	Soil Classification, Soil Fertility and Plant Nutrition	3:30/30/90
6.	AE 31012	Postharvest Engineering	2:23/15/62
7.	EC 31012	Agriculture and Food Marketing	2:15/30/55
8.	CC 31012	Statistical Methods	2:23/15/62
9.	AC 31012	Principles of Management	2:30/00/70
	Total		**19**

Third Year Second Semester Courses

No.	Code	Title	Credits
1.	AG 32012	Plantation and Export Crops Production	2:23/15/62
2.	AS 32012	Animal Product Processing Technology	2:15/30/55
3.	AB 32012	Genetics and Plant Breeding	2:23/15/62
4.	FS 32012	Food Technology	2:20/20/60
5.	AE 32012	Environmental Engineering	2:23/15/62
6.	EC 32012	Introduction to Econometrics	2:23/15/62
7.	AC 32011	Scientific Writing	1: 00/30/20
8.	AC 32022	English III	2: 30/00/70
	Total		**12**

Third Year Second Semester Specialization Courses

No.	Code	Title	Credits
Department of Agronomy			
9	AG 32022	Resilient and Sustainable Cropping System	2:23/15/62
10.	AG 32032	Commercial Floriculture	2:23/15/62
Department of Animal Science			
9	AS 32022	Sustainable Animal Breeding	2: 23/15/62
10.	AS 32032	Marine and Inland Fish Production	2: 23/15/62
Department of Agricultural Biology			
9	AB 32022	Agricultural Acarology	2: 23/15/62
10.	AB 32032	Nematology	2:23/15/62
Department of Agricultural Chemistry			
Soil Science			
9	SS 32022	Soil Physics for Sustainable Agriculture	2: 20/20/60
10.	SS 32032	Soil Chemistry	2: 23/15/62
Food Science			
9	FS 32022	Food Chemistry	2:23/15/62
10.	FS 32032	Food Microbiology	2:23/15/62
Department of Agricultural Engineering			
9	AE 32022	Irrigation and Water Management	2:23/15/62
10.	AE 32032	Farm Machinery Testing and Evaluation	2:23/15/62
Department of Agricultural Economics			
Applied Economics and Agribusiness Management			
9	EC 32022	Agricultural Development and Policy Analysis	2:30/00/70
10.	EC 32032	Natural Resource and Environmental Economics	2:23/15/62
Agricultural Extension			
9.	EX 32022	Extension Education	2:15/30/55
10.	EX 32032	Development Communication	2:23/15/55
	Total		**4**

Third Year First Semester - Core Courses (31000)

<table>
<tr><td>Course Title</td><td colspan="3">Horticulture II</td></tr>
<tr><td>Course Code</td><td colspan="3">AG 31012</td></tr>
<tr><td>Credit Value</td><td colspan="3">02</td></tr>
<tr><td>Core/Elective</td><td colspan="3">Core course</td></tr>
<tr><td>Prerequisite</td><td colspan="3">None</td></tr>
<tr><td rowspan="2">Notional hours</td><td>Theory</td><td>Practical</td><td>Independent learning</td></tr>
<tr><td>15</td><td>30</td><td>55</td></tr>
<tr><td>Objectives</td><td colspan="3">Enlighten the student with the knowledge and skills on production techniques of fruit crops, orchard management, post-harvest handling, storage, transportation and marketing</td></tr>
<tr><td>Intended Learning Outcomes</td><td colspan="3">• Identify various fruits crops and their varieties based on morphology, climatic requirements, fruit type, and ripening behaviour
• Outline various agronomic practices adopted to enhance the productivity of major fruit crops
• Explain physiological changes that occur in fruits, vegetables, and cut flowers following the harvest.
• Compare maturity indices and ripening behaviour in fruits
• Discuss different techniques of post-harvest handling, storage, and transportation of horticultural crops
• Propose the significance of growing a wide range of fruit crop species for sustainability
• Originate innovative practices to enhance the productivity of a farm</td></tr>
<tr><td>Detailed syllabus</td><td colspan="3">Theory
Present status of fruit crop industry in Sri Lanka; Orchard management for high productivity; Constraints in orchard management; Classification of fruits based on morphology; Climatic requirements; Fruit type and ripening behaviour; Production technology of major fruit crops; Maturity indices and ripening behaviour in fruits; Physiological disorders of fruit crops and remedies; Factors influence the deterioration of horticultural products; Post-harvest physiology for horticultural crops; Post-harvest operations practices in orchards.

Practical
Identification of different fruits based on morphologies of flowers and fruits; Establishment of mango and citrus nursery for the production of rootstocks; Identification and classification of different materials used as planting materials; Using different vegetative techniques to propagate fruit crops (cuttings, layering, grafting and budding etc.); Training and pruning of fruit crops (grapes, mango, guava, pomegranate, and citrus); Identification of banana types; Differentiation of banana suckers and desuckering; Identification of type of flowers; sex expression and fruit</td></tr>
</table>

<table>
<tr><td></td><td colspan="4">types in papaya; Determination of the maturity indices of different products at the field; Sorting and grading of horticultural products; Observations of different post-harvest disorders in horticultural produces; Collection of local materials for the safe packaging of horticultural products; Visit to farmer fields, commercial orchards, warehouses, markets to provide the students to experience the hands-on practices and study the problems faced in the real world.</td></tr>
<tr><td>Teaching and learning Methods/ Activities</td><td colspan="4">Interactive lectures, tutorials, laboratory works, field practical and field visits</td></tr>
<tr><td>Evaluation</td><td colspan="2">Theory (50 %)</td><td colspan="2">Practical (50 %)</td></tr>
<tr><td></td><td>Formative assessment (30%)</td><td>Summative assessment (70%)</td><td>Formative assessment (30%)</td><td>Summative assessment (70%)</td></tr>
<tr><td></td><td>Quiz- 10%
In Class Test -15%
Assignment/ Presentation -5%</td><td>Two hours
Four out of five questions</td><td>Field practical record - 20%
Field visit- 10%</td><td>Practical exam - 30 %
Spot - 30 %
Oral - 10 %</td></tr>
<tr><td>Recommended Readings</td><td colspan="4">1. Brown, L. (2007). Applied principles of horticultural science. Routledge.
2. Durner, E. F. (2013). Principles of horticultural physiology. CABI. UK.
3. Paull, R. E. and Duarte, O. (2011). Tropical fruits (Vol. 1). CABI.
4. Prasantha, B.D.R. (2020). Promising Modified Atmosphere Storage Methods to Protect Shelf-Stable Food Commodities in Sri Lanka. In Agricultural Research for Sustainable Food Systems in Sri Lanka. Springer, Singapore. pp 509-528.
5. Sharma, K.K and Singh, N.P. (2011) Soil and Orchard Management. Daya Publishing House, India.
6. Hosahalli S. Ramaswamy (2014). *Post-harvest Technologies of Fruits &Vegetables*. DEStech Publications, Inc
7. Pradeep Kumar.T (2020). *Management of Horticultural Crops (Horticulture Science* Vol.11. New India Publishing Agency- Nipa
8. Odilo Duarte and Robert E Paull. (2014). *Exotic Fruits and Nuts of the New World.* CABI publications
9. Sudheer K. P and Indira V. (2007). *Post-Harvest Technology of Horticultural Crops: 07: Horticulture Science Series: v. 7*. New India Publishing Agency.
10. Pravendra Nath., Mondher Bouzayen and Autar K Mattoo (2019). *Fruit Ripening*. CABI press</td></tr>
</table>

<table>
<tr><td>Course Title</td><td colspan="3">Monogastric Management and Aquaculture Technology</td></tr>
<tr><td>Course Code</td><td colspan="3">AS 31013</td></tr>
<tr><td>Credit Value</td><td colspan="3">03</td></tr>
<tr><td>Core/Elective</td><td colspan="3">Core</td></tr>
<tr><td>Prerequisite</td><td colspan="3">None</td></tr>
<tr><td rowspan="2">Notional hours</td><td>Theory</td><td>Practical</td><td>Independent learning</td></tr>
<tr><td>30</td><td>30</td><td>90</td></tr>
<tr><td>Objective/s</td><td colspan="3">Impart knowledge on efficient management of monogastrics and the fundamentals of aquaculture technology.</td></tr>
<tr><td>Intended Learning Outcomes</td><td colspan="3">• Select suitable breeds according to the need
• Describe skills on management of poultry, swine and rabbit
• Describe the hatchery management practices for optimum production
• Suggest appropriate hygienic practices for production of meat and egg
• Plan a model farm for given circumstances
• Discuss the fundamental principles of aquaculture
• Recommend appropriate technologies related to aquaculture
• Identify the problems associated with aquaculture industries
• Demonstrate the basic functions in different aquaculture practices</td></tr>
<tr><td>Detailed syllabus</td><td colspan="3">Theory
Management of poultry: parent stock, incubation, brooding, growers, layers and broilers; Egg quality determination, Management of swine: management of boar, sow, piglings, growers/ fatteners; Management of rabbits; Judging and culling ; Housing systems of poultry swine and rabbits; Identification methods and herd management tools , farm planning and record keeping; Introduction to aquaculture; Current status of aquaculture; finfish and shell fishes in aquaculture ; Fisheries and aquaculture resources; Different aquaculture systems; Fundamental management in aquaculture: brood stock management, nursery management, feeding management, basic health management practices and water quality management.

Practical
Identification of monogastrics; Performance evaluation; Selection of egg for incubation; Incubator management; Brooder management; Starter, grower and layer management; Broiler management; Duck and turkey management; Cost benefit analysis for a given flock of poultry; Swine: feeding of swine, general management practices of swine and housing of swine; Herd composition; Rabbit: handling of rabbits, construction of different types of cages for different classes of rabbits; Biology of finfish and shellfish; Dissection of fish; Identification of finfish and shellfish;</td></tr>
</table>

<table>
<tr><td></td><td colspan="4">Basic aquaculture tools and equipment; Determination of water quality parameters; Field visits to study fish breeding methods and landing sites</td></tr>
<tr><td>Teaching and Learning Methods / Activities</td><td colspan="4">Interactive lectures, paired learning, practical, tutorials, group learning, field visits and assignments</td></tr>
<tr><td rowspan="3">Evaluation</td><td colspan="2">Theory (67%)</td><td colspan="2">Practical (33%)</td></tr>
<tr><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td></tr>
<tr><td>Quiz- 10%
In Class Test- 15%
Presentation, (Proposal) and Assignment -5%</td><td>Three hours Five out of six questions</td><td>Laboratory practical record - 10%
Field trip reports - 10%
Field Assignments- 10%</td><td>Practical exam- 30%
Spot exam-30%
Oral-10%</td></tr>
<tr><td>Recommended Readings</td><td colspan="4">1. Fuller, J.G. and Alexander, A.S. (2012). Practical Swine Management. Nabu Press.
2. Dematawewa, B.C.M., Silva, G.L.L.P., and Premasundera, A.S. (2009). Swine industry in Sri Lanka. 1st edition. Department of animal production and health Getambe, Peradeniya.
3. Sherlock. C.C. (2009). Care and Management of Rabbits. Cornell University Library.
4. Coburn, F.D. (2009). Swine Husbandry: A Practical Manual for the Breeding, Rearing and Management of Swine, With Suggestions as to the Prevention and Treatment of Their Diseases. Cornell University Library.
5. Gupta V. K. (2008). Management in Small Poultry Farms. Abhinav Publications.
6. Jull, M.A. (2008). Successful Poultry Management. 2nd Edition. Biotech Books.
7. Saif, Y.M., Fadly, A.M., Glisson, J.R., Mcdougald, L.R., Nolan, I.K. and Swayne, D.E. (2008). Diseases of poultry. 12th Edition. Wiley-Blackwell.
8. Lucas, J.S. and Southgate, P.C. (2012). Aquaculture: farming aquatic animals and plants. 2nd Edition. Wiley-Blackwell.
9. Parker, R. (2012). Aquaculture science. International edition, Printed in the United States of America.
10. Tidwell, J.H. (2012). Aquaculture production systems. 1st Edition. Wiley-Blackwell.</td></tr>
</table>

<table>
<tr><td>Course Title</td><td colspan="4">Plant Protection</td></tr>
<tr><td>Course Code</td><td colspan="4">AB 31013</td></tr>
<tr><td>Credit Value</td><td colspan="4">03</td></tr>
<tr><td>Core/Elective</td><td colspan="4">Core</td></tr>
<tr><td>Prerequisite</td><td colspan="4">None</td></tr>
<tr><td rowspan="2">Notional hours</td><td>Theory</td><td colspan="2">Practical</td><td>Independent learning</td></tr>
<tr><td>30</td><td colspan="2">30</td><td>90</td></tr>
<tr><td>Objective/s</td><td colspan="4">Impart knowledge on economically important pests and diseases of crops and their management, hands on training to identify pest and diseases and develop a suitable IPM model for different cropping system.</td></tr>
<tr><td>Intended Learning Outcomes</td><td colspan="4">• Demonstrate the different category of pests
• Describe the damaging stages of the various pests and specific management strategies
• Categorize the insect pests according to the feeding habits
• Measure the losses due to pest and diseases.
• Identify the pests using symptoms
• Propose suitable IPM methods to manage the crop pests and diseases
• Integrate pest management principles in the field scenario.
• Design pest forecasting models</td></tr>
<tr><td>Detailed syllabus</td><td colspan="4">Theory
Concepts of pest; EIL/ETL and pest management; Major insect pests of cereals, legumes, vegetables, orchard crops, plantation crops, stored products and their management; Plant diseases and distribution of diseases in crop ecosystem; Parasitic nematodes and management; Different methods for integrated pest management in different ecosystems; Pesticide use and safety; Management of pesticides.
Practical
Plant protection appliances and their uses in Integrated Pest Management; Pesticides and their management; Diseases and insect pests of rice, pulses; Oil seed crops: ground nut, sesamum and castor; Vegetables: brinjal, tomato, chilli and okra; Cole crops: cabbage, cauliflower and radish; Tuber crops: potato, sweet potato, manioc; Fruit crops: mango, banana, citrus, guava, pomegranate, papaya and grapes; Fungicides and their usage; Developing integrated disease management for various diseases, Field visits to study the pest status and their management.</td></tr>
<tr><td>Teaching and Learning Methods / Activities</td><td colspan="4">Interactive Lectures, group discussion, assignments, laboratory practical, field practical</td></tr>
<tr><td rowspan="2">Evaluation</td><td colspan="2">Theory (67%)</td><td colspan="2">Practical (33%)</td></tr>
<tr><td>Formative Assessment</td><td>Summative Assessment</td><td>Formative Assessment</td><td>Summative Assessment</td></tr>
</table>

	(30%)	(70%)	(30%)	(70%)
	Quiz- 10% In Class Test– 15% Assignments -5%	Three hours Five out of six questions	Practical records - 10% Insect rearing - 10% Pesticide survey report 10%	Practical exam -30% Spot -30% Oral - 10%
Recommended Readings	1. Capinera, J. (2020). Handbook of Vegetable Pests. Elsevier Science. 2. Agrios, G. N. (2004). Plant pathology. 5th edition. Academic press 3. Madedia, K.M, Dakouo, D. and Mota-Sanchez, D. (2003). Integrated Pest Management in the Global Arena, CABI Publishing, p.522 4. Lee, D.L. (2002). The Biology of Nematodes. APS press. 5. Narayanasamy, P. (2001) Plant Pathogen Detection and Disease Diagnosis. Marcel Dekker. 6. Singh, K. (1998). Principles of plant pathology. Kalyani publications, New Delhi. 7. Dubey, and Mageswary, (1999). Text book of microbiology. Kalyani publications, New Delhi. 8. Pathak, M.D. and Khan, Z.R. (1994). Insect Pests of Rice. IRRI - International Rice Research Institute			

Course Title	**Agricultural Biotechnology**		
Course Code	**AB 31022**		
Credit Value	**02**		
Core/Elective	Core		
Prerequisite	None		
Notional hours	Theory	Practical	Independent learning
	23	15	62
Objective/s	Impart knowledge and skills of biotechnology in crop improvement and agricultural applications		
Intended Learning Outcomes	● Demonstrate the importance of biotechnology in crop production ● Explain the *in-vitro* cell culture techniques in quality homogeneous planting material production ● Demonstrate the importance of recombinant DNA technology and their application in agriculture ● Analyze the genetic variations of the organism using molecular ● Develop new crop varieties through different types of *in-vitro* cell culture techniques		

<table>
<tr><td></td><td colspan="4">

- Apply suitable biotechnological techniques in various agro based industries' production
- Design for a laboratory for *in-vitro* culture with aseptic and controlled environment.

