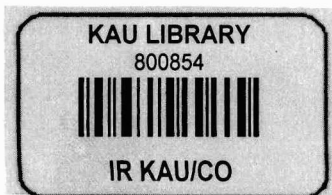


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KERALA
AGRICULTURAL UNIVERSITY

Courses for the Undergraduate
Programme in Agriculture
(Draft)



1972



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INTRODUCTION

This undergraduate course programme in Agriculture has been prepared taking into account the fact that only candidates who have passed the two year Pre-Degree Examination of any one of the Universities in Kerala or its equivalent with Physics, Chemistry and Biology (Botany and Zoology) as optional subjects are eligible for admission.

A candidate who has passed the two year Pre-Degree Examination will have a stronger background in English, Physics, Chemistry, Botany and Zoology as compared to those who have undergone the one year Pre-University course or passed the Higher Secondary School Examination. For instance, at the Pre-Degree level, ten and six hours per week are assigned during the first and second year respectively for teaching English in the Kerala University. The course contents of the other subjects are also good. Hence only the marginal deficiencies in these subjects are rectified by offering suitable courses. It is not found necessary to offer any course in Physics.

It is proposed to set apart the second trimester of the fourth year for practical field training. By that time the student would normally have completed all the courses except the electives. The student will be given training for one month each as an Agricultural Demonstrator in any one of the Research Stations of the University and as a Village Level Extension Officer in an N.E.S. Block. During the remaining period he/she will be given training as an Agricultural Extension Officer.

Successful completion of the practical field training will be considered a pre-requisite for the

award of the Degree. A separate certificate will be issued to the candidate indicating whether his performance during the practical training is excellent, good, fair or poor.

The fourth trimester of the Final Year will be devoted for teaching the elective subjects.

1. B.Sc. (Ag.) DEGREE PROGRAMME

(a) Qualifications for admission

The minimum qualification for admission to the B.Sc. (Ag.) Degree course is a pass in the two year pre-degree examination of any one of the Universities in Kerala or its equivalent with Physics, Chemistry and Biology (Botany & Zoology) as optional subjects.

(b) Duration of the course

The course will cover a period of four years consisting of twelve trimesters. Each trimester will be of 14 weeks duration. The total number of credits that a candidate will have to acquire during the four year period will be 200. The distribution of credits for the different subjects and for other assignments is as follows:

	Subject.	Course credits.
A.	Orientation.	1*
B.	Humanities.	
	1. English	... 2
	2. Sociology and Psychology	... 4
	3. Basic Economics	... 2
	Total	... <u>8</u>
C.	Basic Sciences.	
	Chemistry	... 4
	General Microbiology	... 3
	Botany	... 5
	Zoology	... 3
	Mathematics	... 4
	Basic Geology	... 2
	Basic nutrition	... 2
		<u>23</u>

D Core courses.

1. Agronomy	...	22
2. Soil Science & Agrl. Chemistry	...	16
3. Agricultural Botany	...	13
4. Horticulture	...	15
5. Agricultural Economics	...	10
6. Agricultural Entomology	...	10
7. Plant Pathology.	...	10
8. Agricultural Engineering	...	10
9. Agricultural Extension	...	10
10. Animal Husbandry and Veterinary Science	...	12
11. Agricultural Statistics	...	6
		134

E. Practical field training.

16*

F. Electives.

1. Agronomy		18
2. Agricultural Botany		
3. Soil Science and Agrl. Chemistry		
4. Agrl. Entomology		
5. Horticulture		
6. Plant Pathology		
7. Plant Protection		
8. Agricultural Extension		
9. Agricultural Economics		

* The credits assigned for orientation and practical field training will not be taken into account for calculating the overall Grade Point Average.

2 DESCRIPTION OF COURSES

HUMANITIES

English

Eng. 101 *Composition* 1+1

Composition, epitomization and speech.
Idioms and phrases.

Sociology and Psychology

Soc. & Psy. 101 *Sociology* 3+1

Sociology as a science — development of sociology, social life, society and functions, rural and urban society — social, economic and religious institutions. Social process. Culture — its definition and meaning — material and non-material culture — factors affecting culture — cultural change. Social structure; Social stratification; Social control; Social change — definition and factors of social change.

Psychology

Psychology as a science — development of psychology, different psychological systems. Heridity and environment. Growth and maturation. Learning — its definition, laws and theories. Motivation and adjustment — different types of motives. Personality — theories and factors affecting personality.

Practical

Conduct of social surveys and seminars. Observation of motivation and learning characteristics of the farming community.

Economics

Econ. 101	<i>Basic Economics</i>	1+1
<p>Nature and scope of Economics -- definition and scope. Importance of the study of economics. Fundamental concepts of economics - goods, utility, value, price, wealth. Classification of wealth - income, wealth and welfare. Consumption and its importance. Human wants and their characteristics - necessities comforts and luxuries. Standard of living. Law of diminishing utility. Consumers' surplus. Demand - elasticity of demand. Supply. Production and its significance. Law of diminishing returns. Labour - Malthusian theory of population, Modern theory of population, efficiency of labour. Organization - forms of business organization. Exchange - nature and necessity of exchange, markets, their evolution and classification. Money - evolution of money, functions of money, kinds of money. Distribution - meaning of distribution. Rent - Ricardian theory of rent. Quasi rent. Wages - methods of payment of wages, nominal wage and real wage. Interest. Profit - gross profit and pure profit.</p>		

Practical

The practical includes library work and seminars, group discussions on current economic problems in India.

