



General Certificate of Education (A/L)

(Grade 12 - 13)

Biosystems Technology

Syllabus

(To be implemented from 2017)

Department of Technical Education
Faculty of Science and Technology
National Institute of Education
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Grades 12 & 13

Syllabus

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1.0 Introduction

It is a pleasure to get an occasion to re-update the subject, Biological Systems Technology that was introduced in the year 2013 for G.C.E. (Advanced Level) grades.

It aims to expand the occasions for technological education based on the knowledge that gets through the practical activities and give students the basic technological knowledge and practical experiences that is needed to the developing world through studying of this subject.

The subject, Biological Systems Technology has been prepared by combining the use of modern technology in the fields of agricultural science, ecological science, practical science and biology. The students who learn this subject would be able to give large contribution to national development processes through their knowledge. This subject confirms on basic management skills related to the technology and gives necessary knowledge to see the business world with a new vision by combining technology in the process of production value chain. Further, it is a role of this subject to identify the challenges of an economy that is based on the modern technological knowhow through the business knowledge, skills and attitudes and train students to react to those challenges.

This subject includes activities that give necessary skills for occupations or self-employment to the students who do not focus on higher education. The subject is also expected to give entrepreneur skills that can contribute to the economic development of Sri Lanka and improve the skills that are necessary for personal livelihood.

In order to achieve the learning outcomes of this subject, it is a must to import theoretical knowledge and practical skills through classroom as well as field activities. Keeping this focus, it is the responsibility of all of us to build a suitable environment in the school to achieve this end.

2.0 Common National Goals

The national system of education should assist individuals and groups to achieve major national goals that are relevant to the individual and society.

Over the years major education reports and documents in Sri Lanka have set goals that sought to meet individual and national needs. In the light of the weaknesses manifest in contemporary educational structures and processes, the National Education Commission has identified the following set of goals to be achieved through education within the conceptual framework of sustainable human development.

- I. Nation building and the establishment of a Sri Lankan identity through the promotion of national cohesion, national integrity, national unity, harmony and peace, and recognizing cultural diversity in Sri Lanka's plural society within a concept of respect for human dignity.
- II. Recognizing and conserving the best elements of the nation's heritage while responding to the challenges of a changing world.
- III. Creating and supporting an environment imbued with the norms of social justice and a democratic way of life that promotes respect for human rights, awareness of duties and obligations, and a deep and abiding concern for one another.
- IV. Promoting the mental and physical well-being of individuals and a sustainable life style based on respect for human values.
- V. Developing creativity, initiative, critical thinking, responsibility, accountability and other positive elements of a well-integrated and balanced personality.
- VI. Human resource development by educating for productive work that enhances the quality of life of the individual and the nation and contributes to the economic development of Sri Lanka.
- VII. Preparing individuals to adapt to and manage change, and to develop capacity to cope with complex and unforeseen situations in a rapidly changing world.
- VIII. Fostering attitudes and skills that will contribute to securing an honourable place in the international community, based on justice, equality and mutual respect.

3.0 Common National Competencies

The following Basic Competencies developed through education will contribute to achieving the above National Goals.

(I) Competencies in Communication

Competencies in Communication are based on four subsets; Literacy, Numeracy, Graphics and IT proficiency.

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|----------------|---|--|
| Literacy | : | Listen attentively, speak clearly, read for meaning, write accurately and lucidly and communicate ideas effectively. |
| Numeracy | : | Use numbers for things, space and time, count, calculate and measure systematically. |
| Graphics | : | Make sense of line and form, express and record details, instructions and ideas with line, form and colour. |
| IT proficiency | : | Computer literacy and the use of information and communication technologies (ICT) in learning, in the work environment and in personal life. |

(II) Competencies relating to Personality Development

- Generic skills such as creativity, divergent thinking, initiative, decision making, problem solving, critical and analytical thinking, team work, interpersonal relations, discovering and exploring;
- Values such as integrity, tolerance and respect for human dignity;
- Emotional intelligence.

(III) Competencies relating to the Environment

These competencies relate to the environment: social, biological and physical.

- Social Environment : Awareness of the national heritage, sensitivity and skills linked to being members of a plural society, concern for distributive justice, social relationships, personal conduct, general and legal conventions, rights, responsibilities, duties and obligations.
- Biological Environment : Awareness, sensitivity and skills linked to the living world, people and the ecosystem, the trees, forests, seas, water, air and life- plant, animal and human life.
- Physical Environment : Awareness, sensitivity and skills linked to space, energy, fuels, matter, materials and their links with human living, food, clothing, shelter, health, comfort, respiration, sleep, relaxation, rest, wastes and excretion.

Included here are skills in using tools and technologies for learning, working and living.

(IV) Competencies relating to Preparation for the World of Work

Employment related skills to maximize their potential and to enhance their capacity

- To contribute to economic development,
- To discover their vocational interests and aptitudes,
- To choose a job that suits their abilities, and
- To engage in a rewarding and sustainable livelihood.

(V) Competencies relating to Religion and Ethics

Assimilating and internalizing values, so that individuals may function in a manner consistent with the ethical, moral and religious modes of conduct in everyday living, selecting that which is most appropriate.

(VI) Competencies in Play and the Use of Leisure

Pleasure, joy, emotions and such human experiences as expressed through aesthetics, literature, play, sports and athletics, leisure pursuits and other creative modes of living.

(VII) Competencies relating to “learning to learn”

Empowering individuals to learn independently and to be sensitive and successful in responding to and managing change through a transformative process, in a rapidly changing, complex and interdependent world.

Suggestions for a national policy framework for general education in Sri Lanka - National Education Commission (December, 2003)

4.0 Objectives of the syllabus

- To improve the technological knowhow needed for day today life.
- To develop the necessary skills to solve the problems of developing world.
- To develop employment base skills.
- To connect the student's occupational education with the national framework.
- To develop basic technological knowledge base to continue work in biological systems.
- To improve the necessary skills for management and planning.
- To give basic knowledge and knowhow on laboratory activities, fields activities and the using of equipment and tools and improve the employment base skills
- To improve the necessary skills to employ technological methods effectively and efficiently to gain high quality products.
- To generate innovations and testings related to the Biological Systems Technology.
- To intensify readiness in students to exploit technology-based employment opportunities.

5.0 Evaluation and Assessment

It is expected that learning-teaching tools are prepared creatively and used covering the competencies and competency levels earmarked for each term under the school based programme. through it, the proficiency level of students can be assessed.

In grades 12,13, evaluation is done at two levels, under school level and national level. School level assessment is carried-out by the school and the provincial education department.