</td></tr>
<tr><td>Detailed syllabus</td><td colspan="4">

Theory

Importance of agricultural biotechnology; Tissue culture techniques; Requirements for *in-vitro* cultures; Micro propagation; Type of cultures; Germplasm conservation; Gene and cDNA libraries; Regulation and expression; DNA sequencing; DNA finger printing; Gene silencing; Vector; Recombinant DNA technology; *Agrobacterium*-mediated transformation techniques; Transgenic plants; PCR, RFLP, RAPD, Gene technology for plant protection; Bioethics; Career opportunities in agricultural biotechnology.

Practical

Wet, dry, heat, filter and surface sterilization techniques; Preparation of different types of artificial nutrient media for micro-propagation; Preparation of explants for different crops; Plant cell culture and subculture; Rooting and acclimatization techniques; DNA extraction from plants using CTAB method; Polymerase Chain Reaction and Agarose gel electrophoresis.

</td></tr>
<tr><td>Teaching and Learning Methods / Activities</td><td colspan="4">Interactive lectures, Group discussion, Assignments, field visit, laboratory practical</td></tr>
<tr><td rowspan="3"></td><td colspan="2">Theory (75%)</td><td colspan="2">Practical (25%)</td></tr>
<tr><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td></tr>
<tr><td>Quiz- 10%
In Class Test–15%
Assignments -5%</td><td>Two hours
Four out of five questions</td><td>Practical records -15%
Field visit reports -15%</td><td>Practical exam - 30%
Spot -30%
Oral - 10%</td></tr>
<tr><td>Recommended Readings</td><td colspan="4">

1. Abdin. and Malik Zainul. (2017). Plant Biotechnology: Principles and application. Singapore Springer Nature.
2. Clark. and David. (2016). Biotechnology. Amsterdam Elsevier
3. Dubey, R.C. (2010). A Text book of biotechnology. New Delhi S Chand.
4. Rao. and Madhusudan. (2013). Plant tissue culture and biotechnology. New Delhi Black prints.
5. Chawila, H.S. (2011). Introduction to Plant biotechnology. New Delhi oxford IBH pub.
6. Bradley, J.T. *et al*. (2015). Low cost methods for molecular characterization of mutant plants. International Atomic Energy Agency.
7. Ciftci, Y.O. (2012). Transgenic plants Advances and Limitation. InTech.

</td></tr>
</table>

<table>
<tr><td>Course Title</td><td colspan="3">Soil classification, fertility and plant nutrition</td></tr>
<tr><td>Course Code</td><td colspan="3">SS 31013</td></tr>
<tr><td>Credit Value</td><td colspan="3">03</td></tr>
<tr><td>Core/Elective</td><td colspan="3">Core</td></tr>
<tr><td>Prerequisite</td><td colspan="3">None</td></tr>
<tr><td rowspan="2">Notional hours</td><td>Theory</td><td>Practical</td><td>Independent learning</td></tr>
<tr><td>27</td><td>36</td><td>87</td></tr>
<tr><td>Objective/s</td><td colspan="3">Provide knowledge about soil classification, soil survey and mapping, soils of Sri Lanka and to impart knowledge and skills required for sustainable plant nutrition and soil fertility management</td></tr>
<tr><td>Intended Learning Outcomes</td><td colspan="3">• Explain soil variability, soil survey and mapping
• Classify soils at different levels based on the properties
• Evaluate soils of Sri Lanka based on potentials and limitations
• Judge nutrient availability in different soils
• Choose fertilizer recommendation and application methods for different purposes
• Compare and contrast different types of fertilizers
• Analyze plants, soil, and fertilizers to evaluate the same
• Discuss nutrient availability in submerged soils</td></tr>
<tr><td>Detailed syllabus</td><td colspan="3">Theory
Kinds of soil information; Soil survey and mapping: remote sensing and geographic information system in soil survey reports and maps; Soil classification: importance of soil classification, systems of soil classification, soil taxonomy; Soils of Sri Lanka: classification, agricultural potentials and limitations; Macro and micro nutrients: their availability in soils, nutrient cycling and influence by human, role of nutrients in plant nutrition, deficiency and toxicity of plant nutrients; Fertilizers: manufacture and properties of fertilizers, methods of fertilizer application, fertilizer use efficiency, organic sources of nutrients; Soil nutrient evaluation and fertilizer recommendation; Nutrient availability in acid soils; Alkaline soils and submerged soils.

Practical
Study of profiles of different soils of Sri Lanka; Introduction to use of software of Geographic Information System; Qualitative tests for fertilizers and essential elements; Study of deficiency and toxicity symptoms; Determination of total nitrogen, available nitrogen, available phosphorus, available potassium, available sulfur, available calcium, available magnesium, lime requirement; Determination of plant nutrients, rapid plant tissue tests for nutrients.</td></tr>
<tr><td>Teaching and Learning Methods / Activities</td><td colspan="3">Lectures, Think-pair-share learning, fish bowl learning, Jig-Zaw learning, Group Discussions, Group presentations, laboratory practicals, field practicals, case studies</td></tr>
</table>

Evaluation	Theory (60%)		Practical (40%)	
	Formative Assessment (30%)	Summative Assessment (70%)	Formative Assessment (30%)	Summative Assessment (70%)
	Quiz- 10% In-class Test -15% Assignment - 5%	Three hours Five out of six questions	Practical Records/ Assignments- 30%	Practical exam- 40 % Spot Exam - 20 % Oral - 10 %
Recommended Readings	1. Brady,N.C and Weil,R.R (2002). The Nature and Properties of soil, 13th edition, Prentice Hall, New Jersey. 2. Benton, J.J (2012). Plant nutrition and Soil Fertility Manual, 2nd edition, CRC Press 3. Panpatte, D.G and Jhala,Y.K (eds). (2019). Soil fertility Management for Sustainable Development 4. White, R.E. (2006). Principles and Practice of Soil Science. 4th edition, Blackwell Publishing, Australia 5. Mapa, R.B (2020). (eds.) The soils of Sri Lanka, world soil book series, Springer.			

Course Title	**Postharvest Engineering**		
Course Code	**AE 31012**		
Credit Value	**02**		
Core / Elective	Core		
Prerequisite	None		
Notional hours	Theory	Practical	Independent learning
	21	21	58
Objectives	Provide adequate knowledge and practical skills on postharvest engineering aspects of agricultural produces and products to reduce postharvest losses by implementing appropriate strategies.		
Intended Learning Outcomes	• Identify postharvest losses of agricultural produces and the factors that affect postharvest losses. • Explain basic scientific concepts of postharvest engineering and their importance. • Analyze reasonable techniques to reduce losses after harvesting for of agricultural produces. • Describe basic maturity indicators of fruits and vegetables. • Relate fundamentals of thermal processing and psychometric processing to the design of processing machines.		
Detailed Syllabus	**Theory** Parboiling of grains; Principle of parboiling: changes in parboiling, methods of parboiling; Storage of grains: requirement for storage, factors affecting storage, storage methods; Separation of grains: separation methods, husking of grains, milling operation, polishing and whitening,		

<table>
<tr><td></td><td colspan="4">Grinding: plain grinding and selective grinding, grinding machines; Physical and thermal properties of agricultural produces; Laws of thermodynamics and their fundamentals; Ideal cycles with perfect gases; Thermodynamic properties of water and steam; Psychrometry and drying of grains; Usage of psychometric chart; Drying; Dehydration and selection of grain dryers; Quality control and grading system; Combine harvester; Threshers; Reapers and their losses.

Practical
Paddy parboiling; Heat exchanger design for processing; Applications of rheology in postharvest engineering; Mass transfer in packaging materials; Mass and energy balance applications in postharvest engineering; Function operation and maintenance of milling machines; Measurement of physical properties; Components of combine harvesters and their maintenance; Milling yield analysis; Cooling load calculations; Cyclone design for grain separations; Applications of thermodynamics in postharvest engineering; Dehydration system design; Application of belt conveyors; Pneumatic conveyors; Screw conveyors and bucket elevators in postharvest handling of grains.</td></tr>
<tr><td>Teaching and learning methods</td><td colspan="4">Lectures, Tutorials, Practical demonstrations, Group presentation, Field practical and Field visits.</td></tr>
<tr><td>Evaluation</td><td colspan="4"><table>
<tr><td colspan="2">Theory (67 %)</td><td colspan="2">Practical (33 %)</td></tr>
<tr><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td></tr>
<tr><td>Quiz - 10%
In Class Test - 15%
Assignment/ Presentation - 5%</td><td>Two hours
Four out of five questions</td><td>Practical records/ Assignments - 20%
Field visit reports - 10 %</td><td>Practical exam - 30%
Spot - 30%
Oral - 10%</td></tr>
</table></td></tr>
<tr><td>Recommended Readings</td><td colspan="4">
Jian, F., and Jayas, D.S., (2021). Grains: Engineering Fundamentals of Drying and Storage. Taylor & Francis Group.
Chakraverty, A. and Singh, R.P., (2014). Postharvest Technology and Food Process Engineering. CRC Press, Taylor and Francis Group
Shewfelt, R.L., and Prussia, S.E., Taylor, S., (2012). Postharvest Handling: A Systems Approach, ISSN. Elsevier Science.
Rizvi, S.S.H., and Mittal, G.S., (1992). Experimental Methods in Food Engineering. Springer US.
Toledo, R.T., Singh, R.K., and Kong, F., (2018). Fundamentals of Food Process Engineering, Food Science Text Series. Springer International Publishing.
</td></tr>
</table>

<table>
<tr><td>Course Title</td><td colspan="3">Agriculture and Food Marketing</td></tr>
<tr><td>Course Code</td><td colspan="3">EC 31012</td></tr>
<tr><td>Credit value</td><td colspan="3">02</td></tr>
<tr><td>Core / Elective</td><td colspan="3">Core</td></tr>
<tr><td>Prerequisite</td><td colspan="3">None</td></tr>
<tr><td rowspan="2">Notional hours</td><td>Theory</td><td>Practical</td><td>Independent learning</td></tr>
<tr><td>15</td><td>30</td><td>55</td></tr>
<tr><td>Objectives:</td><td colspan="3">Provide students with a theoretical and empirical basis for evaluating the performance of agricultural marketing organizations, the market of agricultural commodities and the impact of public policy on producer and consumers welfare.</td></tr>
<tr><td>Intended Learning Outcomes</td><td colspan="3">• Apply economic theory to problems of agricultural marketing
• Design strategies for effective market performance
• Explain the marketing concepts for analyzing market structure and performance in agriculture and formulation of effective agricultural marketing policy
• Apply theoretical models of imperfect market structures to inform public policy
• Explain the organizational forms unique to agricultural industries.
• Discuss the price discovery mechanisms under different market structures
• Explain marketing decisions</td></tr>
<tr><td>Detailed Syllabus / Course Content</td><td colspan="3">Theory
Introduction to food marketing; Market imperfections and Market failure; Agricultural production and marketing; Food wholesaling and retailing; Price analysis and exchange function; Competition in food markets; Food marketing costs; Market development and demand expansion; Market bargaining power; Market information; Standardization and grading.

Practical
Identifying the types of markets functioning around the Northern region; Recording the seasonal fluctuations of the market prices for agricultural commodity; Estimating the transportation cost, retailer and wholesaler margins for some selected agricultural commodities; Collecting information regarding existing storage; Grading and sales promotions system around the peninsula; Estimating the percentage of value addition for some selected agricultural products.</td></tr>
<tr><td>Teaching and learning methods</td><td colspan="3">Interactive lectures, tutorials, laboratory works, group presentation, group discussion, field practical, field visits and Problem based learning</td></tr>
</table>

Evaluation	Theory (50%)		Practical (50%)		
	Formative assessment (30%)	Summative Assessment (70%)	Formative assessment (30%)	Summative Assessment (70%)	
	Quiz- 10% In Class Test -15% Assignment/ Presentation -5%	Two hours Four out of five questions	Field practical records - 20 % Field visit reports - 10 %	Practical exam-30 % Spot - 30 % Oral- 10 %	
Recommended readings:	1. Kohls, R.L. and Uhl, J.N. (2002). Marketing of Agricultural Products. Prentice Hall. 2. Amstrong Gary and Philip Kotler. (1997). Marketing an introduction. Pearson, International Edition. 3. Debertin, D.L. (1986). Agricultural Production Economics. Collier Macmillan publishers. 4. Gregory Mankiw. (2007). Principles of Micro Economics. Thomson south-western, USA				

Course Title	**Statistical Methods**		
Course Code	**CC 31012**		
Credit Value	**2**		
Core/Elective	Core		
Prerequisite	None		
Notional hours	Theory hours	Practical hours	Independent learning
	23	15	62
Objective/s	Provide the students with the fundamentals bio-statistics of probability, statistical methods, and data analysis by manual and with aid of statistical packages and interpreting the results from statistical tests.		
Intended Learning Outcomes	• Identify the role of descriptive statistics and the importance of summary measures to describe characteristics of a data set • Explain fundamentals of probability and various probability rules • Use Ms Words, Excel to represent raw data into a summarized format • Explaining the procedures to be followed in conducting statistical tests. • Describe foundations for classical inference involving confidence intervals and hypothesis testing • Explain the impact of the application of statistical methods on decision making • Perform several data handling operations available in excel • Perform a wide variety of parametric statistical test manually and with the aid of computer packages		

<table>
<tr><td></td><td colspan="4">

- Apply objectivity in the interpretation of the results
- Interpret and report regression outcomes
- Calculate and interpret a chi-square statistic.