BASIC SCIENCES

Chemistry

Chem 101	<i>Basic Chemistry</i>	3+1
(Physical and organic)		

The gas laws - gas equation - ideal gas - deviations of real gases from ideal behaviour - Van der Waal's equation - Critical phenomenon and liquefaction.

Dilute solutions - diffusion and osmosis - osmotic pressure - laws of osmotic pressure - Van't Hoff's theory - Raoult's law - Molecular weights of dissolved substances - abnormal molecular weights to Colloids - classification, preparation and purification - dialysis - electrical double layer and zeta potential - properties and applications of colloids - gels and emulsions. Chemical equilibria - law of mass action and its application to homogeneous systems - Le Chatelier's theorem and its application. Electrochemistry - laws of electrolysis - ionisation - weak and strong electrolytes - hydrogen ion concentration - buffer action - theory of indicators - salt hydrolysis - electronic theory of valency. Radioactivity - the fundamental particles - structure of the atoms - stable and radioactive isotopes.

Elementary study of oils, fats and waxes - the fat constants and their significance - steroids - sterols; ergosterol and cholesterol. Carbohydrates - classification and nomenclature - glucose - fructose - sucrose - maltose and lactose - mutarotation - osazones - Polysaccharides - inulin - starch - pectin - cellulose - hemicellulose and lignin. Proteins - properties and classification - peptides and polypeptides - purines and pyrimidines - Alkaloids, an elementary study.

Vitamins - history and classification - Vitamins A, B complex, C, D, E and K. Plant pigments - an elementary study of chlorophyll, carotenes, xanthophylls, anthocyanins and flavones.

Practical

Extraction of oil from oil seeds - determination of the fat constants - estimation of glucose, sucrose, starch and cellulose - Analysis of plant materials for their proximate composition.

Microbiology

Mic. 101

General Microbiology

2+1

Microbiology—its definition and importance. An outline classification of microorganisms and their occurrence in nature.

Mycology. A general understanding of the morphology, reproduction and taxonomy of fungi. A study of the structure and reproduction of the following fungi:— *Pythium aphanidermatum*, *Phytophthora palmivora*, *Albugo candida*, *Sclerospora graminicola*, *Rhizopus nigricans*, *Saccharomyces cerevisiae*, *Phyllachora cynadontis*, *Puccinia graminis*, *Ustilago nuda*, *Tilletia caries*, *Agaricus cambestris*, *Cercospora personata*, *Septoria thespesiae*, *Rhizoctonia solani*.

Bacteriology. Morphology and nutritional requirements of bacteria. A broad outline classification of bacteria.

Virology. A preliminary study of plant viruses, their modes of transmission and properties—common symptoms produced by plant viruses—bacteriophages.

Practical

Use and care of microscope and other common instruments. Preparation and sterilization of culture media. Culturing of microorganisms. Identification of different fungi, bacteria and actinomyces. Examination of virus infected plants.

Botany

Bot. 101

Morphology, Embryology and Anatomy

2+1

Types, modifications and functions of roots. Modifications and functions of stem. Venation, phyllotaxy, modification and functions of leaves. Various types of inflorescences. Morphology of the flowers. Pollination—Types and mechanisms

of pollination. Various types of fruits. Mechanism of fruit dispersal. Cell and cell inclusions. Meristems—Primary and secondary tissues. Structure of stem, root and leaves of dicots and monocots. Anatomical adaptations of xerophytes and hydrophytes. Structure and development of anther and ovule. Male and female gametogenesis. Fertilization. Development of seed.

Practical

Study of modifications of root, stem, leaf and flower. Students should make hand sections of stem, root and leaf and identify the various tissues. They should be able to identify permanent slides showing embryological features.

Bot. 102

Systematic Botany

1+1

General principles of classification. Classification of Bentham & Hooker. Classification: Study of the following families with emphasis on the diagnostic features and economic importance of the following families: Malvaceae, Rutaceae, Anacardiaceae, Myrtaceae, Leguminosae, Cucurbitaceae, Umbelliferae, Rubiaceae, Compositae, Solanaceae, Piperaceae, Euphorbiaceae, Musaceae, Zingiberaceae, Palmaceae and Graminae.

Practical

Students should be able to identify plants belonging to the above families. They should make dissection of flowers and drawings of the same.

Zoology

Zool. 101

2+1

Biology, habits and control of animals of agricultural importance including Snails and Slugs, nematodes ticks and mites, earthworms, crabs, millipedes, rodents and birds.

Fish and Fish culture - fresh water and brackish water fish rearing, suitable species, stocking, manuring and harvesting. Economics of pond culture and modern techniques of fish rearing. Animals of commercial importance including silk worm, lac and honey bees.