National level evaluation is done through the end of the G.C.E. (A/L) examination held by the Department of Examinations, at teh end of grade 13. Here 75 marks are allocated for the written paper and 25 marks are given for the practical test. The practical test consists of a spot test with 30 questions and two practical activities.

Suggested number of periods for each competency

Grade 12

Competency	Periods
1. Interprets weather conditions suitable for biological systems.	12
2. Investigates the soil in biological systems.	30
3. Exhibits readiness for surveying and levelling.	50
4. Investigates the water resources in biological systems.	08
5. Determines the quality of water.	22
6. Exhibits readiness to produce quality plants commercially.	18
7. Exhibits readiness to engage in aquaculture.	22
8. Exhibits readiness to engage in animal production through application of technology.	38
9. Plans methodologies for quality food production.	65
10. Investigates the post harvest techniques for high quality products.	15
11. Investigates the technology of controlled environment for crop production.	20
Total	300

Grade 13

Competency	Periods
12. Exhibits readiness for mechanization.	74
13. Exhibits readiness to utilize sustainable timber and non-timber based products.	26
14. Investigates different techniques to produce plantation and minor export crops based products.	20
15. Exhibits readiness to develop and construct process control and automation mechanisms.	72
16. Exhibits readiness to apply Occupational Safety and Health (OSH) practices related to different occupations.	08
17. Exhibits readiness to engage in horticulture.	40
18. Investigates environmental friendly strategies for sustainable development of biological systems.	45
19. Improves necessary skills for enterprise and product development.	15
Total	300

Competencies and competency levels for Grades 12 and 13

Grade	Term	Competency and competency level
Grade 12	First Term	From first competency to fourth competency (14 competency levels)
	Second Term	From fifth competency to eighth competency (12 competency levels)
	Third Term	From ninth competency to eleventh competency (17 competency levels)
Grade 13	First Term	From twelfth competency to thirteenth competency (10 competency levels)
	Second Term	From fourteenth competency to sixteenth competency (10 competency levels)
	Third Term	From seventeenth competency to nineteenth competency (11 competency levels)

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
1. Interprets weather conditions suitable for biological systems.	1.1 Inquires into climatic factors affecting biological systems.	<ul style="list-style-type: none"> • Weather and climate • Climatic factors <ul style="list-style-type: none"> • Rainfall • Sunlight • Temperature • Wind • Relative humidity • Atmospheric pressure • Impact of climatic factors on different bio-systems 	<ul style="list-style-type: none"> • Distinguishes between weather and climate. • Names climatic factors. • Describes the impact of climatic factors on biological systems. 	04
	1.2 Inquires into meteorological observation station and its functions.	<ul style="list-style-type: none"> • Meteorological observation station <ul style="list-style-type: none"> • Site selection • Instruments and installation • Data collection • Data recording • Automated Weather Station (AWS) • Weather forecasting <ul style="list-style-type: none"> • Importance 	<ul style="list-style-type: none"> • Describes factors to be considered to establish a meteorological station. • Names different instruments to be used to measure particular weather parameters. • Describes the way of installing instruments in a meteorological observation station. • Determines the weather parameters using relevant instruments. • Presents information about AWS. • Describes the importance of weather forecasting. 	08

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
2. Investigates the soil in biological systems.	2.1 Inquires into characteristics of soil.	<ul style="list-style-type: none"> • Soil <ul style="list-style-type: none"> • Importance • Characteristics <ul style="list-style-type: none"> • Physical characteristics <ul style="list-style-type: none"> • Soil texture • Soil colour • Soil structure • Soil consistency • Water holding capacity <ul style="list-style-type: none"> • Infiltration rate • Soil temperature • Soil density • Chemical characteristics <ul style="list-style-type: none"> • Soil pH • Cation Exchange Capacity (CEC) • Electrical Conductivity (EC) • Biological characteristics <ul style="list-style-type: none"> • Micro • Meso • Macro 	<ul style="list-style-type: none"> • Describes the importance of soil. • Categorizes the characteristics of soil. • Describes the impact of physical characteristics of soil in a biological system. • Determines the soil texture and structure. • Determines the soil colour. • Determines the soil consistency. • Determines bulk density and true density of soil. • Calculates soil porosity. • Describes the impact of chemical characteristics of soil in a biological system. • Suggests corrective measures to overcome adverse chemical characteristics of soil. • Determines pH value in soil. • Determines EC in soil. • Interprets the soil condition according to EC. • Describes the impact of biological characteristics of soil in a biological system. • Identifies the macro organisms in soil. 	28

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
3.Exhibits readiness for surveying and levelling.	2.2 Investigates the characteristics of common soil types in Sri Lanka.	<ul style="list-style-type: none"> • Common soil types in Sri Lanka and their characteristics in relation to the purpose <ul style="list-style-type: none"> • Reddish Brown Earth (RBE) • Red Yellow Podsollic (RYP) soil • Lowland Humic Clay (LHG) soil • Laterite soil 	<ul style="list-style-type: none"> • Describes the characteristics of common soil types in Sri Lanka and their distribution. • Proposes suitable soil type according to purpose. 	02
	3.1 Inquires into fundamentals of surveying.	<ul style="list-style-type: none"> • Surveying <ul style="list-style-type: none"> • Applications <ul style="list-style-type: none"> • Construction • Mapping • Agriculture • Types of measurements and units used <ul style="list-style-type: none"> • Linear (Distance) • Angular • Area • Volume • Working with maps <ul style="list-style-type: none"> • Components <ul style="list-style-type: none"> • Scale • Symbols • Index • Measurements on a map 	<ul style="list-style-type: none"> • Describes the different applications in surveying. • Describes the methods and instruments used in measuring distance and area. • Applies units and their conversions in surveying. • Describes the components of a map. • Names different symbols in a map. • Describes the factors affecting in selection of a scale in mapping. • Relates map to ground. 	14
	3.2 Inquires into surveying techniques.	<ul style="list-style-type: none"> • Surveying techniques <ul style="list-style-type: none"> • Plane table surveying • Chain surveying • Compass surveying • Theodolite surveying • Electronic Distance Measurement (EDM) • Global Navigation Satellite System (GNSS) • Photogrammetry • Geographic Information System (GIS) 	<ul style="list-style-type: none"> • Names different surveying techniques. • Lists out the uses of different surveying techniques. • Describes the advantages and disadvantages of compass surveying. • Finds out a given location by using hand held GPS. 	08