</td></tr>
<tr><td>Detailed syllabus</td><td colspan="4">Theory
Introduction to Bio-Statistics; Frequency Distributions and Graphic Presentations; Introduction to descriptive Statistics; Measures of central tendency; Dispersion ad position; Probability; Discrete and continuous probability distributions; Sampling methods; Central limit theorem; Sampling distribution, Estimation and confidence intervals of concepts Hypothesis testing; Null and alternative hypothesis; Types of errors; Tests of significance; One-Sample tests and two-Sample Tests; F-test; Chi square test; Correlation and regression,

Practical
Refreshment and enhancement of working ability with MS Excel; Introduction to MS Excel; Excel functions (Text functions, Mathematical and trigonometric functions; Logical function; Statistical functions and formula); Charts and General analysis; Systematic approach of data; Tabulation.</td></tr>
<tr><td>Teaching and Learning Methods / Activities</td><td colspan="4">Theory Lectures, Computer Laboratory Practical, Individual Assignments</td></tr>
<tr><td rowspan="3">Evaluation</td><td colspan="2">Theory (75%)</td><td colspan="2">Practical (25%)</td></tr>
<tr><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td></tr>
<tr><td>Quiz- 10%
In Class Test – 15%
Assignment -5%</td><td>Two hours
Four out of five questions</td><td>Assignment1- 10%
Assignment2- 10%
Assignment3- 10%</td><td>Practical exam – 70%</td></tr>
<tr><td>Recommended Readings</td><td colspan="4">

1. Ken Bluttman, (2019). Excel Formulas & Functions For Dummies, 5th Edition, John Willey & Sons Inc.
2. Bill Jelen and Michael Alexander, (2019). Microsoft Excel Pivot Table Data Crunching (Business Skills), 1st Edition, Pearson Education, Inc.
3. Mead, R., Curnow, R.N. and Hasted, A.M., (1993). Statistical methods in Agriculture and experimental biology. 2nd edition. Chapman and hall, London.
4. Aczel, A.D. (1995). Statistics: Concepts and application. lrwin, Chicago.
5. Rohlf, F.J (2011). Biometry. W. H. Freeman
6. Sokal, R.R. (2012). Statistical Tables. Chapman and Hall.

</td></tr>
</table>

<table>
<tr><td>Course Title</td><td colspan="3">Principles of Management</td></tr>
<tr><td>Course Code</td><td colspan="3">AC 31012</td></tr>
<tr><td>Credit Value</td><td colspan="3">02</td></tr>
<tr><td>Core/Elective</td><td colspan="3">Core</td></tr>
<tr><td>Prerequisite</td><td colspan="3">None</td></tr>
<tr><td rowspan="2">Notional hours</td><td>Theory</td><td>Practical</td><td>Independent learning</td></tr>
<tr><td>30</td><td></td><td>70</td></tr>
<tr><td>Objectives</td><td colspan="3">Provide a basic understanding of principles of management to develop the ability to apply them in diverse contexts.</td></tr>
<tr><td>Intended Learning Outcomes</td><td colspan="3">• Define the basic management theories
• Explain the evolution of management in various eras
• Explain the managerial roles, levels, and skills of the organization
• Identify the functions of Management
• Express the necessity of good management practices in organizations</td></tr>
<tr><td>Detailed syllabus</td><td colspan="3">Theory
Introduction to management; The evolution of management theory; Planning; Importance of planning, Types of plans; Vision; Mission; Goals; Objectives; Aims; Tasks; Formal planning process; Importance of decision making process and types of decisions; Organizational structure; Co-ordination in Organization; Delegation of Authority; Responsibility; Accountability; Span of control; Power; Centralization and decentralization; Departmentalization; Leadership and motivation and controlling.</td></tr>
<tr><td>Teaching and Learning Methods / Activities</td><td colspan="3">Interactive lectures, tutorials, group presentation, group discussion, and Problem based learning</td></tr>
<tr><td rowspan="3">Evaluation</td><td colspan="3">Theory</td></tr>
<tr><td>Formative Assessment (30%)</td><td colspan="2">Summative Assessment (70%)</td></tr>
<tr><td>Quiz- 10%
In Class Test – 15%
Assignment/ Presentation -5%</td><td colspan="2">3 hours
Five out of six questions</td></tr>
<tr><td>Recommended Readings</td><td colspan="3">1. Daft, R.L, (2012). New Era of Management, 10th Edition, Cengage Learning, New Delhi
2. Griffin, R.W (2013). Management: Principles and Applications, 10th Edition, Cengage Learning, New Delhi
3. Ghuman, K, and Aswathappa, K (2010). Management concepts Practice and Cases, Tata McGraw-Hill, New Delhi
4. Koontz, K., and Weihrich, H. (2010). Essentials of Management: An International Perspective, 8th Edition, Tata McGraw-Hill, New Delhi</td></tr>
</table>

Third Year Second Semester - Core Courses (32000)

<table>
<tr><td>Course Title</td><td colspan="3">Plantation and Export Crops Production</td></tr>
<tr><td>Course Code</td><td colspan="3">AG 32012</td></tr>
<tr><td>Credit Value</td><td colspan="3">02</td></tr>
<tr><td>Core/Elective</td><td colspan="3">Core course</td></tr>
<tr><td>Prerequisite</td><td colspan="3">None</td></tr>
<tr><td rowspan="2">Notional hours</td><td>Theory</td><td>Practical</td><td>Independent learning</td></tr>
<tr><td>23</td><td>15</td><td>62</td></tr>
<tr><td>Objectives</td><td colspan="3">Impart the students with the knowledge and skills on the production and processing technology of plantation and export agricultural crops with different methods of value addition techniques to improve their export qualities</td></tr>
<tr><td>Intended Learning Outcomes</td><td colspan="3">• List different plantation and export crops and their ecological requirements for commercial cultivation
• Identify different cultivars of plantation and export crops based on their morphological characters
• Demonstrate common methods of propagation and planting techniques of important plantation and export crops
• Outline the recommended agronomic practices to produce plantation and export agricultural crops
• Explain the benefits of intercropping, shade trees and other land use management practices to improve the productivity in the plantations
• Describe the appropriate harvesting methods and postharvest operations to obtain quality end products
• Elaborate different processing and value addition techniques adopted for the products and by-products from plantation and export crops
• Discuss different strategies to improve the export quality and marketability of the end products</td></tr>
<tr><td>Detailed syllabus</td><td colspan="3">Theory
Significance of plantation (i.e., tea, rubber, and coconut) and export crops (i.e., coffee, cocoa, pepper, cloves, cardamom, nutmeg, cinnamon, cashew, vanilla, betel, and palmyrah) in Sri Lanka’s economy; Constraints to the plantation and export crop sector in Sri Lanka; Ecological requirements and geographical distribution; Propagation methods; Nursery establishment and management; Field establishment; Nutrient and water management; Crop protection; Pruning and training; Shade trees; Intercropping; Special management practices; Harvesting and processing; Grading and value addition.</td></tr>
</table>

<table>
<tr><td></td><td colspan="4">Practical

Visiting plantations and relevant research institutes to practice identification of different cultivars of plantation and export crops; Propagation methods; Nursery establishment and management; Field establishment; Fertilizer application; Soil water conservation practices; Pests, diseases and weed management; Intercropping methods in coconut estates; Establishment of shade trees in tea plantations; Special management practices, harvesting and postharvest operations; Study visits to the small, medium and large scale factories and industries to get hands-on experiences on processing; Value addition; Record keeping and quality assurance of different products and by products of plantation and export crops.</td></tr>
<tr><td>Teaching and Learning Methods</td><td colspan="4">Interactive lectures, tutorials, assignments, laboratory works, field practical and field visits</td></tr>
<tr><td rowspan="3">Evaluation</td><td colspan="2">Theory (75 %)</td><td colspan="2">Practical (25 %)</td></tr>
<tr><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td></tr>
<tr><td>Quiz- 10%
In Class Test -15%
Assignment/ Presentation -5%</td><td>Two hours
Four out of five questions</td><td>Field practical record- 20%
Field visit - 10%</td><td>Practical exam - 30 %
Spot - 30 %
Oral - 10 %</td></tr>
<tr><td>Recommended Readings</td><td colspan="4">

1. De Costa, W. A. J. M, Mohotti, A. J. and Wijeratne, M. A. (2007). Ecophysiology of Tea. *Brazilian Journal of Plant Physiology*, 19(4), 299-332.
2. Mahindapala, R. and Pinto, J. L. J. G. (1991). Coconut cultivation. Coconut Research Institute, Lunuwila, Sri Lanka.
3. Chopra, V and Peter, K. (2008). Handbook of Industrial Crops. CRC press, Routledge.
4. Department of Export Agriculture of Sri Lanka, web database (www.dea.gov.lk).
5. Handbook of Tea, Tea Research Institute of Sri Lanka, Talawakelle, Sri Lanka.
6. Shanmugavelu, K. G., Kumar, N. and Peter, K. V. (2002). Production Technology of Spices and Plantation Crops. Agrobios, India.
7. Carr M. K. V. (2012). *Advances in Irrigation Agronomy: Plantation Crops*, 1st edition Cambridge University Press.
8. Bhani Ra m., Mamta Dal. and Anil Sharma (2016). *Plantation Crops*. New India Publishing Agency.
9. Sivaram, B. (2000). *Plantation management in the new millennium. National Institute of Plantation Management*, Athuragiriya.
10. Ravindran, P. N and. Madhusoodanan, K. J (2002). *Cardamom*. 1st Edition, CRC Press, India.
11. Varadathasan sanmugavel (2019). *Eco-friendly Cardamom Cultivation*. Independently published, India

</td></tr>
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<table>
<tr><td>Course Title</td><td colspan="3">Animal Products Processing Technology</td></tr>
<tr><td>Course Code</td><td colspan="3">AS 32012</td></tr>
<tr><td>Credit Value</td><td colspan="3">02</td></tr>
<tr><td>Core/Elective</td><td colspan="3">Core</td></tr>
<tr><td>Prerequisite</td><td colspan="3">None</td></tr>
<tr><td rowspan="2">Notional hours</td><td>Theory</td><td>Practical</td><td>Independent learning</td></tr>
<tr><td>15</td><td>30</td><td>55</td></tr>
<tr><td>Objective/s</td><td colspan="3">Impart knowledge on value addition and quality control of milk, meat and fish. Performing cost benefit analysis for value added products.</td></tr>
<tr><td>Intended Learning Outcomes</td><td colspan="3">• Describe the process of clean milk production
• Describe the composition and physicochemical properties of milk, meat and fish.
• Identify the factors affecting the composition of milk, meat and fish.
• Explain the aspects of value chain management and quality control of milk
• Describe the steps involved in processing of milk, meat and fish.
• Discuss the aspects of slaughtering management.
• Describe meat and fish preservation techniques.
• Assess the quality of raw products and processed products of fish and meat.
• Estimate the profitability of different animal products</td></tr>
<tr><td>Detailed syllabus</td><td colspan="3">Theory
History, Present status and scope of the dairy industry in Sri Lanka; Clean milk production, Composition, properties and factors affecting milk composition; Spoilage of milk; Milk supply chain management and quality control; Milk processing techniques; Fat rich dairy products: ghee, butter, cream; Starter cultures and fermented dairy products: yoghurt, cheese, ice cream and frozen dairy products; Condensing and drying of milk; Slaughtering of farm animals; Carcass quality and Meat preservation; Meat products; Processing and preservation of fish; Principles of value addition to eggs.

Practical
Clean milk production (Milking Techniques), Determination of milk fat and MSNF using Gerber test and Lactometer reading; Determination of adulterants in milk; Milk Processing: standardization of milk, preparation of ghee, preparation of butter, preparation of cream, preparation of set and stirred yoghurts, preparation of cheese, preparation of ice cream, condensing and drying of milk, preparation of meat products, preparation of different fish and egg products, Assessing carcass quality.</td></tr>
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<table>
<tr><td>Teaching and Learning Methods / Activities</td><td colspan="4">Interactive lectures, fishbowl learning, practical, tutorials, group discussion, field visits and assignments</td></tr>
<tr><td rowspan="3">Evaluation</td><td colspan="2">Theory (50%)</td><td colspan="2">Practical (50%)</td></tr>
<tr><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td></tr>
<tr><td>Quiz- 10%
In Class Test- 15%
Presentation, (Proposal) and Assignment -5%</td><td>Two hours
Four out of five questions</td><td>Laboratory practical records - 10%
Field trip reports - 10%
Field assignments - 10%</td><td>Practical exam - 30%
Spot exam - 30%
Oral - 10%</td></tr>
<tr><td>Recommended Readings</td><td colspan="4">1. Truong, T., Lopez, C., Bhandari, B. and Prakash, S., (2020). Dairy Fat Products and Functionality,Springer Cham.
2. Walstra, P., Walstra, P., Wouters, J.T. and Geurts, T.J., (2005). Dairy science and technology. CRC press.
3. Chavan, R.S. and Goyal, M.R. eds., (2018). Technological Interventions in Dairy Science: Innovative Approaches in Processing, Preservation, and Analysis of Milk Products. CRC Press.
4. Fatih, Y. (2019). Development And Manufacture Of Yogurt And Other Functional Dairy Products. S.L.: Crc Press.
5. Mine, Y. ed., (2008). Egg bioscience and biotechnology. John Wiley & Sons.
6. Wong, N.P., (2012). Fundamentals of dairy chemistry. Springer Science & Business Media.
7. McSweeney, P.L. and Fox, P.F. eds., (2003). Advanced dairy chemistry (Vol. 1). Kluwer Academic/Plenum.
8. Kerth, C.R., (2013). The science of meat quality. Blackwell Publishing.
9. Toldrá, F. ed., (2017). Lawrie's meat science. Woodhead Publishing.
10. Pearson, A.M. ed., (2012). Muscle and meat biochemistry. Elsevier.</td></tr>
</table>

<table>
<tr><td>Course Title</td><td colspan="3">Genetics and Plant Breeding</td></tr>
<tr><td>Course Code</td><td colspan="3">AGB 32012</td></tr>
<tr><td>Credit Value</td><td colspan="3">02</td></tr>
<tr><td>Core/Elective</td><td colspan="3">Core</td></tr>
<tr><td>Prerequisite</td><td colspan="3">None</td></tr>
<tr><td rowspan="2">Notional hours</td><td>Theory</td><td>Practical</td><td>Independent learning</td></tr>
<tr><td>23</td><td>15</td><td>62</td></tr>
<tr><td>Objective/s</td><td colspan="3">Impart knowledge and skills on the principles and methods of genetics and plant breeding.</td></tr>
</table>