Practical

Acquaintance with the above mentioned animal pests of agricultural and commercial importance. Bee culture operations. Acquaintance with important acaricides, nematocides, rodenticides, molluscicides, avicides.

Basic Geology

Geo. 101

1+1

Origin of the earth - its composition - Rocks and minerals - their properties - classification and identification - Rocks and minerals of South India with special reference to those of Kerala - Rock systems of India - Weathering of rocks and minerals and soils formed from them - placement of soil material.

Practical

Study of the properties of rocks and minerals and their identification - field collection of rocks and minerals and identification of the primary mineral constituents of the soil.

Basic Nutrition

Basic Nut. 101

2-0

Introduction to the study of human nutrition - nutritional aspects of agricultural produces. Nutrients - their characteristics, functions, metabolism - sources of nutrients, daily allowances. Deficiency diseases - Nutritional problems of the country with particular references to rural areas. Applied Nutrition programme.

Mathematics

Math. 101 *Mathematics for students of Agriculture* 3+1

Laws of integral exponents - Addition and multiplication of polynomials - Division of a polynomial by another - Factorisation of a quadratic solution of quadratic equations - solution of simultaneous equations - Definition of logarithms - Laws of logarithms - computations with common logarithms - Binomial expansion for a positive integral exponent - Sum of Binomial coefficients - Geometric series

Elements of trigonometry - Relations between trigonometric ratios - relations between sides and angles of a triangle - Mensuration - Area of regular figures - Triangles - Area of irregular figures - Simpson's rules and trapezoidal rules - volume of solids cube - Rectangular solid - parallelepiped - cylinder - cone - pyramid prism - sphere - frustum - wedge - prismoid - Simpson's rule for volume.

Distance between points - area of a triangle - Equation of a straight line - angle between two straight lines - Differentiation - simple applications - increasing and decreasing functions - Maxima and minima of functions of a single variable - Integration of simple functions.

Practical

Problems in Algebra, Trigonometry, Analytical geometry, Calculus and Mensuration.

CORE COURSES

Soil science and Agricultural chemistry

Ag. Chem. 101 *Agricultural Biochemistry* 2+1

Biochemistry and its scope. Composition of living matter. Enzymes. Role of vitamins, hormones and mineral elements.

Biochemistry of carbohydrates, lipids, proteins and nucleic acids. Importance of DNA as a genetic material. Biochemical changes during germination of seeds and ripening of fruits.

Practical

Qualitative tests for carbohydrates, fats, proteins, tannins and alkaloids. Quantitative estimation of simple carbohydrates, fats and proteins from plant and animal sources. Estimation of vitamin C, simple experiments in chromatography.

Ag. Chem. 201 *Analytical chemistry* 1+1

Volumetric analysis. Classification and theories of reactions. Acidimetry and alkalimetry. Argentometry and permanganometry. Precipitation and complex formation. Colorimetric analysis and introduction to instrumental methods of quantitative analysis. Use of organic reagents in inorganic analysis with reference to the major elements of importance to agriculture. Principles of gravimetric analysis.

Practical

Estimation of carbonates and bicarbonates. Volumetric estimation of phosphorus. Neutralising values of liming materials. Estimation of Ca and Mg in dolomite by versenate titration. Estimation of calcium by the permanganate method. Estimation of Mg, Fe and Al by use of 8-hydroxyquinoline. Estimation of Fe, Al and Mg by gravimetric methods. Determination of P, Fe and Al by colorimetric methods.

Ag. Chem. 202 *Fundamentals of Soils* 3+1

Soil as a natural body and as a medium for plant growth. Weathering of rocks and soil formation. Physical properties of soils - colour, specific gravity, pore space, internal surface, plasticity, shrinkage and expansion. Soil texture and structure. Soil temperature and factors affecting it.

Soil colloids. Soil solution and the exchange phenomenon. Flocculation and deflocculation. Soil acidity and lime requirement. Saline and alkali soils, their formation and reclamation. Quality of irrigation water and its effects on soils.

Soil water - classification. Retention of water in soils. Movement of water in soils. Loss of water from soils. Irrigation and drainage.

Soil air - composition and replenishment - aerobic and anaerobic conditions.

Soil erosion and its control.

Soil classification and soil and land use survey. Soils of India with special reference to those of Kerala.

Practical

Study of the soil profile. Collection of soil samples. Mechanical analysis by various methods. Determination of the single value constants. Estimation of soil organic matter, nitrogen, phosphorus, potassium, calcium, magnesium and total sesqui-oxides in soils.

Ag. Chem. 301 *Soil Microbiology* 1+1

Soil population and variability in microbial counts. The carbon cycle. Soil organic matter and humus formation. Nitrogen transformations in soils - ammonification and nitrification. Nitrification and denitrification. Nitrogen fixation - symbiotic and non-symbiotic - Transformations of P, S and Fe in soils. Rhizosphere and bacterisation Micro-organisms and soil structure.

Practical

Estimation of the micro-organisms in the soils. Isolation of *Azotobacter* and *Rhizobium* Study of nitrification by incubation experiments. Simple experiments to study sulphur transformations. Estimation of rhizosphere population.