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
	3.3 Engages in plane table surveying.	<ul style="list-style-type: none"> • Plane table surveying <ul style="list-style-type: none"> • Required instruments • Methods <ul style="list-style-type: none"> • Traversing • Radiation • Triangulation/intersection • Advantages and disadvantages of each method • Preparation of surveying plan <ul style="list-style-type: none"> • Map reading • Calculation of the area of a land 	<ul style="list-style-type: none"> • Identifies the instruments used for plane table surveying. • Describes plane table surveying process. • States advantages and disadvantages of plane table surveying methods. • Develops a survey plan using plane table method. • Calculates the area of the surveyed land. 	08
	3.4 Engages in chain surveying.	<ul style="list-style-type: none"> • Chain surveying <ul style="list-style-type: none"> • Terminology • Steps <ul style="list-style-type: none"> • Field work (Surveying) • Office work <ul style="list-style-type: none"> • Mapping • Calculation • Technical problems • Advantages and disadvantages 	<ul style="list-style-type: none"> • Lists out the required equipment needed for chain surveying. • Lists out the technical terms used in chain surveying. • Names the steps in chain surveying. • Develops a map for a small land using chain surveying. • Calculates the area using chain surveying. • Describes the advantages and disadvantages in chain surveying. • Describes the technical problems and suggests the solutions to overcome them. 	08

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
	3.5 Performs levelling in the field.	<ul style="list-style-type: none"> • Levelling <ul style="list-style-type: none"> • Applications • Terminology • Types <ul style="list-style-type: none"> • Profile levelling • Differential levelling • Methodology <ul style="list-style-type: none"> • Field work <ul style="list-style-type: none"> • Height of the instrument method • Office work • Calculation • Possible errors 	<ul style="list-style-type: none"> • Names different types of levelling. • Identifies instruments used in levelling. • Selects type of levelling according to purpose. • Applies the height of the instrument method to find out relative height difference between two selected points. • Determines the accuracy of levelling. • Explains possible errors occurred in levelling. 	06
	3.6 Performs contour mapping for levelling.	<ul style="list-style-type: none"> • Contouring <ul style="list-style-type: none"> • Applications • Terminology • Field work <ul style="list-style-type: none"> • Direct contouring • Indirect contouring • Contour map preparation <ul style="list-style-type: none"> • Grid system • Spot height • Contour interpolation • Identification of ground features using contour line 	<ul style="list-style-type: none"> • Lists out the applications in contouring. • Defines different terms related to contouring. • Describes the indirect contouring methodology. • Calculates contour position by height interpolation. • Sketches various geographical features using contours. 	06

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
4. Investigates the water resources in biological systems.	4.1 Inquires into water resources and rain water harvesting methods in Sri Lanka.	<ul style="list-style-type: none"> • Water resources <ul style="list-style-type: none"> • Surface • Ground water • Factors to be considered in selection of a water resource for following uses <ul style="list-style-type: none"> • Agriculture • Domestic • Industrial • Other • Rain water harvesting methods <ul style="list-style-type: none"> • Structures • Usage 	<ul style="list-style-type: none"> • Describes the uses of water resources. • Describes the factors to be considered in selection of a water resources for different uses. • Describes methods of rain water harvesting in Sri Lanka. • Constructs a model of rain water harvesting structure. 	04
	4.2 Inquires into ground water	<ul style="list-style-type: none"> • Ground water <ul style="list-style-type: none"> • Factors affecting occurrence <ul style="list-style-type: none"> • Geological factors <ul style="list-style-type: none"> • Porosity of soil • Permeability of soil • Aquifers • Ground water recharge <ul style="list-style-type: none"> • Importance • Methods • Ground water depletion and elimination 	<ul style="list-style-type: none"> • Describes the factors affecting for occurrence of ground water. • Describes aquifers. • Describes the methods of ground water recharge. • Suggests methods to eliminate ground water depletion. 	04
5. Determines the quality of water.	5.1 Evaluates the quality of water.	<ul style="list-style-type: none"> • Water quality <ul style="list-style-type: none"> • Parameters <ul style="list-style-type: none"> • Physical <ul style="list-style-type: none"> • Total Suspended Solids (TSS) • Colour • Odour • Turbidity • Temperature 	<ul style="list-style-type: none"> • Describes physical, chemical and biological parameters of water. • Determines physical characteristics of water. • Determines chemical characteristics of water. • Determines biological characteristics of water. 	16

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
	<p>5.2 Inquires into impact of polluted water.</p> <p>5.3 Inquires into the treatment of waste water .</p>	<ul style="list-style-type: none"> • Chemical <ul style="list-style-type: none"> • pH • BOD • COD • DO • Salinity/EC • Hardness • Biological <ul style="list-style-type: none"> • Total coliforms • Faecal coliforms • Quality standards of municipal and domestic supplies • Quality standards of treated waste water • Water pollution <ul style="list-style-type: none"> • Sources of water pollution <ul style="list-style-type: none"> • Point • Non-point • Impact on biosystems • Waste water sources <ul style="list-style-type: none"> • Industrial • Agricultural • Domestic • Treatment of waste water <ul style="list-style-type: none"> • Importance • Process <ul style="list-style-type: none"> • Preliminary • Primary • Secondary • Tertiary 	<ul style="list-style-type: none"> • Describes the different sources of water pollution. • Describes the impact of water pollution on biosystems. • Describes the different sources of waste water. • Describes the importance of water treatment. • Describes the process of waste water treatment. 	<p>02</p> <p>04</p>

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
6. Exhibits readiness to produce quality plants commercially.	6.1 Propagates plants by using advanced techniques.	<ul style="list-style-type: none"> • Plant propagation methods <ul style="list-style-type: none"> • Sexual • Asexual • Advanced asexual propagation techniques <ul style="list-style-type: none"> • Layering <ul style="list-style-type: none"> • Aerial layering • Ground layering • Budding and grafting • Micro propagation 	<ul style="list-style-type: none"> • Compares advantages and disadvantages of sexual and asexual plant propagation. • Performs different layering techniques according to plant species. • Performs different budding and grafting techniques according to plant species. • Performs experiments on micro propagation. 	10
	6.2 Inquires into plant nursery techniques.	<ul style="list-style-type: none"> • Plant nursery <ul style="list-style-type: none"> • Objectives and benefits • Commercially used nursery containers <ul style="list-style-type: none"> • Compots • Pots • Bio-degradable nursery containers • Poly bags • Selection and preparation of planting materials <ul style="list-style-type: none"> • Selection of mother plants • Selection and preparation of cuttings/ seeds • Production of nursery plants <ul style="list-style-type: none"> • Preparation of media • Sterilization • Filling • After care practices <ul style="list-style-type: none"> • Pest and diseases control • Hardening off • Grading • Preparation for transportation • Quality standards 	<ul style="list-style-type: none"> • Describes the importance of a plant nursery. • Describes the different types of commercially used plant nursery containers. • Produces nursery plants and maintains properly. • Describes the factors to be considered for grading and transporting nursery plants. • Lists out the quality standards of nurseries. 	08