<table>
<tr><td>Intended Learning Outcomes</td><td colspan="4">• Demonstrate Mendelian principles of inheritance and their extension, linkage and recombination.
• Demonstrate chromosome mapping, cytogenetic, quantitative and population genetics.
• Identify the superior plants based on their phenotypic characters for the selection program
• Apply acquired knowledge to select suitable parents based on the objective
• Apply acquired skills for hybridization of parent plants
• Explain the development of new crop variety through hybridization and selection.
• Plan for multi-location yield trails and seed certification.</td></tr>
<tr><td>Detailed syllabus</td><td colspan="4">Theory
Mendelian principles and their extension; Linkage; Recombination; Coincidence and interference; Chromosome mapping; Cytogenetics and quantitative genetics; Population genetics; Basic concepts of plant breeding; Genetic basis of plant breeding; Breeding methods; Self-pollinated; Cross-pollinated and asexually propagated crops; Breeding techniques; Emasculation; Pollination; Screening techniques for insect pests and disease resistance in crops; Heterosis and hybridization; Genetic resources and conservation; Center of origin and bio-diversity.
Practical
Problems related to Mendel’s law; Epistasis and lethality; Linkage; Crossing over; Cytogenetics; Population genetics; Mode of reproduction in crops; Floral structure and floral biology: cereals, pulses, oil seeds, commercial crops; Selfing techniques in crops; Tools used in breeding (Breeder’s kit); Emasculation techniques in crops and pollination methods.</td></tr>
<tr><td>Teaching and Learning Methods / Activities</td><td colspan="4">Interactive lectures, field demonstration, Group discussion, Assignments, problem solving sums</td></tr>
<tr><td rowspan="3"></td><td colspan="2">Theory (75%)</td><td colspan="2">Practical (25%)</td></tr>
<tr><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td></tr>
<tr><td>Quiz- 10%
In Class Test– 15%
Assignments -5%</td><td>Two hours Four out of five questions</td><td>Practical records -15%
Field visit reports -15%</td><td>Practical exam-30%
Spot -30%
Oral - 10%</td></tr>
<tr><td>Recommended Readings</td><td colspan="4">1. Al-Khayri, J. M., Jain, S. M., & Johnson, D. V. (2015). Advances in plant breeding strategies: breeding, biotechnology and molecular tools. 1st Edition, Cham: Springer International Publishing.
2. Babcock EB (2007). Genetics and Plant breeding. Cham Springer, Jodhpur Agrobios India.
3. Mendel, G. (2008). Experiment in Hybridisation. Cosimo, Inc, New York.
2. Henry, R.J (2006) Plant Conservation Genetics. CRC Press.</td></tr>
</table>

	3. Har Ram and Hari (2003). Crop breeding and Genetics. Ludhiana Kalyani pub. 4. Sinha U (2004) Cytogenetics, plant breeding and evolution. New Delhi Vikas pub. 5. Griffith and Anthony (2003). An Introduction to genetic analysis. New York WH Freeman Pub

Course Title	**Food Technology**		
Course Code	**FS 32012**		
Credit Value	**02**		
Core/Elective	Core		
Prerequisite	None		
Notional hours	Theory	Practical	Independent learning
	20	20	60
Objective/s	Impart the knowledge of principles and methods of food preservation, and processing technologies of food products and provide related analytical skills		
Intended Learning Outcomes	● Describe the principles and practices of the major techniques used in food preservation ● Apply the principles of food processing techniques to specific commodities ● Demonstrate development of value-added products from locally available raw materials ● Analyze the quality of food and beverages ● Discuss the technologies used in the local food processing industries ● Categorize the traditional food processing techniques		
Detailed syllabus	**Theory** Principles and methods of food preservation; Fruits and vegetables processing technology; Cereals and starch processing technology; Fat and oil processing technology; Sugar and confectionary processing technology; Alcoholic beverages processing technology. **Practical** **S**alt content estimation in salted dry fish; Ethanol content estimation in wine/toddy, Development of cordial, jam, sauce and bakery products; Field visits: fruit processing and soft drink industries, rice mills, bakery, traditional and modern oil extraction mills, sweet and confectionery manufacturing industries, pot still and patent still distilleries.		
Teaching and Learning Methods / Activities	Interactive lectures, tutorial discussions, group discussions, group presentations, laboratory practical sessions, field visits, assignments		

<table>
<tr><td rowspan="2">Evaluation</td><td colspan="2">Theory (67%)</td><td colspan="2">Practical (33%)</td></tr>
<tr><td>Formative assessment (30%)</td><td>Summative assessment (70%)</td><td>Formative assessment (30%)</td><td>Summative assessment (70%)</td></tr>
<tr><td></td><td>Quiz- 10%
In Class Test - 15%
Assignment -5%</td><td>Two hours
Four out of five questions</td><td>Practical records -10%
Field visit reports- 10%
Assignments- 10%</td><td>Practical exam - 40%
Spot Exam - 20%
Oral - 10%</td></tr>
<tr><td>Recommended Readings</td><td colspan="4">1. Fellows, P.J. (2016). Food Processing Technology, 4th Ed.,WoodHead Publishing,
2. Rahman, M.S. (2007). Handbook of Food Preservation, 2nd Ed. CRC Press, New York
3. Hoseney, R.C. (2010). Principles of cereal science and technology, 3rd Ed., American Association of Cereal Chemists, Inc.
4. Ward, J. D. and Ward, L. T. (2013). Principles of food science, 4th Ed. Good heart-Willcox company Inc., Illinois.
5. Potter, N. N. and Hotchkiss, J. H. (1995). Food Science, 5th Ed. Springer.
6. Sivasanker, B. (2016). Food processing and preservation, 2nd Ed. Prentice-Hall of India private Limited, New Delhi, India
7. Jaiswal,A.K. (2017) Food Processing Technologies, Impact on Product Attributes, CRC Press, Boca Raton</td></tr>
</table>

Course Title:	**Environmental Engineering**		
Course Code:	**AE 32012**		
Credit Value:	**02**		
Core/ Optional	Core		
Prerequisite	None		
Notional Hours	Theory	Practical	Independent learning
	21	21	58
Objectives	Provide engineering knowledge and practical skills related to environmental processes for the sustainable use of natural resources.		
Intended Learning Outcomes	• Suggest measures to solve environmental problems using basic engineering knowledge. • Explain various process influencing environmental stability. • Analyze different industrial process for resource optimization. • Develop eco-friendly environmental strategies for conserving environment. • Relate the importance of renewable energy for environmental sustainability.		

<table>
<tr><td>Detailed Syllabus</td><td colspan="4">Theory

Waste and environment; Climate change; Air pollution; Salinity development; Solid waste; Compost making; Environmental Impact Assessment and mitigation; Introduction to renewable energy; Agricultural and industrial pollution and pollutants; Suspended Particulate Matters (SPM): SO_2, CO, NO_x, Oxidant/ozone and their control measures; Effect of industrial pollution; Solid waste management; Municipal waste and household waste; Wastewater management; Wastewater and its properties; Sewage disposal and treatment; Reuse of water; Oxygen dynamics of streams discharged with industrial effluent; Contaminant transport and the breakthrough curves.

Practical

Preparation EIA sheet; Measurement of the parameters of wastewater; Breakthrough curve development; Oxygen dynamics of water bodies polluted by industrial effluent; Application of solid waste options for better efficiency; Design of constructed wetland; Design of efficient compost making plant.</td></tr>
<tr><td>Teaching and learning methods</td><td colspan="4">Interactive teaching sessions, Case study, Oral Presentations, Group assignment and Field visits.</td></tr>
<tr><td rowspan="3">Evaluation</td><td colspan="2">Theory (67 %)</td><td colspan="2">Practical (33 %)</td></tr>
<tr><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td></tr>
<tr><td>Quiz - 10%
In Class Test - 15%
Assignment/ Presentation - 5%</td><td>Two hours
Four out of five questions</td><td>Practical records/ Assignments - 20%
Field visit reports - 10 %</td><td>Practical exam - 30%
Spot - 30%
Oral - 10%</td></tr>
<tr><td>Recommended Readings</td><td colspan="4">1. Agarwal,V.K. and Verma,P.S., (1996). Environmental Ecology.S.Chand and company ltd.,New Delhi.
2. Asawa,G.L., (2006). Irrigation and Water Resources Engineering. New Age International.
3. Chhabra,R.,(1996). Soil salinity and water quality.Oxford and IBH publishing co.pvt.ltd.,New Delhi.
4. Mihelcic, J.R. and Zimmerman, J.B., (2014). Environmental Engineering: Fundamentals, Sustainability and Design. John Wiley & Sons.
5. Shahid, S.A., Abdelfattah, M.A., Taha, F.K., (2013). Developments in Soil Salinity Assessment and Reclamation:</td></tr>
</table>

	Innovative Thinking and Use of Marginal Soil and Water Resources in Irrigated Agriculture. Springer Netherlands. 6. Hanif, M.A., Nadeem, F., Bhatti, I.A., Tauqeer, H.M., (2020). Environmental Chemistry: A Comprehensive Approach. John Wiley & Sons.

Course Title	**Introduction to Econometrics**		
Course Code	**EC 32012**		
Credit value	**2**		
Core / Elective	Core		
Prerequisite	None		
Notional hours	Theory	Practical	Independent learning
	23	15	62
Objectives/s:	Impart a working knowledge of econometrics and its applications to real-world economic data.		
Intended Learning Outcomes	• Explain the nature and scope of econometrics as a social science • Explain the fundamental theory underlying regression analysis • Estimate economic relationships by applying regression analysis to data. • Test economic hypotheses. • Interpret regression estimates.		
Detailed Syllabus / Course Content	**Theory** Role of econometrics in economic analysis; Basic probability concept: discrete and continuous random variables, dummy variable, probability density function, mean, expected value, variance, joint, marginal and conditional probability, covariance, correlation, normal, standardized normal, chi-square, student-t and F statistic distribution; Purpose of regression analysis; Simple and multiple linear regression model: assumptions of ordinary least squares method and estimation, population and sample regression model, Properties of least squares estimators: unbiased, consistency and efficient, Gauss-Markov theorem, best linear unbiased estimator, central limit theorem; Inference in the regression model: type I and II error, hypothesis test, analysis of variance, student-t and F-tests, confidence interval, coefficient of determination; Functional forms: linear, reciprocal, log-log, linear-log, log-linear, log-inverse; Hypothesis testing and non-sample information; Multicollinearity; Heteroskedasticity; Autocorrelation; Testing qualitative effects: intercept and slope dummy variables and interaction effect; Dependent dummy variable: probit model, Logit Model;		

<table>
<tr><td></td><td colspan="4">Practical
Loading data in econometric packages; Data Transformations; Checking for Statistical Properties of Series; Detection of Classical Assumptions Violation; Estimate simple linear regression model including logarithmic transformations, test for the statistical significance of the estimates and the model, Estimate multiple linear regression model, test for the statistical significance of the estimates and the model, Interpretation of Results, diagnostic testing</td></tr>
<tr><td>Teaching and learning methods</td><td colspan="4">Interactive lectures, tutorials, laboratory works, group presentation, group discussion and Problem based learning</td></tr>
<tr><td rowspan="3">Evaluation</td><td colspan="2">Theory (75%)</td><td colspan="2">Practical (25%)</td></tr>
<tr><td>Formative assessment (30%)</td><td>Summative Assessment (70%)</td><td>Formative assessment (30%)</td><td>Summative Assessment (70%)</td></tr>
<tr><td>Quiz- 10%
In Class Test -15%
Assignment/ Presentation -5%</td><td>Two hours
25 MCQ and
Three out of four essay questions</td><td>practical records-30 %</td><td>Practical exam - 60 %
Oral 10 %</td></tr>
<tr><td>Recommended readings:</td><td colspan="4">1. Gujarati, Damodar and Dawn Porter, (2009). Basic Econometrics, 5th Edition. McGraw-Hill.
2. Stock, James H. and Mark Watson, (2007). Introduction to Econometrics, 2nd Edition. Pearson, Addison Wesley.
3. Jeffery M Wooldridge, (2016). Introductory Econometrics: A Modern Approach, 6th Edition, Cengage learning</td></tr>
</table>

<table>
<tr><td>Course Title</td><td colspan="3">Scientific Writing</td></tr>
<tr><td>Course Code</td><td colspan="3">AC 32011</td></tr>
<tr><td>Credit value</td><td colspan="3">01</td></tr>
<tr><td>Core / Elective</td><td colspan="3">Auxiliary course</td></tr>
<tr><td>Prerequisite</td><td colspan="3">None</td></tr>
<tr><td rowspan="2">Notional hours</td><td>Theory</td><td>Practical</td><td>Independent learning</td></tr>
<tr><td>00</td><td>30</td><td>20</td></tr>
<tr><td>Objectives:</td><td colspan="3">Educate the students on range of perspectives on the value and purposes of scientific writing, practicing to define the problem, setting of objectives, framing the research methodology, analyzing the data, interpreting the results, and finding the conclusion, writing the abstract, shaping the title, preparing the proposal and deliver as dissertation/research paper and poster/oral presentation.</td></tr>
</table>

<table>
<tr><td>Intended Learning Outcomes</td><td colspan="2">• Recall the basic knowledge for effective scientific writing.
• Identify research problems and scientific gap for scientific research
• Formulate research questions and objectives for scientific research
• Explain the different components of scientific writing
• Develop research proposal for scientific research
• Discuss the methods of analyzing data
• Develop skills at the level of sentences, paragraphs, abstracts and entire papers for producing high-quality scientific papers
• Apply principles of the scientific narrative, language movements, effective punctuation, grammar, sentence, paragraph, and document design for a scientific document.
• Exercise accepted methods for literature discussion, citing and quoting to written scientific documents
• Develop students' skills as effective and engaging scientific writers</td></tr>
<tr><td>Detailed Syllabus / Course Content</td><td colspan="2">Introduction to research, Research methods, Ethics in research and writing, Components of scientific writing, Identify appropriate research problem and research gaps , Formulate research question, Searching and compiling literature, Proposing an appropriate Title, proposal writing, Range of styles and techniques for scientific writing, Use of language, proof reading; Analytical tools, experimental designs, data analysis, data collection methods and interpretation; Dissertation writing and format, Report writing, Writing of Scientific research paper, Research publication, Citation and referencing, Preparation of oral and postal presentation, Critique of readability in relevant papers, Utilize the processes of smart revision by positive, constructive peer reviews of the documents by fellow students on their writing teams and by revising their own documents, Answers to Active-Passive Exercise, Writing exercises, group editing session, Improve proof reading skills, Organize the sections of a scientific paper effectively, Be equipped to choose journals for future papers, Find the Common errors in scientific writing</td></tr>
<tr><td>Teaching and learning methods</td><td colspan="2">Interactive discussions, experimentation, group assignment and discussion, Case studies, Writing Exercise, Group editing, presentation, peer evaluation</td></tr>
<tr><td rowspan="3">Evaluation</td><td colspan="2">Practical (100 %)</td></tr>
<tr><td>Formative assessment (40%)</td><td>Summative Assessment (60%)</td></tr>
<tr><td>Group activity- 10 %
In class assessment- 20 %
Preparation for research Poster – 5 %
Preparation for Oral presentation– 5 %</td><td>Research proposal formulation- 40 %
Research proposal presentation- 30 %</td></tr>
<tr><td>Recommended readings:</td><td colspan="2">1. Malmfors, B., Garn worthy, P. and Grossman, M. (2000). Writing and presenting scientific papers. Nottingham University press, United Kingdom.
2. Kothari, C.R. (2004). Research methodology: Methods and techniques. New Age International.</td></tr>
</table>

	3. Kumar, R. (2019). Research methodology: A step-by-step guide for beginners. Sage Publications Limited. 4. Creswell, J.W. and Creswell, J.D. (2017). Research design: Qualitative, quantitative, and mixed methods approaches. Sage publications. 5. Garcia-Granda, S. (2013). Writing science: how to write papers that get cited and proposals that get funded.