Ag. Chem. 302 *Soil Fertility and Fertilizers* 3+2

The concept of soil fertility. History and development of soil fertility studies. The essential elements and their functions in plants. Mineral deficiency symptoms. Soil nitrogen, phosphorus, potassium, calcium and magnesium. The micro-nutrient elements.

Fertiliser materials - organic and inorganic. Green manure, farm yard manure, composts and oil cakes - their preparation, composition and uses.

Fertilisers - nitrogenous, phosphatic and potassic - manufacture, composition, properties, storage and uses.

Fertiliser mixtures and complex fertilisers - evaluation of fertilisers. Soil amendments and their evaluation. Soil testing and other methods of evaluation of soil fertility.

Practical

Determination of the cation exchange capacity of soils and the exchangeable cations. Estimation of available N, P and K. Tissue tests for detection of deficiencies.

Estimation of nitrogen in oil cakes. Analysis - bone meal for N and P - ammoniacal and nitrate forms of N in fertilisers - water-soluble, citrate soluble and total P in phosphatic fertilisers - K in ash and muriate of potash. Analysis of fertiliser mixtures for N, P and K. Evaluation of liming materials.

ELECTIVES

Ag. Chem. 401 *Pedology* 2+1

Historical development of the Science of Pedology. Soil as a natural body. Factors of soil formation and soil forming processes. The Great soil groups of the world. Different systems of classification. Soils of India. Soil and Land use survey-

purpose, kinds and techniques. Examination and description of soils in the field. Units of soil classification. Soil mapping and cartography - aerial photography - soil correlation - preparation of soil survey reports.

Practical

Examination of typical soil profiles of the State. Preparation of macro and micro monoliths. Preparation of a soil survey report of a selected area.

Ag. Chem. 402

Soil Physics

2+1

Soil as a three phase system - organic and inorganic constituents. Particle size distribution - Stokes' Law, mechanical analysis by different methods, textural classification, specific gravity and volume weight, soil consistency, structure and soil conditioners. Soil moisture - classes - soil moisture constants - measurement of soil moisture - moisture flow in saturated and unsaturated soils - elementary concept of soil moisture - energy relationships. Soil air - composition, biophysical relations and gaseous exchange - soil aeration and plant growth. Soil temperature - heat capacity and flow of heat in soil. Tillage and physical properties of soils. Physical properties of soils in relation to erosion and run off.

Practical

Mechanical analysis of soils. Aggregate analysis of soils - estimation of percentage of water stable aggregates. Keen's box experiments - estimation of physical constants of soils. Determination of plastic limits, sticky point, determination of moisture tension using tensiometers; pressure plate apparatus, pressure membrane apparatus. Determination of moisture equivalent.

Ag. Chem. 403 *Soil Chemistry* 2+1

Inorganic constituents of soil - their origin, composition and properties - inorganic and organic soil colloids. Silica sesquioxide ratio and its significance. Formation and properties of humus. Cation exchange and its significance. Soil reaction. Development of soils in arid, semi arid and humid conditions. Podsolisation, laterisation and calcification. Acid, saline and alkali soils and their methods of reclamation.

Practical

Separation and fusion analysis of clays. Lime and gypsum requirements of soils. Determination of pH and total soluble salts.

Ag. Chem. 404 *Soil plant Relationships* 2+1

Elements essential for plant growth. Criteria for essentiality. Mitscherlich's equation. Spillman's equation and Baule unit. Soil as a source of nutrients to plants. Mechanism of ion absorption and factors affecting soil reaction, liming, salinity, alkalinity and exchangeable bases in relation to plant growth and availability of nutrients in the soil. Role of organic matter in soil fertility - chemical, physical and biological properties of organic matter. Anion solubilisation of phosphate and chelation. Use of radio-isotopes for assessing soil fertility.

Practical

Determination of available N, P and K using newer extractants. Evaluation of soil fertility by Neubauer method. Microbiological methods for assessing soil fertility. Determination of total and available micronutrients.

Ag. Chem. 405 *Insecticides and Fungicides* 2+1

Chemistry of the common synthetic and plant insecticides and fungicides. Basic principles in

the formulation of pest control chemicals. Hazards relating to the use of pesticides.

Practical

Analysis of common insecticides and fungicides for their active principle.

Ag. Chem. 406

Fertiliser Technology

2+1

Nitrogen, phosphorus and potassic requirements of the state and the nation. Fertiliser terminology. Nitrogenous fertilisers - natural, organic and inorganic sources - artificial fixation of nitrogen and modern processes for the manufacture of basic materials - technology of nitrogenous fertiliser manufacture - properties of nitrogenous fertilisers - equivalent acidity and basicity.

Phosphatic fertilisers. Phosphate resources of the nation, mining and processing of phosphate rocks - manufacture of phosphatic fertilisers and their properties.

Potassic fertilisers - natural sources, manufacture and properties of potassic fertilisers.

Mixed, compound, complex and high analysis fertilisers - incompatibilities in mixing - conditioners and fillers - modern methods of granulation, bagging, labelling and storage.

Incorporation of micronutrients, insecticides and weedicides. Modern methods of marketing fertilisers - fertiliser administration - fertiliser control order - ISI standards for fertilisers and enforcement of Fertiliser Laws.