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
7 Exhibits readiness to engage in aquaculture.	7.1 Inquires into ornamental fish farming.	<ul style="list-style-type: none"> • Fresh water ornamental fish culture <ul style="list-style-type: none"> • Importance • Culturing species <ul style="list-style-type: none"> • Egg laying • Live bearers • Broodstock selection and breeding • Larval rearing • Methodology <ul style="list-style-type: none"> • Setting up an aquarium • Introduction of fish • Feeding • Disease management • Harvesting • Packing and transport 	<ul style="list-style-type: none"> • Identifies suitable fresh water species for ornamental fish culture. • Describes the way of broodstock rearing and breeding. • Prepares a feed for fish larvae. • Maintains a fish tank properly. • Packs ornamental fish for the market. 	10
	7.2 Inquires farming techniques of fresh water table fish.	<ul style="list-style-type: none"> • Fresh water table fish culture <ul style="list-style-type: none"> • Culturing species <ul style="list-style-type: none"> • Fresh water • Brackish water • Methodology <ul style="list-style-type: none"> • Site selection • Pond construction • Fish introduction • Feeding • Harvesting 	<ul style="list-style-type: none"> • Identifies potential culturable fresh water fish species. • Explains general culture procedures of fresh water fish species. • Describes the way of harvesting mature fish. 	04
	7.3 Inquire into ornamental aquatic plant industry.	<ul style="list-style-type: none"> • Aquatic plant industry <ul style="list-style-type: none"> • Economically important aquatic plants <ul style="list-style-type: none"> • Ornamental • Edible • Ornamental aquatic plants culture <ul style="list-style-type: none"> • Culturing techniques • Propagation methods • Maintenance • Harvesting • Packing for the market, display 	<ul style="list-style-type: none"> • Selects economically important aquatic plants. • Follows suitable farming techniques. • Maintains ornamental aquatic plant cultivation. • Describes the way of processing of ornamental aquatic plants for the market. 	10

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
8. Exhibits readiness to engage in animal production through technology.	8.1 Inquires about technologies used in animal production.	<ul style="list-style-type: none"> • Technologies in livestock production <ul style="list-style-type: none"> • Importance • Poultry management <ul style="list-style-type: none"> • Rearing systems and housing <ul style="list-style-type: none"> • Brooders, deep litter system • Egg incubation <ul style="list-style-type: none"> • Artificial method <ul style="list-style-type: none"> • Conditions • Egg selection • Quality Day old chicks • Feeding • Water supply • Dairy management <ul style="list-style-type: none"> • Rearing systems and housing • Feeding • Water supply • Machine milking • Identification of animals • Health management and sanitation 	<ul style="list-style-type: none"> • Explains the importance of adopting technology in livestock production. • Distinguishes methods of incubation. • Prepares an incubator using locally available resources. • Explains the way of using technologies in poultry and cattle management. 	16
	8.2 Inquires into the required conditions for commercial milk industry.	<ul style="list-style-type: none"> • Commercial milk industry <ul style="list-style-type: none"> • Importance • Quality assessment <ul style="list-style-type: none"> • Physical • Chemical • Biological • Milk adulteration <ul style="list-style-type: none"> • Identification • Technological requirements for a milk collecting centre • Dairy processing <ul style="list-style-type: none"> • Clarification • Standardization • Separation • Homogenization 	<ul style="list-style-type: none"> • Describes the factors affecting quality milk. • Identifies quality milk. • Describes the technological requirements for a milk collecting centre. • Describes the common dairy processing techniques. 	10

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
9. Plans methodologies for quality food production.	8.3 Inquires into broiler meat industry.	<ul style="list-style-type: none"> • Quality broiler meat <ul style="list-style-type: none"> • Importance • Factors affecting • Processing <ul style="list-style-type: none"> • Procedure • Market forms <ul style="list-style-type: none"> • Whole chicken • Commercially valuable chicken portions • Diversified and value added chicken products 	<ul style="list-style-type: none"> • Describes the importance of production of quality broiler meat. • Describes the factors affecting quality of broiler chicken. • Describes the steps of broiler meat processing. • Names the market forms of broiler meat. • Prepares a diversified and value added chicken products. 	08
	8.4 Inquires new trends of egg related products.	<ul style="list-style-type: none"> • Egg and egg related product industry <ul style="list-style-type: none"> • Egg quality characteristics and their measurements <ul style="list-style-type: none"> • External • Internal • Grading of dietary eggs <ul style="list-style-type: none"> • Importance • Egg related products 	<ul style="list-style-type: none"> • Selects quality eggs. • Grades eggs based on criteria. • Describes the method of processing egg related products. • Prepares egg related food products. 	08
	9.1 Identifies the factors affecting food spoilage.	<ul style="list-style-type: none"> • Food spoilage <ul style="list-style-type: none"> • Factors affecting <ul style="list-style-type: none"> • Physical factors <ul style="list-style-type: none"> • Temperature • Relative humidity • Adulterants • Chemical factors • Biological factors <ul style="list-style-type: none"> • Enzymes • Insects and rodents • Micro organisms • Favourable conditions for the growth of micro-organisms 	<ul style="list-style-type: none"> • Lists out various factors affecting food spoilage. • Describes how physical factors affect food spoilage. • Explains chemical and biological factors affecting food spoilage. • Identifies favourable conditions for microbial activities which affect food spoilage. 	06

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
	<p>9.2 Plans methods to preserve food by following the principles of food preservation.</p>	<ul style="list-style-type: none"> • Food preservation <ul style="list-style-type: none"> • Importance and objectives • Principles <ul style="list-style-type: none"> • Inhibition • Inactivation • Pre-treatment methods <ul style="list-style-type: none"> • Blanching • Preservation methods <ul style="list-style-type: none"> • Physical methods <ul style="list-style-type: none"> • Thermal preservation <ul style="list-style-type: none"> • Sterilization • Pasteurization • Low temperature <ul style="list-style-type: none"> • Refrigeration • Freezing • Blast freezing • Dehydration • Concentration • Irradiation • Chemical methods <ul style="list-style-type: none"> • Adding preservatives • Smoking • Bio-chemical methods <ul style="list-style-type: none"> • Fermentation • Combined methods 	<ul style="list-style-type: none"> • Describes the importance of food preservation. • States the principles of food preservation. • Identifies the preservation principles of traditional food preservation techniques. • Suggests appropriate food preservation methods based on the type of food. • Preserves foods by using different methods. 	<p>16</p>
	<p>9.3 Inquires into new trends in food processing.</p>	<ul style="list-style-type: none"> • New trends <ul style="list-style-type: none"> • Value addition • Enrichment • Fortification • Minimal processing • High pressure processing • Pulse electric heating • Membrane filtration 	<ul style="list-style-type: none"> • Describes new trends of food processing. • Performs minimal processing. • Performs food enrichment. • Performs food fortification. 	<p>10</p>