Course Title	**English III**		
Course Code	**AC 32022**		
Credit Value	**02**		
Core/Elective	Core		
Prerequisite	None		
Notional hours	Theory	Practical	Independent learning
	30		70
Objective/s	Facilitate learners to achieve higher level of proficiency, so that they will gain the academic English language skills which can enable the learners to function in a fairly complex academic research-oriented context and to use the language skills for writing dissertation and research articles through referencing, paraphrasing, describing, summarizing, editing and proof reading in their academic and professional setting in future.		
Intended Learning Outcomes	• summarize a selected text with citations and references • construct short articles , – this is done before • identify the errors in articles and research papers • produce multiple genres of writing necessary for academic work • appraise an extended academic text with complex language (description, reports, articles, narratives) • practice editing and proof reading their own writing • formulate introduction and abstract for a research paper • demonstrate understanding of the concept of plagiarism • utilize appropriate language courtesy formulas for academic discussions • select a range of functional language and discourse strategies to give and respond to opinion or argument		
Detailed syllabus	**Academic writing styles** Reading and understanding selected academic text (research papers, reports); Demonstrating the understanding of the concept of plagiarism (how to avoid it); Practicing and using		

<table>
<tr><td></td><td colspan="4">paraphrasing; Developing reference lists - citations, references; Using academic vocabulary; Practicing nominalization; Practicing self- editing skill in relation to research writing; Using process writing skills

Summarizing

Distinguishing the summary and paraphrase; Identifying the techniques used in summary writing; Summarizing academic texts and lecture notes

Giving opinions

Identifying the format and types of essay; Developing a thesis statement based on an opinion or argument; Constructing topic sentences and use transitions in making supporting details in writing; Using appropriate cohesive devices

Proof reading

Recognizing the rules of grammar and mechanics of writing (articles, prepositions, adverbs, conjunctions, punctuation, number agreement); Identifying the sentence type (complex, compound) and practice improving accuracy , error correction; Editing one’s own and peer research writing

Literature review and Research writing

Synthesizing information; Identifying the academic writing styles in research articles; reviewing previous researches done: Applying CARS model for research writing; Establishing research questions: Writing an introduction to a research paper.</td></tr>
<tr><td>Teaching and Learning Methods / Activities</td><td colspan="4">Lecture, Guest lectures, Task-based language learning, student centred learning activities on LMS, presentations, discussions, video on famous speeches</td></tr>
<tr><td rowspan="6">Evaluation</td><td rowspan="6">In course Assessment</td><td>Writing research proposal on a topic (20 Marks)</td><td>5%</td><td rowspan="6">30 %</td></tr>
<tr><td>Presentation of the research proposal (20 Marks)</td><td>5%</td></tr>
<tr><td>Writing abstract on a selected research topic (20 Marks)</td><td>5%</td></tr>
<tr><td>Poster presentation</td><td>5%</td></tr>
<tr><td>Mid semester exam (20 Marks)</td><td>10%</td></tr>
</table>

	Written Examination: The question paper for the written examination contains 2 parts based on the writing and speaking components. The duration of the written paper is 2 hours and the students are expected to answer all the questions in Part I. Part I: Writing – writing academic proposals/articles/essays, summarizing texts, editing texts, writing research proposals and abstracts, review research articles, paraphrasing research articles in their related topic, etc. – 60 Marks Part II: Speaking –power point/poster presentation on a research topic – 40 Marks **Total marks: 100 Marks**. **(100 marks will be converted to 70 Marks)**
Recommended Readings	1. Downes, C. (2008). *Cambridge English for job-hunting*. Cambridge: Cambridge University Press. 2. Goodale, M. (2005). *Professional presentations.* Cambridge University Press 3. Goodale, M., & Gordon, M. (2017). *The language of meetings*. Andover Hampshire: Cengage Learning. 4. Grussendorf, M. (2017). *English for presentations*. Oxford: Oxford University Press. 5. Mascull, B. (2018). *Business Vocabulary in Use: Intermediate; Self-study and Classroom use* Cambridge: Cambridge University Press. 6. Mohan, K., & Banerji, M. (2009). *Developing communication Skills* (2n ed.). Macmillan Publishers. 7. Murphy, R. (2012). *English grammar in use: A self-study reference and practice book for intermediate learners of English*. Cambridge: Cambridge University Press. 8. Thomson, A. J., & Martinet, A. V. (2010). *A practical English grammar*. Oxford: Oxford University Press.

Third Year Second Semester - Specialization Courses (32000):

<table>
<tr><td>Course Title</td><td colspan="3">Resilient and Sustainable Cropping Systems</td></tr>
<tr><td>Course Code</td><td colspan="3">AG 32022</td></tr>
<tr><td>Credit Value</td><td colspan="3">02</td></tr>
<tr><td>Core/Elective</td><td colspan="3">Core course</td></tr>
<tr><td>Prerequisite</td><td colspan="3">None</td></tr>
<tr><td rowspan="2">Notional hours</td><td>Theory</td><td>Practical</td><td>Independent learning</td></tr>
<tr><td>23</td><td>15</td><td>62</td></tr>
<tr><td>Objectives</td><td colspan="3">Enlighten the knowledge and skills on the concepts and applications of resilient and sustainable cropping systems to face the challenges of global environmental change</td></tr>
<tr><td>Intended Learning Outcomes</td><td colspan="3">• Define resilience and sustainability in the context of cropping systems
• Identify the consequences of conventional agriculture and global environmental change
• Classify different type of cropping systems in Sri Lanka
• Identify salient features of resilient and sustainable cropping systems
• Illustrate the framework of resilient and sustainable cropping systems
• Select appropriate indices and metrics to evaluate the resilience and sustainability in cropping systems
• Apply a systems approach to agricultural management to provide solutions to complex problems
• Discuss the contribution of designing resilient and sustainable cropping systems for food and nutritional security</td></tr>
<tr><td>Detailed syllabus</td><td colspan="3">Theory
Defining resilience and sustainability in crop production systems; Objectives of resilient and sustainable cropping systems; Sustainable intensification of cropping systems; Introduction to global environmental change; Integrated management practices that facilitate the adaptation to abiotic and biotic stresses; Elements of resilience; Shocks and Stressors; Vulnerability; exposure and sensitivity; Absorptive, adaptive and transformative capacity; Mitigation, adaptation, and recovery; Principle of cropping system; Definitions, concepts and advantages of different cropping systems; Multiple cropping systems; Interactions in different cropping systems; Indices for evaluation of cropping systems; Classification of different types of cropping systems in Sri Lanka; Resource use efficiency in cropping systems; Framework of resilient and sustainable cropping systems; Indices and metrics of resilience and sustainability in cropping</td></tr>
</table>

<table>
<tr><td></td><td colspan="4">systems; Sustainable and resilient cropping systems for food and nutritional security.

Practical
Establishment of model cropping system; Assessment of cropping systems using different indices; Identifying the shocks and stressors resulted by global environmental change; Practices of integrated crop management and crop protection to adapt various abiotic and biotic stresses; Evaluating resilience and sustainability in cropping systems using appropriate indices and metrics; Designing the framework of resilient and sustainable cropping systems; Visiting to the established cropping systems in different regions of Sri Lanka to get hands-on experiences on the tools and techniques adopted to increase sustainability and resilience in those systems.</td></tr>
<tr><td>Teaching and Learning Methods</td><td colspan="4">Interactive lectures, tutorials, demonstration, group assignments, video clips, field practical and field visits</td></tr>
<tr><td rowspan="3">Evaluation</td><td colspan="2">Theory (75 %)</td><td colspan="2">Practical (25 %)</td></tr>
<tr><td>Formative assessment

(30%)</td><td>Summative Assessment

(70%)</td><td>Formative assessment

(30%)</td><td>Summative Assessment

(70%)</td></tr>
<tr><td>Quiz- 10%
In Class Test– 15%
Assignment/ Presentation -5%</td><td>Two hours
All four questions</td><td>Field practical record -20%
Field visit report-10 %</td><td>Practical exam-30 %
Spot- 30 %
Oral - 10 %</td></tr>
<tr><td>Recommended Readings</td><td colspan="4">1. Hatfield, J. L. and Karlen, D. L. (1993). Sustainable agriculture systems. CRC Press.
2. Wezel, A.(2017). Agroecological practices for sustainable agriculture: principles, applications, and making the transition. World Scientific.
3. Pretty, J. andBharucha, Z. P. (2018). Sustainable intensification of agriculture: greening the world's food economy. Routledge.
4. Campanhola, C. and Pandey, S. (2018). Sustainable food and agriculture: An integrated approach. Academic Press.
5. Lengnick, L. (2014). Resilient agriculture: Cultivating food systems for a changing climate. New Society Publishers.
6. Gardner, S. M., Ramsden, S. J. and Hails, R. S. (2019). Agricultural Resilience. Cambridge University Press.
7. Urruty, N., Tailliez-Lefebvre, D. andHuyghe, C. (2016). Stability, robustness, vulnerability and resilience of agricultural systems. A review. Agronomy for Sustainable Development, 36(1), 1-15.
8. De Costa, W. A. J. M. (2020). Increasing Climate Resilience of Cropping Systems in Sri Lanka. In Agricultural Research for Sustainable Food Systems in Sri Lanka (pp. 107-157). Springer, Singapore.</td></tr>
</table>

<table>
<tr><td>Course Title</td><td colspan="3">Commercial Floriculture</td></tr>
<tr><td>Course Code</td><td colspan="3">AG 32032</td></tr>
<tr><td>Credit value</td><td colspan="3">02</td></tr>
<tr><td>Core / Elective</td><td colspan="3">Core</td></tr>
<tr><td>Prerequisite</td><td colspan="3">None</td></tr>
<tr><td rowspan="2">Notional hours</td><td>Theory</td><td>Practical</td><td>Independent learning</td></tr>
<tr><td>23</td><td>15</td><td>62</td></tr>
<tr><td>Objectives:</td><td colspan="3">Acquaint the students with knowledge, advanced technologies and technical, planning, and management skills to be an Industrialist or to be a part of the established industries</td></tr>
<tr><td>Intended Learning Outcomes</td><td colspan="3">• Summarize the global scenario and the scope of the floricultural industries in Sri Lanka
• Exhibit the skills on commercial scale propagation of floricultural crops and nursery management
• Propose the required environmental conditions, necessary inputs, appropriate protected structures and management practices for the commercial cultivation of floricultural crops
• Describe the cultivation and special management practices for important cut flowers, cut foliage and potted plants under green houses
• Demonstrate how to treat flowers after field cutting
• Practice procedures to increase life span of floral materials
• Select correct flowers for floral arrangements
• Show capacity to plan a commercial level floricultural farm</td></tr>
<tr><td>Detailed Syllabus / Course Content</td><td colspan="3">Theory
Global scenario of floriculture production; Scope and importance of floricultural crops in Sri Lanka; Principles and practices in propagation of flower crops; Propagation structures; Environmental factors affecting flower production; Factors to be considered in establishing a commercial floricultural nursery; Usage of containers, specialized growing medias and growth regulators; Nutrition management; Irrigation and other cultural practices adopted for obtaining quality products; Pre-harvest and harvesting care; Principle of post-harvest physiology, post-harvest handling and post-harvest treatments; Advanced technologies needed for commercial level production of cut flower, foliage, ornamental and potted plants; Principles and elements of floral design; Significances of crop improvement programmes.

Practical
Identification of different cut flower and greeneries; Propagation of floricultural plant using different propagation techniques; Cultivation of cut flowers cut-foliage crops in field; Preparation of potted plants; Cultivation of floricultural under protected structures; Preparation of rooted, un-rooted cuttings; Post- harvest treatments for cut flowers and foliage; Arrangements of cut flowers and foliage; Applying pre and post-harvest practices to increase the life span of the flowers; Preparation of event management plan</td></tr>
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<table>
<tr><td></td><td>for various events; Visit to automated green houses to expose the students to the advance techniques used in commercial level farming; Visit to commercial farms to give students hands-on skills and to experience the constraints faced by the commercial growers.</td></tr>
<tr><td>Teaching and learning methods</td><td>Lectures, tutorials, laboratory works, audio visual materials, homework Assignments, group and individual activities, guest speakers, group discussion and presentation, field practical and field visits, event plan presentation</td></tr>
<tr><td>Evaluation</td><td>
<table>
<tr><th colspan="2">Theory (75 %)</th><th colspan="2">Practical (25 %)</th></tr>
<tr><td>Formative assessment (30%)</td><td>Summative Assessment (70%)</td><td>Formative assessment (30%)</td><td>Summative Assessment (70%)</td></tr>
<tr><td>Quiz- 10%
In Class Test -15%
Assignment/ Presentation -5%</td><td>Two hours
All four questions</td><td>Field practical records - 20 %
Field visit reports - 10 %</td><td>Practical exam- 30 %
Spot - 30 %
Oral - 10 %</td></tr>
</table>
</td></tr>
<tr><td>Recommended readings:</td><td>