Practical

Field trips to fertiliser factories, mixing yards and selling points. Collection of samples observing principles laid down under fertiliser laws.

Ag. Chem. 407 *Acid, saline and alkali soils* 2+1

Soil acidity - its causes and plant effects. Lime requirement of soils - agricultural liming materials with special emphasis to locally available materials.

Saline and alkali soils - their classification and characteristics. Electrical conductivity, pH, soluble cations and anions - influence on structure and general plant effects - modern criteria for evaluation of saline and alkali soils - gypsum requirement of alkali soils - methods of reclamation.

Practical

Analysis of irrigation waters. Determination of electrical conductivity of saturation extracts of soils. Determination of SAR, permeability and hydraulic conductivity.

Ag. Chem. 408 *Soil reclamation and water conservation* 2+1

Conservation of soil and water resources. Soil erosion - causes and effects - types - run off and its measurement - methods of erosion control - controlling gullies, terracing, strip cropping, cover crops, pasture improvement, shelter belts, farm drainage. Soil conservation survey - its interpretation and use. Land use - water shed management. Soil conservation plans - productivity ratings - development of cropping patterns for soil and water conservation - problems of soil reclamation.

Practical

Field trips to study soil conservation and water management practices in the State.

HORTICULTURE

Hort. 101 *Introductory Horticulture* 2+1

Horticulture - definition - divisions. Importance of horticultural crops - economical and nutritional.

Factors to be considered in selection of sites for orchards. Planting systems in orchards and plantations - steps in planting. Irrigation - methods. Soil management - mulching, cover cropping, intercropping. Training and pruning. Fruit set - factors affecting - fruit shedding. Harvesting grading storage and marketing of fruits and vegetables.

Plant propagation practices - sexual and asexual methods - advantages and disadvantages. Rootstock influences.

Practical

Practice in seed sowing, nursery raising, transplanting - potting and repotting of plants - asexual propagation methods - cuttings, layering, budding, grafting - raising of rootstocks. Use of plant growth substances in rooting of cuttings.

Hort. 201 *Pomology I* 2+1

(Mango, banana, pineapple, cashew, papaya, jack)
Importance of fruits - economical and nutritional. Area and production. Origin, botany and varieties. Climate and soil requirements. Propagation methods. Preparation of land, spacing, planting, establishing, maintaining. Cultural and manurial requirements - training and pruning. Harvesting - packing and marketing - commercial products and their uses.

Practical

Identification and description of varieties of the above fruit crops. Practice in the preparation of plans, layout and planting of orchards - maintenance of performance records of fruit trees.

Hort. 301 *Plantation Crops I* 2+1

(Coconut, oil palm, arecanut, rubber)

Coconut, Oil palm and arecanut. Importance of plantation crops in the national economy. Area and

varieties - hybrid varieties and their importance. Climate and soil requirements. Propagation methods and nursery - seed selection. Preparation of land, planting, establishing and maintaining plantations. Cultural and manurial practices. Harvesting - processing produce - commercial products and their uses.

Rubber. Area and production - importance. Botany - varieties - clones, clonal gardens. Propagation methods and nursery. Climate and soil requirements. Preparation of land, planting, establishing and maintaining plantations - soil conservation methods. Cultural and manurial practices - training. Tapping - collection of latex and their uses.

Practical

Identification of the varieties of the above crops and commercial products. Tapping in rubber and preparation of rubber sheets. Practice in propagation methods and raising nurseries.

Hort. 302

Plantation Crops II

2+1

(Tea, Coffee, Cardamom, Pepper)

Area and production - importance. Botany and varieties. Climate and soil requirements. Propagation methods and nursery. Preparation of land, planting, establishing and maintaining plantations. Cultural and manurial practices - training and pruning. Harvesting - processing of the produce - commercial products and their uses.

Practical

Identification of the species and varieties of the above mentioned crops and crop produces - practice propagation methods of the above crops.

Hort. 401

Olericulture and Ornamental Gardening

2+1

Olericulture. Definition - importance of vegetables - economical and nutritional. Classification of vegetables. Types of vegetable growing.

Crops: Tomato, brinjal, chillies, cucurbits and bhindi.

Soil and climatic requirements. Varieties - important characters. Seed sowing - nursery raising, transplanting. Preparation of land and planting - cultural requirements - manuring and irrigation - crop management. Harvesting.

Ornamental Gardening: Different types of ornamental gardens. Principles of layout. Features of gardens - lawns, preparation and maintenance - flower beds, preparation and maintenance - ornamental trees - shrubs - herbaceous perennials - hedges and edge plants - rockery - water garden. Green houses - shade loving plants - ferns, palms, orchids.

Practical

Olericulture. Identification of common vegetables - Practice in raising nursery, transplanting and preparation of plans for kitchen gardens.

Ornamental gardening. Identification of important ornamental plants. Practice in preparing plans for home garden, school garden and public parks.

ELECTIVES

Hort. 402

Pomology-II

2+1

Fruit zones in India and South India. Detailed study of the following fruit crops.