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
	9.4 Inquires into the procedure of new food product development	<ul style="list-style-type: none"> New food product development <ul style="list-style-type: none"> Related standards and regulations Procedure <ul style="list-style-type: none"> Need assessment RDA table Selecting raw materials Formulation and product development Sensory evaluation Cost evaluation Shelf-life determination Packaging Product certification 	<ul style="list-style-type: none"> Names standards and regulations related to new food product development. Describes the procedure of new food product development. Develops a new food product and packages it. Performs sensory evaluation for food products. Determines the shelf life of foods. 	08
	9.5 Inquires diversity of food packaging.	<ul style="list-style-type: none"> Food packaging <ul style="list-style-type: none"> Objectives Different packaging materials Packaging under special conditions <ul style="list-style-type: none"> Controlled atmosphere (CA) <ul style="list-style-type: none"> Vacuum packaging Shrink wrap packaging Modified atmosphere (MA) <ul style="list-style-type: none"> Nitrogen Carbon dioxide Biodegradable packaging Intelligent packaging system Food labelling <ul style="list-style-type: none"> Objectives Regulatory requirements 	<ul style="list-style-type: none"> Describes the objectives of food packaging. Names food packaging materials and lists out their properties. Describes food packaging technologies under special conditions and their importance. Selects suitable packing materials for different foods. 	04
	9.6 Inquires importance of labeling food.	<ul style="list-style-type: none"> Food safety 	<ul style="list-style-type: none"> Describes the objectives of food labelling. Lists out the information to be included in a food label. Designs a food label. Describes regulation requirements. 	04

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
	9.7 Plans to improve food safety.	<ul style="list-style-type: none"> • Types of hazards and issues <ul style="list-style-type: none"> • Physical • Chemical • Biological • Radiological • Methods to improve food safety 	<ul style="list-style-type: none"> • Describes the types of food hazards and safety issues. • Names microbes and food types that may cause food allergies and food poisoning. • Proposes actions to overcome food hazards and issues. • Identifies permitted food colours. 	03
	9.8 Inquires into food adulteration.	<ul style="list-style-type: none"> • Food adulteration <ul style="list-style-type: none"> • Adulterants <ul style="list-style-type: none"> • Types • Identification • Unauthorized and unethical food preparation practices and related health issues 	<ul style="list-style-type: none"> • Describes ways of food adulteration. • Identifies non-adulterated spices and flour. • Presents unauthorized and unethical food preparation practices and related health issues. 	08
	9.9 Identifies methods associated with quality management of food.	<ul style="list-style-type: none"> • Quality certification <ul style="list-style-type: none"> • Importance • Steps • Food quality standards <ul style="list-style-type: none"> • ISO • SLS • Food safety management systems <ul style="list-style-type: none"> • GAP - Good Agricultural Practices • GMP - Good Manufacturing Practices • HACCP - Hazard Analysis Critical Control Point • ISO 22000 • FSSC 22000 	<ul style="list-style-type: none"> • Explains the importance of food quality certification. • Names different steps of quality certification. • Names quality certification institutes in Sri Lanka. • Presents information regarding food quality standards and food safety management systems. 	03

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
10. Investigates the post harvest techniques for a high quality products.	9.10 Inquires about rules and regulations of food handling.	<ul style="list-style-type: none"> • Rules and regulations related to food handling <ul style="list-style-type: none"> • Necessity • Food act (1980 No. 02) • Food act implementation mechanism • Regulations included in the act <ul style="list-style-type: none"> • Consumer protection • Food additives • Packaging • Labelling • Storage • Food processing 	<ul style="list-style-type: none"> • Explains the importance of rules and regulations related to food handling. • Lists out the important details included in the food act. • Describes the way of presenting a food item to the market according to the food act. 	03
	10.1 Inquires into rice processing techniques for minimizing post harvest losses.	<ul style="list-style-type: none"> • Rice processing techniques for minimizing post harvest losses <ul style="list-style-type: none"> • Drying • Storage • Hulling • Milling • Grading 	<ul style="list-style-type: none"> • Identifies the grain processing basics. • Describes the methods of increasing Head Rice Yield (HRV). 	06
	10.2 Inquires into the techniques for minimizing post harvest losses of perishables.	<ul style="list-style-type: none"> • Maturity index of crop harvest <ul style="list-style-type: none"> • Determination <ul style="list-style-type: none"> • Visible testing • According to calendar dates • Other • Minimizing post harvest losses of crop harvest <ul style="list-style-type: none"> • Storage • Transport 	<ul style="list-style-type: none"> • Determines maturity index of perishables using various techniques. • Makes necessary actions to minimize post harvest losses of perishables. 	06

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
11. Investigates the technology of controlled environment for crop production.	10.3 Inquires into the proper ways of handling harvested fish for minimizing post harvest losses.	<ul style="list-style-type: none"> • Proper handling of fish harvest <ul style="list-style-type: none"> • Importance • Handling stages <ul style="list-style-type: none"> • At catching • At vessel • At transportation • At market • At consumption 	<ul style="list-style-type: none"> • Describes the importance of proper handling of harvested fish. • Describes handling of harvested fish at different stages. • Identifies quality fish. 	03
	11.1 Inquires into importance of crop cultivation under controlled conditions.	<ul style="list-style-type: none"> • Crop cultivation under controlled conditions <ul style="list-style-type: none"> • Importance • Protected agricultural structures <ul style="list-style-type: none"> • Classification <ul style="list-style-type: none"> • According to protective structure • According to protective cover • According to durability 	<ul style="list-style-type: none"> • Describes the importance of crop cultivation under controlled conditions. • Classifies protected structures according to different criteria. 	02
	11.2 Inquires into way of constructing protective structures.	<ul style="list-style-type: none"> • Constructing protective structures <ul style="list-style-type: none"> • Procedure <ul style="list-style-type: none"> • Site selection • Selecting construction materials <ul style="list-style-type: none"> • Floor • Covering materials • Roofing materials • Accessories • Designing structural loads • Site preparation • BOQ preparation 	<ul style="list-style-type: none"> • Describes the factors to be considered in site selection for protective structures. • Names different construction materials according to component of the structure. • Prepares the plan and layout of the structure according to the suitability of locality. • Prepares a BOQ for protected house. • Constructs a small protected structure using locally available materials. 	06