1. Dole, J.M. (2005). Floriculture; Principles and species. 2nd edition. Pearson education, New Jersy.
2. Lynette Morgan. (2021). Hydroponics and Protected Cultivation. CABI, Newzealand.
3. Nazim S. Gruda. (2021). Advances in horticultural soilless culture (Burleigh Dodds Series in Agricultural Science). Burleigh Dodds science publishing, Germany
4. Padmini, S. M. P. C. and Kodagoda, T. D. (2017). Present status and future scope of floriculture industry in Sri Lanka and its potential in women empowerment Sri Lanka. Journal of Social Sciences. 40 (1): 31-40
5. Sachin Tyagi and Sanjay Sahay (2019). *Protected Cultivation of Flowers*. New India publishing agency- NIPA. ISBN-1: 978-9387973442
6. Prasad S. and U. Kumar (2019). *Commercial Floriculture-second edition*. Bio-Green Books. ISBN-10 : 8177543733/ ISBN-13 : 978-8177543735
7. Allan M. Armitage and Judy M. Laushman (2015). *Specialty Cut Flowers: The Production of Annuals, Perennials, Bulbs and Woody Plants for Fresh and Dried Cut Flowers.* Timber Press; REV & Enlarged edition
8. George Sabina (2009). Ornamental Plants Hardcover. New India Publishing Agency
9. Desh Raj. (2006). *Objective Floriculture and Landscaping*. Kalyani Publishers. ISBN: 9789327282337, 9327282337

</td></tr>
</table>

<table>
<tr><td>Course Title</td><td colspan="4">Sustainable Animal Breeding</td></tr>
<tr><td>Course Code</td><td colspan="4">AS 32012</td></tr>
<tr><td>Credit Value</td><td colspan="4">02</td></tr>
<tr><td>Core/Elective</td><td colspan="4">Core</td></tr>
<tr><td>Prerequisite</td><td colspan="4">None</td></tr>
<tr><td rowspan="2">Notional hours</td><td>Theory</td><td colspan="2">Practical</td><td>Independent learning</td></tr>
<tr><td>23</td><td colspan="2">15</td><td>62</td></tr>
<tr><td>Objective/s</td><td colspan="4">Impart knowledge into the needs for better use of animal genetic resources in the context of projected demands for food.</td></tr>
<tr><td>Intended Learning Outcomes</td><td colspan="4">• Analyze the global perspectives of animal genetic resources
• Describe the use of quantitative methods to estimate genetic parameters
• Critique the use of different selection methods in the selection process
• Formulate appropriate breeding programmes according to the resources available
• Discuss the livestock development policies and strategies under Sri Lankan perspectives
• Explain the breeding policies for livestock under different agro-climatic conditions</td></tr>
<tr><td>Detailed syllabus</td><td colspan="4">Theory
Global perspectives of animal genetic resources; Knowledge of indigenous genetic resources; Quantitative methods in animal breeding; National livestock development policies and strategies; Livestock breeding policy guidelines and development of breeding programmes.

Practical
Manual and computer exercises on genetic relationships and inbreeding; Estimation of quantitative parameters; Selection index; Selection and genetic gain; Prediction of breeding values; Formulating breeding plans.</td></tr>
<tr><td>Teaching and Learning Methods / Activities</td><td colspan="4">Interactive lectures, paired learning, practical, tutorials, group discussions, field visits and assignments,</td></tr>
<tr><td rowspan="2">Evaluation</td><td colspan="2">Theory (75%)</td><td colspan="2">Practical (25%)</td></tr>
<tr><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td></tr>
<tr><td>Quiz- 10%
In Class Test- 15%
Presentation, (Proposal) and</td><td>Two hours
All four questions</td><td>Laboratory practical reports - 10%
Field trip reports - 10%</td><td>Practical exam - 30%
Spot exam - 30%
Oral - 10%</td></tr>
</table>

	Assignment -5%		Field assignments -10%	
Recommended Reading	1. Jacky, T. 2010, Animal Breeding, Welfare and Society, 1st edition CAB international, United Kingdom. 2. Walley, T. (2010) Hints on the breeding and rearing of farm animals. Nabu press. 3. Harmon, J. (2000) Swine breeding and gestation facilities handbook. 1st Edition. Mid west plan service. 4. Bourdon, R.M. (1997) Understanding Animal Breeding. Prentice Hall, USA.			

Course Title	**Marine and Inland Fish Production**		
Course Code	**AS 32022**		
Credit Value	**02**		
Core/Elective	Core		
Prerequisite	None		
Notional hours	Theory	Practical	Independent learning
	20	20	60
Objective/s	Impart in-depth knowledge of culturing of fish in marine and freshwater, including the culture of marine and freshwater finfish, shrimp, oyster and culture of other molluscs such as clams, mussels and scallops		
Intended Learning Outcomes	• Demonstrate different culture practices of finfish and shellfish • Plan a fish farm • Describe culture techniques of different species • Describe steps of feeding, breeding, disease and water quality management. • Describe the scope for the ornamental fish production. • Diagnose health issues in various fish species • Demonstrate breeding techniques of finfish and shellfish • Describe the steps of harvesting and postharvest management • Analyze the cost benefits of an aquaculture farm		
Detailed syllabus	**Theory** Overview of fisheries potential in Sri Lanka; Economic importance of cultivable marine and inland finfish and shell fishes; Planning culture facilities, Culture practice of finfish: broodstock management and breeding techniques, nursery management, feeding management, other management practices; Culture practice of shellfish: broodstock management and breeding techniques, nursery management, feeding management, other management practices; Harvesting and transportation of economically important finfish and shell fish; Scope and culture of ornamental and aesthetic fish production, diseases and health management of fin fish and shell fish.		

<table>
<tr><td></td><td colspan="4">Practical
Construction of cages, pens and pond for aquaculture; Construction of ornamental fish tanks; Feed preparation for finfish and shellfish: compound feed, live feed; Field visits to different aquaculture farms and hatcheries to study fish breeding, construction of ponds, management and harvesting; Cost benefit analysis.</td></tr>
<tr><td>Teaching and Learning Methods / Activities</td><td colspan="4">Interactive lectures, practical, tutorials, group discussion, field visits and assignments</td></tr>
<tr><td rowspan="3">Evaluation</td><td colspan="2">Theory (67%)</td><td colspan="2">Practical (33%)</td></tr>
<tr><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td></tr>
<tr><td>Quiz- 10%
In Class Test- 15%
Presentation, (Proposal) and Assignment -5%</td><td>Two hours
All four questions</td><td>Laboratory practical reports 10%
Field trip reports 10%
Field assignments 10%</td><td>Practical exam 30%
Spot exam 30%
Oral 10%</td></tr>
<tr><td>Recommended Readings</td><td colspan="4">1. Goddek, S., Joyce, A., Benz Kotzen and Burnell, G.M. (2019). Aquaponics food production systems : combined aquaculture and hydroponic production technologies for the future. Cham, Switzerland: Springer
2. Shumway, S.E. (2021). Molluscan shellfish aquaculture : a practical guide. Essex, Uk: 5M Books Ltd.
3. Perumal Santhanam, R, T.A., Pachiappan Perumal and Springerlink (Online Service (2015). Advances in Marine and Brackishwater Aquaculture. New Delhi: Springer India.
4. Frandson, D. R., Wilke, L.W. and Fails, A.D. (2009) Anatomy and physiology of farm animals. 7th edition. Blackwell publishing.
5. Wilbur, F. and Eastman, Jr. (2020) A guide to canning, freezing, curing and smoking meat, fish and game. Storey publishing, LLC.
6. Andrew, B. (1999) Economics of brackish water shrimp culture. Daya Publishing House, India.
7. Yadav, B.N. (1999) Fish and Fisheries. 2nd Edition. Daya Publishing House, India.
8. Chitravadivelu, K. (1993) Shrimp culture. 1st Edition. University of Jaffna Publications.
9. Gautam, A. (1998) Conservation and management of aquatic resources. Daya Publishing House, India.
10. Yadav, B.N. (2010) Fish and fisheries. Daya Publishing House, India.</td></tr>
</table>

<table>
<tr><td>Course Title</td><td colspan="4">Agricultural Acarology</td></tr>
<tr><td>Course Code</td><td colspan="4">AB 32012</td></tr>
<tr><td>Credit Value</td><td colspan="4">02</td></tr>
<tr><td>Core/Elective</td><td colspan="4">Core</td></tr>
<tr><td>Prerequisite</td><td colspan="4">None</td></tr>
<tr><td rowspan="2">Notional hours</td><td>Theory</td><td colspan="2">Practical</td><td>Independent learning</td></tr>
<tr><td>23</td><td colspan="2">15</td><td>62</td></tr>
<tr><td>Objective/s</td><td colspan="4">Impart knowledge and skills on the predatory, and plant parasitic habits of mites and their morphology, biology in the plant ecosystem and their damages, and the management of insect and plant parasitic mites</td></tr>
<tr><td>Intended Learning Outcomes</td><td colspan="4">● Illustrate the morphological variations found in different mites' groups
● Classify acari (mites and ticks) exists in crops and storage
● Describe crop damages caused by mites and their etiology
● Demonstrate the living habits of mites
● Estimate the losses due to mites
● Propose specific management tactics of phyto-mites</td></tr>
<tr><td>Detailed syllabus</td><td colspan="4">Theory

Introduction to mites and ticks; Morphology of mites and ticks; Internal anatomy of mites; Classification of phytophagous; Predatory and parasitic types of damages caused by ticks and mites in plants and house-hold animals; Diagnosis of mites' incidences; Management of mites and ticks.

Practical

Identification of mite damage; Collection of mites; Microscopic examination of mites; Rearing techniques of phytophagous mites in various substrates; Rearing of predatory mites; Assessing the potential of mites and ticks; Role of spiders and their beneficial role in agriculture; Visit to farmers fields to identify mites damage.</td></tr>
<tr><td>Teaching and Learning Methods / Activities</td><td colspan="4">Interactive lectures, Group discussion, Assignments, Laboratory practical, field practical</td></tr>
<tr><td rowspan="3"></td><td colspan="2">Theory (75%)</td><td colspan="2">Practical (25%)</td></tr>
<tr><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td></tr>
<tr><td>Quiz- 10%
In Class Test– 15%
Assignments -5%</td><td>Two hours
All four questions</td><td>Practical records -15%
Field visit reports -15%</td><td>Practical exam -30%
Spot -30%
Oral - 10%</td></tr>
</table>

Recommended Readings	1. Dhooria, M.S. (2016). Fundamentals of Applied Acarology. Springer Science. 2. Vacante, V. (2016). The Handbook of mites of Economic Plants: Identification, Bio-Ecology and Control. CABI 1) 3. Sabelis, Maurice, W. and Bruin.jan(ed.) (2010) Trends in Acarology. Springer. 4. Kranz, G. (1997). Hand book of Acarology, Vol.2. 5. Lindquist, E.E. *et al*. (1996). Eriophyoid Mites: Their Biology, Natural Enemies and Control. Elesevier Science.			

Course Title	**Nematology**		
Course Code	**AB 32022**		
Credit Value	**02**		
Core/Elective	Core		
Prerequisite	None		
Notional hours	Theory	Practical	Independent learning
	23	15	62
Objective/s	Impart knowledge and skills on pest and predatory habits nematode's biology, distribution, damages, and their management		
Intended Learning Outcomes	● Describe the morphological and anatomical characters of different nematodes ● Sketch the morphological and anatomical modification found in different nematodes ● Classify plant parasitic, entomopathogenic and predatory nematodes ● Describe crop damages caused by phytonematodes ● Suggest suitable integrated nematodes management practices ● Measure nematode incidences and severity in the field scenario ● Apply acquired knowledge and skills to predict and forecast nematode diseases		
Detailed syllabus	**Theory** Introduction to Nematology; Characteristics of plant pathogenic nematodes; Diagnosis; Isolation and preservation of nematodes; Symptoms caused by nematodes; Interrelationship between nematodes and other plant pathogens; Ecology of nematodes; Gall forming nematodes; Entomopathogenic nematodes; Management of phytophagous nematodes.		

<table>
<tr><td></td><td colspan="4">Practical
Identification of nematode damage; Rearing techniques of phytophagous nematodes in various substrates; Rearing of predatory nematodes; Microscopic examination of different groups of nematodes; Assessing the potential of nematodes in crop ecosystem; Role of nematode in agriculture; Visit to farmers fields to identify nematode damage</td></tr>
<tr><td>Teaching and Learning Methods / Activities</td><td colspan="4">Interactive lectures, Group discussion, Assignments, Laboratory practical, field practical, problem solving</td></tr>
<tr><td rowspan="3"></td><td colspan="2">Theory (75%)</td><td colspan="2">Practical (25%)</td></tr>
<tr><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td></tr>
<tr><td>Quiz- 10%
In Class Test– 15%
Assignments -5%</td><td>Two hours
All four questions</td><td>Practical records -15%
Field visit reports -15%</td><td>Practical exam -30%
Spot -30%
Oral - 10%</td></tr>
<tr><td>Recommended Readings</td><td colspan="4">1. Luc, M., Sikora, R.A. and Bridge, J. (Eds.) (2005). Plant Parasitic nematodes in tropical and subtropical Agriculture. 2nd Edition. CABI Publishing.
2. Lee, D.L. (2002). The Biology of Nematodes. APS press
3. Decker, H. (1981). Plant Nematodes and Their Control (Phytonematology). Amerind Co. Pvt. Ltd., New Delhi.
4. Agrios, G. N. (2004). Plant pathology. 5th edition. Academic press.
5. Zuckerman, B.M. and Rohde, R.A. (1981). Plant Parasitic Nematodes. Academic Press.
6. Gaugler, R. (2002). Entomopathogenic Nematology. CABI publishing</td></tr>
</table>

Course Title	**Soil Physics for Sustainable Agriculture**		
Course Code	**SS 32012**		
Credit Value	**02**		
Core/Elective	Core		
Prerequisite	None		
Notional hours	Theory	Practical	Independent learning
	20	20	60
Objective/s	Impart knowledge and skills on soil physical properties and processes, in order to manage the soils for agricultural sustainability and environmental quality		
Intended Learning Outcomes	• Compare and contrast different soil physical properties and processes		

<table>
<tr><td></td><td colspan="4">

- Appraise soil physics in relation to agricultural sustainability and environmental quality
- Discuss the variability of physical conditions of soils
- Evaluate physical conditions of soils
- Suggest management practices to improve physical condition of soils

</td></tr>
<tr><td>Detailed syllabus</td><td colspan="4">Theory
Soil physics, agricultural sustainability and environmental quality; Dimensional analysis; Soil components and phases; Soil texture; Particle size distribution and its uses; Soil structure: formation, assessment of aggregation and structure, impact of structural degradation and management of soil structure; Soil crusting and crust management; Soil moisture content and soil water potential; Soil water movement in saturated and unsaturated soil and implications; Solute transfer; Soil temperature and heat flow; Soil air and aeration.