(a) Tropical fruits: Citrus, grapes, pomegranate, annona, guava, sapota.

(b) Humid tropical fruits: Mangosteen, avocado, litchi, breadfruit.

(c) Temperate fruits: apple, pear, plum, peach.

- Hort. 403 *Plantation and spice crops* 2+1
 (Cocoa, ginger, clove, nutmeg, cinnamon,
 vanilla, lemongrass, Eucalyptus)

Importance of spice crops. Their role in national economy and foreign trade. Study of the cultivation details of the above crops. Area and production. Botany - varieties. Climate and soil requirements. Propagation methods - nursery. Preparation of land, planting, establishing and maintaining. Cultural and manurial practices - pruning, shade regulation etc. Harvesting - processing of the produce. Commercial products and their uses.

- Hort. 404 *Plant regulators in horticulture* 2+1

Phytohormones - Plant regulators - action of plant regulators - application in horticulture, root formation, flowering and fruit set, parthenocarpy, abscission, prevention of fruit fall, inhibition of sprouting, weed control.

Practical

Practice in preparation of important growth regulators and their application in crops.

- Hort. 405 *Post harvest handling and storage* 2+1

Maturity and harvesting in relation to storage of fruits and vegetables - Storage conditions as related to shelf life and quality - Changes during ripening of fruits - Methods of storage of important tropical fruits and vegetables - grading, marketing transport.

Practical

Practice in storage methods of fruits and vegetables - observations of changes in storage.

- Hort. 406 *Nursery Management* 2+1

Sexual and asexual methods of propagation of horticultural crops - seed production and storage -

hormones in propagation - Propagation structures, mist chamber - green houses - Layout of nursery - Essential features - management of nursery - commercial production of roses, orchids, foliage plants. Maintenance of records and registers in nursery management.

Practical

Practice in laying out nursery, preparing plans, propagation and management.

Hort. 407 *Landscape Gardening* 2+1

History of landscape gardening - Principles of landscape design - drafting plans and layout - site selection, site analysis - landscape in relation to land, topography climate - natural forces, forms and features - Functional use of plant materials. Urban and rural landscaping.

Practicals in designing and drafting landscape gradens.

Hort. 408 *Breeding of Perennial Crops* 2+1

Principles and methods of breeding. Improvement through selection, hybridisation - heterosis as applied to perennial crops. Inheritance of characters. Problems of breeding perennial crops.

Practical

Hybridisation techniques in coconut, rubber and mango, and other perennial crops.

Hort. 409 *Commercial fruit Products* 2+1

Causes of spoilage of fruits and vegetables. General principles of preservation - Methods of preservation - equipments, techniques - spoilage of preserved foods. Different commercial fruit products - juices, squashes, jam, jelly, ketchup, preserves and pickles

Practical

Preparation of squash, jam, jelly, ketchup, preserves, pickles.

Hort. 410 *Breeding of vegetable Crops* 2+1

Principles and methods—variation in vegetable crops. Improvement of vegetables through selection, hybridisation etc. — heterosis as applied to vegetable crops. Inheritance of characters. Breeding for quality, disease and pest resistance.

Practical

Breeding techniques in common vegetables.

Hort. 411 *Plantation and spices produce Technology* 2+1

Methods of curing and processing in tea, coffee, rubber, coconut, arecanut, cardamon, pepper, ginger, nutmeg, clove, vanilla and extraction of oil in lemongrass, eucalyptus and other essential oil yielding plants and their uses.

Practical

Practice in curing and processing of important plantation crops, spices and essential oils.

Hort. 412 *Systematic Pomology* 2+1

Description, classification and identification of fruit species and varieties of important tropical fruits.

Descriptive blanks and their application.

Practical

Identification of important varieties of fruits.

AGRONOMY

Agron. 101 *Elementary Agronomy I* 3+2

Importance and scope of agriculture in India development of agriculture — food production and

consumption in India and in Kerala. Agronomy — definition and scope. Tillage and tillage implements — objects, methods and effects of minimum tillage — preparation of land for seed beds.

Weather and climate. Importance and scope of agricultural meteorology. Atmosphere — stratification of atmosphere — macro and microclimate — weather elements and weather forecasting — study of meteorological instruments — factors affecting crop distribution — impact of weather elements on crop growth — Monsoon — weather abnormalities — synoptic charts — crop weather studies — crop weather calendar — agro-climatic classification of India — agricultural seasons.

Practical

Preparation and presentation of data on food production, consumption etc. in India and in Kerala. Identification of tillage implements and machinery and handling them in the field. Identification and handling of meteorological instruments — recording weather data.

Agron. 102

Elementary Agronomy II

3+1

Seed — definition — characteristics of good seeds — selection of seeds — dormancy — methods of seed treatment — seed testing — germination tests, quality tests, moisture tests — seed testing in India — distribution of improved varieties of seeds — certified seed and registered seed — seed multiplication farms — National Seeds Corporation — organisation of seed distribution in Kerala.

Sowing — methods of sowing — merits and demerits of different methods — seed rate — factors affecting seed rate — sowing versus transplanting.