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
	11.3 Inquires into techniques of measuring and controlling environmental conditions in protected houses.	<ul style="list-style-type: none"> • Measuring environmental factors and controlling <ul style="list-style-type: none"> • Air • Light • Temperature • Moisture 	<ul style="list-style-type: none"> • Names equipment used to measure environmental conditions in protected houses. • Describes the techniques used to control environmental factors in protected houses. 	02
	11.4 Inquires into soilless culture techniques applied in protected houses.	<ul style="list-style-type: none"> • Soilless culture <ul style="list-style-type: none"> • Importance • Cultivation techniques <ul style="list-style-type: none"> • Hydroponics • Solid media culture • Limitations 	<ul style="list-style-type: none"> • Describes the importance of soilless culture. • Builds a circulating hydroponics system. • Cultivates crops in circulating hydroponics and maintains properly. • Makes structures for cultivation in solid media. • Selects suitable solid media and sterilizes them. • Cultivates crops in solid media and maintains properly. • Suggests solutions to overcome limitations in soilless culture. 	10

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
12. Exhibits readiness for mechanization.	12.1 Inquires into water lifting devices and performs calculations related to water lifting.	<ul style="list-style-type: none"> • Water lifting devices <ul style="list-style-type: none"> • Conventional • Non-conventional <ul style="list-style-type: none"> • Water pumps - operation and working principles <ul style="list-style-type: none"> • Centrifugal • Piston type • Installation and maintenance of centrifugal pumps • Factors to be considered in selection of a water pump • Calculations related to water lifting <ul style="list-style-type: none"> • Suction lift • Delivery head • Frictional losses • Energy for water lifting • Cost of water lifting 	<ul style="list-style-type: none"> • Describes the principles of conventional water lifting methods. • Identifies the components of a centrifugal and piston type water pumps. • Describes the function and working principles of centrifugal and piston type water pumps using diagrams. • Compares advantages and disadvantages between centrifugal and piston type water pumps. • Installs, operates and maintains centrifugal water pumps. • Describes the factors affecting the selection of a particular type of water pump. • Performs calculations related to water lifting. • Selects the pump model according to total water head and the discharge rate. • Calculates the cost of pumping based on energy requirement. 	20

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
	12.2 Inquires into drip and sprinkler irrigation systems.	<ul style="list-style-type: none"> • Drip and sprinkler irrigation systems <ul style="list-style-type: none"> • Components • Installation • Function • Benefits and limitations 	<ul style="list-style-type: none"> • Installs a drip and a simple sprinkler irrigation system. • Operates a drip and a simple irrigation system properly. • Describes benefits and limitations of drip and sprinkler irrigation systems. 	16
	12.3 Inquires into land preparation techniques and related equipment.	<ul style="list-style-type: none"> • Land preparation techniques and related equipment <ul style="list-style-type: none"> • Primary tillage • Secondary tillage • Inter cultivation • Selection and function • Maintenance 	<ul style="list-style-type: none"> • Describes the techniques of land preparation. • Describes the function of land preparation equipment. • Explains maintenance of land preparation equipment. 	14
	12.4 Inquires into small engines and tractors.	<ul style="list-style-type: none"> • Engines <ul style="list-style-type: none"> • Basic engine components <ul style="list-style-type: none"> • Four stroke • Two stroke • Tractors <ul style="list-style-type: none"> • Systems <ul style="list-style-type: none"> • Fuel system and air filtration system • Cooling system • Electrical and ignition • Power transmission system • Hydraulic system • Lubrication system • Power outlets of tractors <ul style="list-style-type: none"> • Two wheel • Four wheel 	<ul style="list-style-type: none"> • Describes the basic engine components of tractors and their functions. • Describes the different systems in tractors and their functions. • Attaches different equipment to two-wheel and four-wheel tractors. 	18

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
13. Exhibits readiness to utilize sustainable timber and non-timber based products.	12.5 Inquires into equipment used in plant protection.	<ul style="list-style-type: none"> • Plant protection equipment <ul style="list-style-type: none"> • Piston type sprayers • Power sprayers • Maintenance of equipment 	<ul style="list-style-type: none"> • Identifies the components of plant protection equipment and describes its function. • Assembles a knapsack sprayer and calibrates. • Maintains knapsack sprayer. 	06
	13.1 Inquires into economically important timber species in Sri Lanka.	<ul style="list-style-type: none"> • Gross features of timber <ul style="list-style-type: none"> • Physical • Mechanical • Economically important timber species <ul style="list-style-type: none"> • For construction • For furniture • For ornaments • For infrastructure • For fuel • In paper industry 	<ul style="list-style-type: none"> • Describes the gross features of timber. • Classifies economically important timber species with examples according to purpose. • Identifies economically important timber species by visual and microscopic observations. 	04
	13.2 Inquires into method of timber seasoning and preservation.	<ul style="list-style-type: none"> • Timber seasoning <ul style="list-style-type: none"> • Necessity • Methods <ul style="list-style-type: none"> • Air drying • Kiln drying • Seasoning defects • Timber preservation <ul style="list-style-type: none"> • Necessity • Types of pests • Techniques 	<ul style="list-style-type: none"> • Describes the importance of timber seasoning and preservation. • Identifies the seasoning defects. • Determines moisture content of air dried timber. • Proposes suitable techniques for timber seasoning and preservation. • Identifies preserved timber by chemical analysis. 	06

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
	13.3 Inquires into the timber grading.	<ul style="list-style-type: none"> • Timber grading <ul style="list-style-type: none"> • Necessity • Grading criteria and standards • Methods <ul style="list-style-type: none"> • Yield method • Cutting method • Stress grading method 	<ul style="list-style-type: none"> • Describes the importance of timber grading. • Describes the standards considered for timber grading. • Grades timber according to different criteria. 	02
	13.4 Performs some important measurements used in forest mensuration.	<ul style="list-style-type: none"> • Forest mensuration <ul style="list-style-type: none"> • Importance • Measurements and equipment <ul style="list-style-type: none"> • Diameter of felling trees • Height of standing • Volume of a standing tree 	<ul style="list-style-type: none"> • Describes the importance of forest mensuration. • Measures the height of standing trees. • Calculates the circumference and volume of standing trees. 	04
	13.5 Performs techniques to produce non-timber forest products.	<ul style="list-style-type: none"> • Non-timber forest products- related industry <ul style="list-style-type: none"> • Categorization <ul style="list-style-type: none"> • Cosmetics • Medicinal • Bath and body care • Ornaments • Non-timber herbal product processing <ul style="list-style-type: none"> • Procedure <ul style="list-style-type: none"> • Collection • Extraction • Production 	<ul style="list-style-type: none"> • Categorizes and lists out various non-timber forest products. • Describes the procedure of non-timber forest products processing. • Prepares non-timber herbal products. 	10