Practical
Assessment of extent of aggregation; Assessment of dry and wet aggregate stability; Assessment of hydraulic conductivity, field capacity, permanent wilting point; Evaluation of physical condition of soils in fields.</td></tr>
<tr><td>Teaching and Learning Methods / Activities</td><td colspan="4">Interactive lectures, think-pair-share, fish bowl learning, Jig-Zaw learning, group presentations, laboratory practicals, problem based learning</td></tr>
<tr><td rowspan="3">Evaluation</td><td colspan="2">Theory (67%)</td><td colspan="2">Practical (33%)</td></tr>
<tr><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td></tr>
<tr><td>Quiz- 10%
In-Class Test -15%
Assignment - 5%</td><td>Two hours
All four questions</td><td>Practical Records/ Assignments– 30%</td><td>Practical exam- 40 %
Spot Exam- 20 %
Oral -10 %</td></tr>
<tr><td>Recommended Readings</td><td colspan="4">

1. Lal, R and Shukla, M. (2004). Principles of Soil Physics. New York Marcel Dekker.
2. Ghildyal, B, P. (2001). Soil Physics. New Delhi New Age International.
3. Scott, H, D. (2000). Soil physics: agricultural and environmental application, New Delhi John Wiley & sons.
4. Majumdar, S. P. (2008). Analysis of soil physical properties. Jodhpur. Agrobios.
5. Daniel Hellel (2003). Introduction to environmental soil physics. Academic Press.

</td></tr>
</table>

<table>
<tr><td>Course Title</td><td colspan="4">Soil Chemistry</td></tr>
<tr><td>Course Code</td><td colspan="4">SS 32022</td></tr>
<tr><td>Credit Value</td><td colspan="4">02</td></tr>
<tr><td>Core/Elective</td><td colspan="4">Core</td></tr>
<tr><td>Prerequisite</td><td colspan="4">None</td></tr>
<tr><td rowspan="2">Notional hours</td><td>Theory</td><td colspan="2">Practical</td><td>Independent learning</td></tr>
<tr><td>20</td><td colspan="2">20</td><td>60</td></tr>
<tr><td>Objective/s</td><td colspan="4">Provide knowledge about soil colloids and their influence on soil properties, processes and uses, chemistry of problem soils and submerged soils</td></tr>
<tr><td>Intended Learning Outcomes</td><td colspan="4">• Classify soil minerals and colloids
• Evaluate soil properties based on colloids
• Distinguish different buffering mechanisms, adsorption isotherms and double layer theories
• Differentiate the chemistry of acid, saline and sodic soils
• Discuss the chemistry of submerged paddy soils
• Critically evaluate chemical analytical data of soils</td></tr>
<tr><td>Detailed syllabus</td><td colspan="4">Theory
Chemical composition and properties of soils: soil minerals, their classification and characteristics, humus and its properties, charge development, soil solution and its reactions, flocculation and dispersion, ion exchange and adsorption isotherms, double layer theories, soil pH, buffering; Chemistry of acid soils and alkaline soils; Chemistry of submerged paddy soils: redox potential, nutrient availability, management.

Practical
Adsorption isotherms; Specific surface of soils; Buffer capacity; Exchangeable sodium percentage; Lime requirement; Gypsum requirement; Study of submerged soils.</td></tr>
<tr><td>Teaching and Learning Methods / Activities</td><td colspan="4">Interactive Lectures, Group Discussions, laboratory practicals, problem-based learning/case study</td></tr>
<tr><td rowspan="2">Evaluation</td><td colspan="2">Theory (67%)</td><td colspan="2">Practical (33%)</td></tr>
<tr><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td></tr>
<tr><td>Quiz- 10%
In-Class Test -15%
Assignment - 5%</td><td>Two hours
All four questions</td><td>Practical Records/ Assignments- 30%</td><td>Practical exam- 40 %
Spot Exam -20 %
Oral -10 %</td></tr>
</table>

Recommended Readings	1. Srimathie, P. I. (2009). Principles and Applications of Soil Mineralogy. IRQUE project, Faculty of agriculture, University of Peradeniya. 2. Tan, K. H. (2018). Principles of soil chemistry.4th edition. Baco Raton CRC Press. 3. Sarkar, A. K. (2013). Acid soils their chemistry and management. New Delhi, New India pub. 4. Sparks, D, L. (2003). Environmental soil chemistry.2nd edition. Amsterdam, Academic Press. 5. Sposito, G. (2008). The chemistry of soils.2nd edition. Oxford University Press.

Course Title	**Food Chemistry**		
Course Code	**FS 32022**		
Credit Value	**02**		
Core/Elective	Core		
Prerequisite	None		
Notional hours	Theory	Practical	Independent learning
	20	20	60
Objective/s	Provide the knowledge on chemistry of individual components of foods, enzymes, additives, adulterants and contaminants and mechanism of natural antioxidants and skills to analyze them		
Intended Learning Outcomes	• Describe the concept of water activity and its influence in chemical, biochemical and microbial stability of food ● Identify different food adulterants and contaminants ● Elaborate the concept of food additives, colorants and flavours ● Discuss the important properties of carbohydrate, protein and fat ● Discuss the roles and properties of different commercial enzymes used in the food industry. ● Correlate the concept of antioxidants and their importance		
Detailed syllabus	**Theory** Concept of water activity; Moisture sorption isotherms; Water binding in foods; Functional properties of carbohydrates; Modified starches and pectin; Food lipids and health; Thermal decomposition of fats; Chemistry of frying; Functional properties of proteins; Important food proteins; Food additives; Food colourants; Food flavours; Adulterants and contaminants in foods; Natural antioxidants; Enzymes used in the food industry. **Practical** Measurement of water activity; Chemical analysis of pectin of different fruits and vegetables; Determination of functional properties of carbohydrates and proteins; Determination of gel consistency of cereal flours; Tests for food adulterants; Detection of food additives;		

<table>
<tr><td></td><td colspan="4">Determination of antioxidants in fruits and vegetables; Hydrolysis of starch by commercial enzyme.,</td></tr>
<tr><td>Teaching and Learning Methods / Activities</td><td colspan="4">Interactive lectures, tutorial discussions, group discussions, group presentations, laboratory practical sessions, assignments</td></tr>
<tr><td rowspan="3">Evaluation</td><td colspan="2">Theory (67%)</td><td colspan="2">Practical (33 %)</td></tr>
<tr><td>Formative assessment (30%)</td><td>Summative assessment (70%)</td><td>Formative assessment (30%)</td><td>Summative assessment (70%)</td></tr>
<tr><td>Quiz- 10%
In-Class Test – 15%
Assignment -5%</td><td>Two hours
All four questions</td><td>Practical records- 20%
Assignments- 10%</td><td>Practical exam - 40%
Spot Exam - 20%
Oral - 10%</td></tr>
<tr><td>Recommended References</td><td colspan="4">1. Damodaran, S., and Parkin, K.L. (2017). Fennema’s Food Chemistry, 5th edition, CRC Press, Boca Raton
2. Sikorski, Z.E. (2007). Chemical and functional properties of food components, 3rd edition, CRC Press, Boca Raton
3. Belitz, H.D., Grosch, W and Schieberle.P. (2009). Food Chemistry, 4th Edition, Springer
4. Apenten, R.O. (2004). Introduction to Food Chemistry, CRC Press, Boca Raton
5. Chopra, H.K. and Panesar.P.S (2010). Food Chemistry, Narosa publishing House, New Delhi.
6. Akoh.C.C. (2017). Food lipids: Chemistry, Nutrition and Biotechnology, 4th Edition, CRC Press, Boca Raton</td></tr>
</table>

<table>
<tr><td>Course Title</td><td colspan="3">Food Microbiology</td></tr>
<tr><td>Course Code</td><td colspan="3">FS 32032</td></tr>
<tr><td>Credit Value</td><td colspan="3">02</td></tr>
<tr><td>Core/Elective</td><td colspan="3">Core</td></tr>
<tr><td>Prerequisite</td><td colspan="3">None</td></tr>
<tr><td rowspan="2">Notional hours</td><td>Theory</td><td>Practical</td><td>Independent learning</td></tr>
<tr><td>20</td><td>20</td><td>60</td></tr>
<tr><td>Objective/s</td><td colspan="3">Provide knowledge on the beneficial and detrimental effects of microorganisms that are associated with food and their detection and enumeration methods</td></tr>
<tr><td>Intended Learning Outcomes</td><td colspan="3">• Describe the varoius factors affecting microbial growth
• Compare the characters of different groups of imporatnt food microorganisms
• Propose suitable detection and enumeration method for different food microbial samples
• Analyse the spoilage pattern of varous food commordities</td></tr>
</table>

<table>
<tr><td></td><td colspan="4">

- Discuss the causes for the food born infection and intoxication
- Discuss the concept of beneficial microorganisms in foods

</td></tr>
<tr><td>Detailed syllabus</td><td colspan="4">

Theory

Classification and general characteristics of microorganisms; Sources of Microorganisms; Factors affecting microbial growth on foods; Sample preparation and detection and enumeration of microorganism in food; Microbial spoilage of foods; Microorganisms associated with fermentation of foods; Food born infection and intoxication; Mycotoxins; Indicator organisms; Beneficial and detrimental effects of genetically modified organisms.

Practical

Quantification of microbes in food; Fermented food products and water: sampling, serial dilution and counting; Culture techniques using standard plates, Pure culture isolation techniques; Detection of coliforms and e.coli; Colony counting using heamocytometer.

</td></tr>
<tr><td>Teaching and Learning Methods / Activities</td><td colspan="4">Interactive lectures, tutorial discussions, group discussions, group presentations, laboratory practical sessions, assignments, case studies</td></tr>
<tr><td rowspan="2">Evaluation</td><td colspan="2">Theory (67 %)</td><td colspan="2">Practical (33 %)</td></tr>
<tr><td>Formative assessment (30%)</td><td>Summative assessment (70%)</td><td>Formative assessment (30%)</td><td>Summative assessment (70%)</td></tr>
<tr><td></td><td>Quiz- 10%
In Class Test – 15%
Assignment -5%</td><td>Two hours
All four questions</td><td>Practical records-20%
Assignments-10%</td><td>Practical exam- 40%
Spot - 20%
Oral - 10%</td></tr>
<tr><td>Recommended References</td><td colspan="4">

1. Matthews. K.R., Kniel.K.E. and Montville,T.J (2017). Food Microbiology: An Introduction. 4th ed. ASM Press. Washington
2. Bell. C., Neaves, P. and Williams, A.P. (2005). Food microbiology and laboratory practice, Blackwell publishing, UK
3. Ray, B. and Bhunia, A. (2008). Fundamental food microbiology, 4th edition, CRC Press, Boca Raton
4. Bohra, A. and Parihar, P. (2006). Food microbiology, Agrobios, India
5. Banwart, G.J. (2004). Basic Food Microbiology, CBS publishers and Distributors, India
6. Jay,J.M., Loessner.M.J. and Golden,D.A (2012). Modern Food microbiology, 7th edition, Springer, New York.
7. Adams,M.R. and Moss.M.O. (2008). Food Microbiology, 3rd Edition, RSC Publishing, Cambridge.

</td></tr>
</table>

<table>
<tr><td>Course Title:</td><td colspan="4">Testing and Evaluation of Farm Machinery</td></tr>
<tr><td>Course Code:</td><td colspan="4">AE 32032</td></tr>
<tr><td>Credit Value:</td><td colspan="4">02</td></tr>
<tr><td>Core/ Optional</td><td colspan="4">Core</td></tr>
<tr><td>Prerequisite</td><td colspan="4">None</td></tr>
<tr><td rowspan="2">Notional Hours</td><td>Theory</td><td colspan="2">Practical</td><td>Independent learning</td></tr>
<tr><td>21</td><td colspan="2">21</td><td>58</td></tr>
<tr><td>Objectives</td><td colspan="4">Impart practical knowledge and practical skills on testing and evaluation of various farm machines such as 4WT, 2WT, Seeders, Planters, Combine harvester, Water pumps, Threshers, Reapers and Sprayers.</td></tr>
<tr><td>Intended Learning Outcomes</td><td colspan="4">• Identify appropriate brand of a machine for particular operation.
• Evaluate farm machineries for their functional stability.
• Demonstrate the condition of a machine to make possible repairs well in advance to increase their durability.
• Evaluate the strategies for an engine without efficiency loss in running conditions.
• Examine working principles of engines.
• Discuss safety precautions for handling of machines without any field accidents.</td></tr>
<tr><td>Detailed Syllabus</td><td colspan="4">Theory

Introduction to testing and evaluation of farm machinery; Basic definitions and calculations related to the capacity of farm machines; Importance of testing and evaluation; Use of four wheel tractor (4WT) and two wheel tractor (2WT) in farm operation; 2WT and 4WT maintenance; Diesel engines and their operations; Power points of 2WT and 4WT; Components and functions of reapers, threshers, pumps, combine harvester, seeders and planters.

Practical

Testing and evaluation of 2WT, 4WT, Knapsack sprayer, Power sprayer, Seeder, Planter, Blowers and dusters, Reapers and threshers; Harvesting loss calculation; Testing and evaluation of combine harvester; Primary tillage tool and secondary tillage tool.</td></tr>
<tr><td>Detailed Syllabus</td><td colspan="4">Interactive lectures, Tutorials, Field practical, Case study, Assignments, Group presentation and Practical demonstrations.</td></tr>
<tr><td rowspan="2">Teaching and learning methods</td><td colspan="2">Theory (67 %)</td><td colspan="2">Practical (33 %)</td></tr>
<tr><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td></tr>
</table>

	Quiz - 10% In Class Test - 15% Assignment/ Presentation - 5%	Two hours All four questions.	Practical records/ Assignments- 20% Field visit reports - 10 %	Practical exam -30% Spot - 30% Oral - 10%
Recommended Readings	1. Donaldson, C., Lecain, G.H. and Goold, V.C., (2002). Tool design. Tata Mcgraw hill publishing company ltd, New Delhi. 2. Kolovsky, M.Z., Lilov, L., Evgrafov, A.N., Semenov, Y.A., Slousch, A. V, (2012). Advanced Theory of Mechanisms and Machines, Foundations of Engineering Mechanics. Springer 3. Berlin Heidelberg, Mehta, M.L.V.S.R.M. and Mehta, M.L.V.S.R.M., (2016). Testing and Evaluation of Agricultural Machinery. DAYA Publishing House 4. Field, H.L., Roth, L.O., (2012). Introduction to Agricultural Engineering: A Problem Solving Approach. Springer US. 5. Smith, D., Sims, B.G. and O'Neill, D.H., (1994). Testing and Evaluation of Agricultural Machinery and Equipment- Principle and Practice. FAO Agricultural Services Bulletin 110. 6. Srivastava, D.S. (1995) Elements of farm machinery. Oxford and IBH publishing co. pvt.ltd, New Delhi			

Course Title	**Irrigation and Water Management**		
Course Code	**AE 32022**		
Credit Value	**02**		
Core/Elective	Core		
Prerequisite	None		
Notional hours	Theory	Practical	Independent learning
	21	21	58
Objectives	Provide advanced knowledge and analytical skills in irrigation and water management practices to develop effective irrigation systems for crop plants.		
Intended Learning Outcomes	• Apply the knowledge in water management for the design of better irrigation systems. • Estimate the irrigation design parameters of different irrigation methods. • Describe the quantity and quality parameters of water for irrigation of crops. • Assess crop response and crop yield loss due to improper irrigation. • Compare the efficiency of different irrigation systems.		