Weeds — economic importance — extent of damage caused by weeds — classification of weeds — aquatic weeds — propagation and dissemination of weeds —

agronomical, chemical and biological control of weeds - weedicides and their mode of action - selective and non-selective weedicides - weedicides - weed control of important crops of Kerala.

Practical

Seed testing - collection and identification of common weeds of south India.

Agron. 201 *Soil Fertility and Management* 3+0

Soil fertility and productivity - factors affecting soil productivity - management of soil productivity. Mineral nutrition of plants - criteria of essentiality - essential elements - role of organic matter in soil fertility. Soil management for important annual and perennial crops of Kerala. Importance of crop rotations, fallowing, mixed cropping and multiple cropping.

Agron. 202 *Soil and Water Management* 2+1

Role of water in plant growth. Irrigation, its importance and scope - water requirements of crops - methods of irrigation - soil factors involved - quality of irrigation water - water lifts.

Importance of drainage - methods - types of drains. Factors affecting soil erosion and extent of damage caused by soil erosion - loss of water and nutrients. Dry farming - definition and scope - principles and agronomic practices for dry farming areas.

Practical

Identification of water lifts, water measuring devices and other irrigation appliances - estimation of soil moisture.

Agron. 301 *Crop Production* 3+1

Classification of crops - detailed study of the origin and distribution. Soil and climatic factors - adaptation - varieties, seasons and cultural practices

involved in sowing - manuring - water management - aftercare. Harvesting, processing and marketing - agricultural and industrial uses. Cereals and millets (rice, wheat, maize, ragi, jowar). Pulses (horsegram, greengram, blackgram cowpea). Sugar crops (sugarcane). Fibre crops (cotton). Green manure crops (sannhemp, daincha). Fodder crops (guinea grass, napier grass, lucerne, berseem).

Practical

Practical crop production, plot cultivation. Identification of seeds, manures and fertilizers.

Agron 401 *Farm Operation and Management* 2+1

Farm management - selection, location and layout of a farm - farm buildings - implements and machinery - farm labour management - choice of type of farming - systems of farming - maintenance of farm records - calender of operations - cultivation sheet and other field and farm records - profit and loss statements - cultivation records - analysis of farm business.

Practical

Working out the cost of equipment, livestock and dead stock for garden land, wet land and dry land farms - preparation of cropping schemes - working out the cost of cultivation of important crops - familiarisation with farm records and accounting systems.

ELECTIVES

Agron. 402 *Principles of Crop Production* 3+0

History of agronomy, the science of crop production. Seeds and sowing - factors of crop growth, effect of nutrients and moisture supply, light,

temperature and aeration. Composition of soil - Maintenance of fertility. Tillage in agriculture - Mixed cropping and dry farming. Weeds and weed control.

Agron. 403 *Irrigation and Drainage* 2+1

Role of water in plant growth - soil and water relations - movement of water in soil - measurement of soil moisture, moisture stress and plant growth. Quality of irrigation water - methods of irrigation - implements for irrigation water requirement and techniques of assessment. Principles and practices of drainage - types of drains - drainage problem of Kerala State.

Practical

Estimation of soil moisture, bulk density of soil, soil moisture constants. Identification of irrigation equipments and handling them in the field.

Agron. 404 *Soil Fertility and Management* 3+0

Criteria of essentiality - Law of Minimum. Factors affecting soil fertility. Plant nutrients, their availability and absorption - organic matter, its role and maintenance - nitrogen, phosphorus, potassium and other elements. Diagnostic techniques in nutritional needs. Activities of soil organisms in relation to productivity - nitrogen cycle - carbon cycle. Rotations and mixed cropping in relation to soil fertility. Methods of fertilizer application - spray fertilization. Economics of fertilizer use.

Agron. 405 *Soil Conservation* 3+0

Importance of soil conservation in crop production - magnitude of erosion problem - types of erosion and factors affecting erosion - measures of erosion control - development of cropping pattern for soil and water conservation. Soil and water conservation in Kerala and India.

- Agron. 406 *Cereal Crops* 3+0
 Origin, history, production, distribution, classification and description - varietal improvement, adaptability, climate, season, water and cultural requirements - quality, its components and factors affecting it - handling and processing of produce - agronomic characters of important varieties, cost of cultivation and profit.
- Agron. 407 *Commercial Crops I* 3+0
 (Plantation crops and tuber crops)
 Importance of plantation and tuber crops in the economy of the state. Origin, history, production and distribution - classification, description, varietal improvement and nutrition - processing and marketing. Package of practices - cost of cultivation and profit of coconut, arecanut, rubber, coffee, tea, sweet potato and tapioca.
- Agron. 408 *Commercial Crops II* 3+0
 (Cotton, jute, groundnut, sugarcane and tobacco)
 Origin, history, production and distribution, classification and description - varietal improvement, adaptability, climate, season, soil, water and cultural requirements - development and nutrition of crop plants - quality of produce - handling and processing. Cost of cultivation and profit.
- Agron. 409 *Practical Crop Production* 0+3
 Students should raise a major crop following the improved agronomic practices. They should carry out all the operations and maintain proper cultivation sheets. They should submit a report on the crop and the various data concerning the cultivation.
- Agron. 410 *Agricultural Meteorology* 2+1
 Importance and scope of agricultural meteorology. Weather and climate - study of weather elements

and their influence on crop growth and distribution. Monsoon in India. Crop weather studies - crop weather calendar - weather forecasting - weather abnormalities. Forecasting the incidence of pests and disease. Agricultural meteorological service in India.