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
14. Investigates different techniques to produce plantation and minor export crops based products.	14.1 Inquires into different techniques to produce plantation based products.	<ul style="list-style-type: none"> ● Plantation crops- based products <ul style="list-style-type: none"> ● Coconut <ul style="list-style-type: none"> ● Kernal products <ul style="list-style-type: none"> ● Desiccated coconut ● Coconut oil ● Shell products <ul style="list-style-type: none"> ● Activated carbon ● Husk products <ul style="list-style-type: none"> ● Fibre products ● Tea <ul style="list-style-type: none"> ● Processing <ul style="list-style-type: none"> ● Green tea ● Black tea ● Rubber <ul style="list-style-type: none"> ● Value added products 	<ul style="list-style-type: none"> ● Describes the different techniques used to produce different products of plantation crops. ● Extracts virgin coconut oil. ● Produces coir based products. ● States the procedure of green and black tea processing. ● Produces rubber based products. 	10
	14.2 Inquires into different techniques used to process minor export crops based products.	<ul style="list-style-type: none"> ● Processing of black pepper <ul style="list-style-type: none"> ● Berry separation ● Hot water treatment ● Drying ● Processing of white pepper <ul style="list-style-type: none"> ● Berry separation ● Soaking ● Removing outer vind ● Soaking in citric acid ● Washing and drying ● Cleaning and winnowing ● Pepper grades ● Processing of bark products of cinnamon ● Quality standards of cinnamon 	<ul style="list-style-type: none"> ● Describes the different techniques used to produce different products of minor export crops based products. ● Processes pepper and cinnamon. ● States the pepper grades and quality standards of cinnamon. 	10

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
15. Exhibits readiness to develop and construct process control and automation mechanisms.	15.1 Inquires in to electrical measurements.	<ul style="list-style-type: none"> • Measuring instruments (Analog and digital multimeters) <ul style="list-style-type: none"> • Measuring DC voltages • Measuring DC currents • Measurement/Reading resistance 	<ul style="list-style-type: none"> • Identifies electrical measuring instruments. • Performs following measurements in a given simple electrical circuits. <ul style="list-style-type: none"> • Resistance • Voltage • Current 	06
	15.2 Assembles simple circuits.	<ul style="list-style-type: none"> • Assembling simple circuits <ul style="list-style-type: none"> • Components <ul style="list-style-type: none"> • Bread boards • Vero boards • Battery pack • Step down transformers • Voltage regulators • LED, ICs • Measurements of V, I and R • Calculation of power. 	<ul style="list-style-type: none"> • Constructs simple circuits with bread boards and vero boards. • Operates different power supplies. • Constructs power supply with voltage regulators. • Make different circuits using components. • Performs different measurements and calculations. • Develops skills in making different circuits. 	10
	15.3 Engages in calculations related to electrical power.	<ul style="list-style-type: none"> • Calculations related to electrical power <ul style="list-style-type: none"> • Voltage • Current • Resistance 	<ul style="list-style-type: none"> • Applies $V=IR$ equation in simple circuits. • Performs electrical power calculations. 	08

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
	15.4 Inquires in to the use of microcontrollers.	<ul style="list-style-type: none"> • Microcontrollers <ul style="list-style-type: none"> • Components <ul style="list-style-type: none"> • Controller • Sensor • Actuator • Types <ul style="list-style-type: none"> • PLCs • Arduino circuit board <ul style="list-style-type: none"> • Simple on/off using arduino • Use of sensors with arduino • Use of actuators with arduino <ul style="list-style-type: none"> • Relay • Bulb • Motor • Transistor switch 	<ul style="list-style-type: none"> • Identifies the role of controller, sensor and actuator • Identifies available microcontrollers (PLCs and arduino boards) • Selects sensors and actuators for different purposes. 	20
	15.5 Fabricates automated systems.	<ul style="list-style-type: none"> • Automated systems <ul style="list-style-type: none"> • Timers for activating simple devices (bulb, fan, heater etc.) • Temperature controller • Automated irrigation system using soil moisture sensors 	<ul style="list-style-type: none"> • Assembles automated systems using Arduino boards. • Acquires hands on experience in building Arduino based automated systems. • Identifies the mechanisms those can be automated with the existing knowledge. • Describes methods of possible automation 	30

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
16. Exhibits readiness to apply Occupational Safety and Health (OSH) practices related to different occupations.	16.1 Investigates occupational hazards.	<ul style="list-style-type: none"> • Occupational safety and health <ul style="list-style-type: none"> • Importance • Hazards <ul style="list-style-type: none"> • Physical • Chemical • Biological • Ergonomics • Psychosocial 	<ul style="list-style-type: none"> • States some disaster incidents relevant to bio-systems technology. • Describes the importance of occupational safety and health. • Describes occupational hazards with examples. 	02
	16.2 Inquires into safety auditing and prevents OSH hazards.	<ul style="list-style-type: none"> • Safety auditing <ul style="list-style-type: none"> • Steps • Hierarchy of hazard control • Hazard evaluation 	<ul style="list-style-type: none"> • Describes the steps of safety auditing. • Prepares a check list for safety auditing. • Performs experiments on hierarchy of hazard control. • Evaluates hazards. 	04
	16.3 Inquires into standards and regulations relevant to OSH.	<ul style="list-style-type: none"> • OSH standards and regulations <ul style="list-style-type: none"> • Local • International 	<ul style="list-style-type: none"> • Describes the legal aspects relevant to OSH. 	02
17 Exhibits readiness to engage in horticulture.	17.1 Inquires into cutflower and foliage plant culture techniques.	<ul style="list-style-type: none"> • Techniques of cultivating economically important species and varieties <ul style="list-style-type: none"> • Cut flowers <ul style="list-style-type: none"> • Tropical • Temperate • Foliage 	<ul style="list-style-type: none"> • Collects different types of economically important cut flowers and foliage and prepares a picture album. • Selects suitable varieties according to environmental conditions. • Applies different techniques to propagate cut flowers and foliage plants. • Establishes plants in selected structures. • Maintains the cultured plants properly. 	08

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
	17.2 Prepares cut flower and foliage products for the market.	<ul style="list-style-type: none"> • Market presentation of products <ul style="list-style-type: none"> • Procedure <ul style="list-style-type: none"> • Cleaning • Processing according to standards • Grading • Post harvest treatment • Packaging • Floral decorations <ul style="list-style-type: none"> • Principles • Materials required • Techniques • Designing 	<ul style="list-style-type: none"> • Applies suitable techniques to harvest yield. • Lists out the quality standards of cut flowers. • Performs post harvest management of cut flowers and foliage. • Prepares floral decorations for different occasions. 	06
	17.3 Investigates the elements and principles in landscape designing.	<ul style="list-style-type: none"> • Landscaping <ul style="list-style-type: none"> • Benefits • Elements of landscape designing <ul style="list-style-type: none"> • Lines • Forms • Texture • Colour • Visual weight • Principles of landscape designing <ul style="list-style-type: none"> • Scale and Proportion • Order • Balance • Rhythm • Unity • Focalization • Variety 	<ul style="list-style-type: none"> • Describes the benefits of landscaping. • Describes the elements and principles of landscape designing. • Describes the applications of elements and principles in landscape designing. 	04