<table>
<tr><td>Detailed Syllabus</td><td colspan="4">Theory
Irrigation system development; History and development of irrigation systems; Selection criteria for different irrigation systems: merit and demerit of border, basin, furrow, sprinkler and drip irrigation; Basic design of border irrigation; Basin irrigation; Furrow irrigation; Sprinkler irrigation; Drip irrigation and lift irrigation; Crop response to irrigation water; Watershed management; Crop water relationship.
Practical
Measurement of design parameters of irrigation; Field installation of drip and sprinkler irrigation; Measurement of irrigation efficiency at irrigation structures; Irrigation scheduling calculations; Development of irrigation layout.</td></tr>
<tr><td>Teaching and learning methods</td><td colspan="4">Lectures, Interactive tutorial classes, Case study, Field practical, Group assignment and practical demonstrations.</td></tr>
<tr><td rowspan="3">Evaluation</td><td colspan="2">Theory (67%)</td><td colspan="2">Practical (33%)</td></tr>
<tr><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td></tr>
<tr><td>Quiz - 10%
In Class Test - 15%
Assignment/ Presentation - 5%</td><td>Two hours
All four questions.</td><td>Practical records/ Assignments - 20%
Field visit reports - 10 %</td><td>Practical exam - 30%
Spot - 30%
Oral - 10%</td></tr>
<tr><td>Recommended Readings</td><td colspan="4">1. Goyal, M.R., Pandian, B.J., (2021). Management Strategies for Water Use Efficiency and Micro Irrigated Crops. Taylor & Francis Group.
2. Goyal, M.R., Pandian, B.J., (2021). Management Strategies for Water Use Efficiency and Micro Irrigated Crops. Taylor & Francis Group.
3. Waller, P., Yitayew, M., (2015). Irrigation and Drainage Engineering. Springer International Publishing.
4. Mollinga, P.P., Dixit, A., Athukorala, K., (2006). Integrated Water Resources Management: Global Theory, Emerging Practice and Local Needs, Water in South Asia. SAGE Publications.
5. Sankara Redid, G.H. and Yellamanda Reddy. T., (2003). Efficient use of irrigation water. Kalyani Publishers, New Delhi.
6. Twomey, D., (2016). Irrigation and Water Management. Syrawood Publishing House.</td></tr>
</table>

Course Title	**Agricultural Development and Policy Analysis**		
Course Code	**EC 32022**		
Credit Value	**02**		
Core/Elective	Core		
Prerequisite	None		
Notional hours	Theory	Practical	Independent learning
	30		70

<table>
<tr><td>Objective/s</td><td colspan="2">Provide an over view of major economic theories of economic growth, the basic concepts and frameworks used in agricultural policy analysis and the limitations of standard economic tools to analyze agricultural policy.</td></tr>
<tr><td>Intended Learning Outcomes</td><td colspan="2">• Explain the problems in economic development and approach them with a rigorous and critical way.
• Analyse critically on the agricultural policy environment, policy formulation process and institutions
• Assess current farm programs, and emerging food policy and trade policy issues.
• Identify the main elements of the major challenges faced by the agricultural policy makers
• Explain the neoclassical framework for economic policy analysis.</td></tr>
<tr><td>Detailed syllabus</td><td colspan="2">Theory
Concepts, and approaches of development; Principles of Economic development, theories and models; Urbanization and Rural-Urban migration; Agricultural transformation and rural development; The environment; Access to markets for development; Policy analysis: framework, economics; Agricultural policies: price policy, marketing policy, input policy, credit policy, land reform policy, irrigation policy, food policy and security; Quantitative analysis of agricultural policy</td></tr>
<tr><td>Teaching and Learning Methods / Activities</td><td colspan="2">Interactive lectures, tutorials, group presentation, group discussion, and Problem based learning</td></tr>
<tr><td rowspan="3">Evaluation</td><td colspan="2">Theory</td></tr>
<tr><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td></tr>
<tr><td>Quiz- 10%
In Class Test – 15%
Assignment/ Presentation -5%</td><td>Three hours
All 5 questions</td></tr>
<tr><td>Recommended Readings</td><td colspan="2">1. Debraj Ray. (1998),Development Economics.Princeton university press.
2. Todaro, M.P. and Smith, S.C. (2009), Economic Development. Pearson, Addison Wesley.
3. Boardman, A.E., Greenberg, D.H., Vining, A.R. and Weimer, D.L. (2006) Cost- Benefit Analysis:Concepts and Practice. Pearson, Prentice Hall.</td></tr>
</table>

<table>
<tr><td>Course Title</td><td colspan="3">Natural Resource and Environmental Economics</td></tr>
<tr><td>Course Code</td><td colspan="3">EC 32032</td></tr>
<tr><td>Credit value</td><td colspan="3">02</td></tr>
<tr><td>Core / Elective</td><td colspan="3">Core</td></tr>
<tr><td>Prerequisite</td><td colspan="3">None</td></tr>
<tr><td rowspan="2">Notional hours</td><td>Theory</td><td>Practical</td><td>Independent learning</td></tr>
<tr><td>23</td><td>15</td><td>62</td></tr>
<tr><td>Objectives/s:</td><td colspan="3">Impart a deeper knowledge in the field of environmental policy and the management of natural resources</td></tr>
<tr><td>Intended Learning Outcomes</td><td colspan="3">• Explain the possibilities and limitations of a market economy in finding the solutions for environmental problems and the management of natural resources,
• Demonstrate the concept of cost efficiency,
• Explain the usefulness of various environmental policy instruments in different situations,
• Explain different methods for valuation of the environment,
• Interpret natural resources management based on economic theory
• Make use of economic theory on local, regional and global environmental problems.</td></tr>
<tr><td>Detailed Syllabus / Course Content</td><td colspan="3">Theory

An introduction to natural resource and environmental economics; Ethics: utilitarianism, the utilitarian intertemporal social welfare function; Concepts of sustainability: economic concepts on sustainability, sustainable yield, resilience, the steady state economy, economic models and policy; Welfare economics and environment: efficiency and optimality, allocation in a market economy, market failure, markets for environmental services, public goods and economic efficiency, externalities, the coarse theorem, the second best problem, government failure; Pollution control: targets, instruments; Valuing the environment; Irreversibility, risk and uncertainty; International environmental problems; Environment and the developing countries; The efficient and optimal use of natural resources; The theory of optimal non-renewable resource extraction; Stock pollution problems.

Practical

Visit to environmental authority and related institutions to study the functions of these institution; Identifying and monitoring the vulnerable</td></tr>
</table>

<table>
<tr><td></td><td colspan="4">areas around Sri Lanka specially around the Northern province; Performing a simple environmental impact assessment.</td></tr>
<tr><td>Teaching and learning methods</td><td colspan="4">Interactive lectures, tutorials, laboratory works, group presentation, group discussion, field practical, field visits and Problem based learning</td></tr>
<tr><td rowspan="3">Evaluation</td><td colspan="2">Theory (75%)</td><td colspan="2">Practical (25%)</td></tr>
<tr><td>Formative assessment (30%)</td><td>Summative Assessment (70%)</td><td>Formative assessment (30%)</td><td>Summative Assessment (70%)</td></tr>
<tr><td>Quiz- 10%
In Class Test -15%
Assignment/ Presentation -5%</td><td>2 Hours
25 MCQ
All three essay questions</td><td>practical records- 20 %
Field visit reports -10 %</td><td>Practical exam- 60 %
Oral -10 %</td></tr>
<tr><td>Recommended readings:</td><td colspan="4">1. Perman, R., Ma, Y., McGilvray J. and Common, M. (2003). Natural Resource and Environmental Economics. Pearson, Addison Wesley.
2. Pearce, D.W. and Turner, R.K. (1990). Economics of Natural Resources and the Environment. Harvester Wheatsheaf.
3. Callan, S. and Thomas, J.M. (2006). Environmental Economics and Management: Theory, Policy and Application. Thomson south-western.</td></tr>
</table>

<table>
<tr><td>Course Title</td><td colspan="3">Extension Education</td></tr>
<tr><td>Course Code</td><td colspan="3">EX 32022</td></tr>
<tr><td>Credit Value</td><td colspan="3">02</td></tr>
<tr><td>Core/Elective</td><td colspan="3">Core</td></tr>
<tr><td>Prerequisite</td><td colspan="3">None</td></tr>
<tr><td rowspan="2">Notional hours</td><td>Theory</td><td>Practical</td><td>Independent learning</td></tr>
<tr><td>15</td><td>30</td><td>55</td></tr>
<tr><td>Objective/s</td><td colspan="3">Provide the students with the concept of extension education and its importance in Agriculture development and an exposure to the students with various Rural development programmes aimed at poverty alleviation.</td></tr>
<tr><td>Intended Learning Outcomes</td><td colspan="3">• Describe the principles and Philosophy of Extension Education
• Explain the importance of adult and distance education in agriculture sector
• Demonstrate current approaches in extension
• Compare decentralized decision making, bottom up planning and farming system approach
• Distinguish Farming situation based extension and Market –Led-Extension</td></tr>
</table>

<table>
<tr><td>Detailed syllabus</td><td colspan="4">Theory

Extension education: meaning, objectives, concepts, principles and philosophy; Adult education; Distance education; Current approaches in extension; Decentralised decision making; Bottom up planning; Farming system approach; Farming situation-based extension; Market – led – extension; Farm field school.

Practical

Functions of the agricultural extension institutions; Detailed Study of their programme in relation to Educational Technology; Methodology; Curriculum Development; Evaluation and Assessment; Exercise on development of curriculum for Distance Education exclusively for farming community. Identification and analysis of different marketing sources for agricultural commodities, Development of strategy for an effective market intelligence system, Development of suitable marketing plan to suite rural situation, The function of Export Development Board (EDB) related to market-led extension, Analysis of Indigenous Technical Knowledge systems, study the cases on integration of Indigenous Technical Knowledge systems and formal research system, Practicing bottom up planning. Public-Private -Farmer partnership. Learning from Food and Nutritional Security and bio-diversity Projects and Programmes,</td></tr>
<tr><td>Teaching and Learning Methods / Activities</td><td colspan="4">Interactive lectures, tutorials, laboratory works, group presentation, group discussion, field practical, field visits and Problem based learning</td></tr>
<tr><td rowspan="3">Evaluation</td><td colspan="2">Theory (50%)</td><td colspan="2">Practical (50%)</td></tr>
<tr><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td><td>Formative Assessment (30%)</td><td>Summative Assessment (70%)</td></tr>
<tr><td>Quiz- 10%
In Class Test – 15%
Assignment/ Presentation -5%</td><td>Two hours
All four questions</td><td>practical records - 20 %
Field visit report - 10%</td><td>Practical exam-60 %
Oral - 10 %</td></tr>
<tr><td>Recommended References</td><td colspan="4">1. Chandrakandan KM, Senthil Kumar & Swatilaxmi. PS. (2005). Extension Education What? And What Not ? RBSA Publ.
2. Gallagher K. (1999). Farmers Field School (FFS) – A Group Extension Process based on Non-Formal Education Methods. Global EPM Facility,FAO.
3. Ganesan R, Iqbal IM & Anandaraja N. (2003). Reaching the Unreached: Basics of Extension Education. Associated Publishing Co.
4. Jalihal KA & Veerabhadraiah V. (2007). Fundamentals of Extension Education and Management in Extension. Concept Publ.</td></tr>
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<table>
<tr><td>Course Title</td><td colspan="3">Development Communication</td></tr>
<tr><td>Course Code</td><td colspan="3">EX 32032</td></tr>
<tr><td>Credit value</td><td colspan="3">02</td></tr>
<tr><td>Core / Elective</td><td colspan="3">Core</td></tr>
<tr><td>Prerequisite</td><td colspan="3">None</td></tr>
<tr><td rowspan="2">Notional hours</td><td>Theory</td><td>Practical</td><td>Independent learning</td></tr>
<tr><td>23</td><td>15</td><td>62</td></tr>
<tr><td>Objectives:</td><td colspan="3">Provide the concept, meaning and process of communication and various methods and modern media of communication.</td></tr>
<tr><td>Intended Learning Outcomes</td><td colspan="3">• Apply communication theories/models, principles, practices, and tools in development work
• Develop a communication program/plan
• Demonstrate effective interpersonal skills as a linker, networker, and mediator
• Communicate in different formats and platforms (print, broadcast, and online)
• Conduct communication research, monitoring, and evaluation
• Develop multi-media materials</td></tr>
<tr><td>Detailed Syllabus / Course Content</td><td colspan="3">Theory

Concept, elements and their characteristics of Communication process; Models and theories of communication; Communication skills, communication effectiveness and credibility, feedback in communication, social networks and development communication; Barriers in communication; Meaning, dimensions of a message, characteristics of a good message; Message treatment and effectiveness, distortion of message; Methods of communication; Oral and written communication; Non-verbal communication, interpersonal communication, organizational communication; Role of communication in development; Role of mass media in dissemination of farm technology; Effect of media mix for rural people; Modern communication media; Tele conference; Computer Assisted Instruction and its implications; Agricultural Journalism: news stories, feature articles, magazine articles, farm bulletins and folders; Techniques of collection of materials for news stories and feature articles; Rewriting Art of clear writing; Readability and comprehension testing procedures; Photo journalism: communicating with pictures, Radio and TV Journalism: techniques of writing scripts for Radio and TV.

Practical
Preparation of Visual/non-Projected Materials; Operations of various Audio-visual Aids; Project preparation on specific area in development</td></tr>
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<table>
<tr><td></td><td colspan="4">communication; Case studies in development communication; Evaluation of a newspaper story; a radio programme and a television broadcast.</td></tr>
<tr><td>Teaching and learning methods</td><td colspan="4">Interactive lectures, tutorials, laboratory works, group presentation, group discussion, field practical, field visits and Problem based learning</td></tr>
<tr><td rowspan="3">Evaluation</td><td colspan="2">Theory (75%)</td><td colspan="2">Practical (25%)</td></tr>
<tr><td>Formative assessment (30%)</td><td>Summative Assessment (70%)</td><td>Formative assessment (30%)</td><td>Summative Assessment (70%)</td></tr>
<tr><td>Quiz- 10%
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Field visit reports -10 %</td><td>Practical exam-60 %
Oral -10 %</td></tr>
<tr><td>Recommended readings:</td><td colspan="4">1. Dahama OP & Bhatnagar OP, (2005). Education and Communication for Development. Oxford & IBH.
2. Grover I, Kaushik S, Yadav L & Varma SK. (2002). Communication and Instructional Technology. Agrotech Publ. Academy.
3. JanaBL&MitraKP.(2005).Farm Journalism. Agrotech Publ.Academy.
4. RayGL. (2006). Extension Communication and Management. Kalyani Publ.Rayudu</td></tr>
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