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
	17.4 Inquires about landscape materials.	<ul style="list-style-type: none"> • Application of elements and principles in landscape designing • Landscape materials <ul style="list-style-type: none"> • Hard landscape materials <ul style="list-style-type: none"> • Water features • Paving • Statues • Murals • Soft landscape materials <ul style="list-style-type: none"> • Lawns • Trees • Borders • Hedges • Flower beds 	<ul style="list-style-type: none"> • Identifies different hard and soft landscape materials. • Prepares a picture album on plants and other elements used in landscaping. 	04
	17.5 Establishes and maintains the garden properly.	<ul style="list-style-type: none"> • Landscape designing <ul style="list-style-type: none"> • Steps <ul style="list-style-type: none"> • Site visit and discussion with client • Surveying of the land • Development of the design • Implementation <ul style="list-style-type: none"> • BOQ and budgeting • Construction <ul style="list-style-type: none"> • Vertical • Horizontal • Establishment <ul style="list-style-type: none"> • Plants • Root-balled trees • Lawn • Maintenance <ul style="list-style-type: none"> • Pruning and training • Fertilizer management 	<ul style="list-style-type: none"> • Describes the steps in landscape designing. • Prepares a suitable landscape design. • Identifies machinery and tools needed for establishment and maintenance of landscapes. • Prepares a BOQ for a small project. • Implements a small landscape project. 	18

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
18. Investigates environmental friendly strategies for sustainable development of biological systems.	18.1 Inquires into techniques to minimize the impact of solid wastes in biological systems.	<ul style="list-style-type: none"> • Solid waste <ul style="list-style-type: none"> • Classification <ul style="list-style-type: none"> • According to source of generation • According to composition • Characteristics of waste <ul style="list-style-type: none"> • Moisture content • Density • Solid waste management <ul style="list-style-type: none"> • Disposal • Size and volume reduction <ul style="list-style-type: none"> • Recycling • Energy recovery • Composting • Incineration • Gasification • Cleaner production <ul style="list-style-type: none"> • Concept • Importance • Techniques • Procedure <ul style="list-style-type: none"> • Energy and water controlling of a production flow chart 	<ul style="list-style-type: none"> • Classifies solid waste based on source of generation and composition. • Describes the characteristics of solid waste. • Determines the composition of a sample of domestic solid waste. • Presents suggestions for solid waste management. • Describes the solid waste disposal techniques. • Performs experiments on disposal techniques of solid wastes. • Determines the most viable solid waste disposal option for locality. • Develops and implements a solid waste management plan for the school. • Explains the concept of cleaner production technology. • Describes the importance of cleaner production technology. • Applies cleaner production techniques in a small entity. (household, technology lab, school canteen etc.) 	24

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
19 Improves necessary skills for enterprise and product development	18.2 Inquires into production of renewable energy sources.	<ul style="list-style-type: none"> • Renewable energy production <ul style="list-style-type: none"> • Importance • Sources <ul style="list-style-type: none"> • Solar power • Wind power • Bio fuel <ul style="list-style-type: none"> • Dendro-thermal power • Biogas 	<ul style="list-style-type: none"> • Describes the importance of renewable energy. • Explains the methodologies of production of renewable energy. • Generates solar power, dendro power and biogas using available waste. 	16
	18.3 Inquires into environmental friendly techniques used in agricultural sector.	<ul style="list-style-type: none"> • Environmental friendly techniques used in agricultural sector <ul style="list-style-type: none"> • Edible gardening <ul style="list-style-type: none"> • Importance • Methodology • Use of biodegradable pesticides <ul style="list-style-type: none"> • Importance • Types and method of application 	<ul style="list-style-type: none"> • Describes the importance of using environmental friendly techniques in agriculture sector. • Establishes an edible garden. • Prepares biodegradable pesticides and applies them into the crops. 	05
	19.1 Investigates business opportunities.	<ul style="list-style-type: none"> • Entrepreneurship <ul style="list-style-type: none"> • Characteristics of an entrepreneur <ul style="list-style-type: none"> • Administrative skills <ul style="list-style-type: none"> • Planning • Organizing • Regulation • Evaluation • Personality skills <ul style="list-style-type: none"> • Risk management • Identifying business opportunities • Creativity/innovation • Entrepreneurial activity <ul style="list-style-type: none"> • Goods • Services • Market orientation vs product orientation 	<ul style="list-style-type: none"> • Describes the role of an entrepreneur in value creation. • Develops the attributes and skills necessary for entrepreneurship • Describes the successes and failures of entrepreneurship in the context of product and market orientation 	04

Competency	Competency Level	Subject Content	Learning Outcomes	Duration
	19.2 Inquires into business process and acquires the tools of business development.	<ul style="list-style-type: none"> • Business opportunities <ul style="list-style-type: none"> • Methods to identify <ul style="list-style-type: none"> • Market surveys • SWOT analysis • Development of Business Plan (BP) <ul style="list-style-type: none"> • Contents and structure of a BP • Illustration of BP for a SME • Basic management activities of a SME <ul style="list-style-type: none"> • Planning • Organizing • Directing, controlling • Evaluating 	<ul style="list-style-type: none"> • Uses SWOT analysis to identify alternatives business pathways. • Describes methodology of market survey. • Converts a business idea into a marketable proposal. • Describes the basic management activities of SME. 	08
	19.3 Investigates the infrastructure facilities required for the existance of a business.	<ul style="list-style-type: none"> • Infrastructure facilities required for the existing a business <ul style="list-style-type: none"> • Support services <ul style="list-style-type: none"> • Finance/credit <ul style="list-style-type: none"> • Microfinance • Leasing • Loans • Regulations <ul style="list-style-type: none"> • Price control • Labour law • Consumer protection • Quality control/ standards certification • Documentation <ul style="list-style-type: none"> • Registration • Import documents • Export documents • Certification • Logistics <ul style="list-style-type: none"> • Transport • Storage • Research and development 	<ul style="list-style-type: none"> • Describes the role of obtainable support services to conduct a business. • Describes the role of regulations and the actions needed to comply with business. • Describes the cost and efficiency issues related to market logistics . 	03