Practical

Identification and handling of meteorological instruments. Preparation of crop weather calendar. Crop weather studies.

Agron. 411 *Farm Operations and Management* 2+1

Organisation of farming - selection, layout and development of farm. Essential features for success in farming. Farm operation - calendar of operations and labour unit for different operations.

Practical

Maintenance of cultivation sheets and other farm records.

Agron. 412 *Weeds and Weed Control* 2+1

Weeds - definition - classification. Economic importance and extent of loss caused by the weeds. Control measures - agronomical, chemical and biological. Chemical weedicides - selective and non-selective - mode of action of weedicides - contact and systemic. Important weeds of South India and their control measures. Aquatic weeds and their control - integrated approach for weed control.

Practical

Collection and identification of common weeds of Kerala. Practical training in the control measures of common weeds in Kerala.

AGRICULTURAL BOTANY

Ag. Bot. 201 *Economic Botany* 2+1

Study of the following crop plants with special reference to distribution, morphology, processing and grading. Rice, ragi, cowpeas, horsegram, greengram, cotton, coconut, gingelly, groundnut, castor, sugarcane, tapioca, sweet potato, pepper, ginger, turmeric, nutmeg, cardamom, tea, coffee, arecanut, betelvine, cocoa, rubber and exotic fodders.

Practical

Students should be able to make botanical description and identification of crop plants and their products.

Ag. Bot. 202 *Plant Physiology* 2+1

Plant Physiology in agriculture. Diffusion, osmosis, plasmolysis. Absorption of water. Transpiration. Guttation. Essential elements and their role, Absorption of solutes and factors affecting the process. Photosynthesis - factors affecting the process. Enzymes - factors affecting enzyme action. Respiration - significance and factors affecting. Photoperiodism. Vernalization. Growth - factors affecting growth. Plant hormones. Seed physiology - germination and dormancy.

Practical

Simple experiments in transpiration, guttation, photosynthesis, respiration, germination etc.

Ag. Bot. 203 *Cytogenetics* 2+2

Generalised cell. Nucleus - its structure and function. Mitosis, meiosis and their significance. Chromosome shape, structure and number. Changes affecting the number and structure of chromosomes. Spontaneous and induced mutations.

Practical

Preparation and identification of different stages of meiosis and mitosis. Students must be able to work out simple genetic problems.

Ag. Bot. 301 *Plant Breeding* 2+1

Role and value of plant breeding. History of plant breeding and its development as a science. Cytogenetic basis of plant breeding. Mode of reproduction in plants and their relation to breeding methods. General techniques of selfing and crossing in plants. A general account of the different methods of breeding - breeding method for self pollinated crops. Plant introduction. Selection. Hybridisation and selection. Breeding work done in South India on rice, coconut and tapioca.

Practical

Floral biology of important plants. Techniques of selfing and crossing in rice, coconut, tapioca and cotton.

ELECTIVES

Ag. Bot. 401 *Cytogenetics* 2+1

Mitosis, Meiosis, Fertilization, Mendelism, and sex chromosomes and sex determination. Polyploidy and aberrations. Background of modern genetics. Heredity and environment. Chromosome as a site of location of genetic factors. Genotype and phenotype. Linkage and crossing over. Measurement of linkage and linkage groups. Chromosome mapping. Multiple alleles and position effect. Pleiotropism Chi-square and its application in genetical problems. Extra chromosomal inheritance.

Practical

Preparation of stains, smear preparation of meiosis

and mitosis. Mendelian ratios and their modifications. Estimation of linkage from test cross ratios. Mapping of chromosomes.

Ag. Bot. 402 *Genetics* 2+1

Nature of the genetic material. Recombination in bacteria and viruses. Transformation and transduction. Concept of gene and gene action. Gene as a unit of recombination and function. Nature and replication of genetic material. Mutations. Mutagenic effects of ionizing and non-ionizing radiations and chemicals. Inheritance of blood groups in man. Tests of allelism. Cis-trans position effect. Biochemical genetics and developmental genetics.

Practical

Study of mutagenic effects of radiations and chemicals.

Ag. Bot. 403 *Plant Breeding-1* 2+1

Role and value of plant breeding in crop improvement. History of plant breeding and its development as a science. General techniques of selfing and crossing in crop plants. Mode of reproduction in plants and their relation to breeding methods. Sterility and incompatibility. Methods of plant breeding. Plant introduction - centres of origin of cultivated plants. Selection - pure line selection in self pollinated plants. Hybridization and selection - bulk, pedigree, multiple and back cross methods. Methods of breeding in self pollinated crops with reference to rice.

Practical

Study of reproductive organs of plants - pollination - pollen tube growth and pollen viability.

Ag. Bot. 404 *Plant Breeding II* 2+1

Methods of breeding in cross pollinated crops with reference to maize. Utilization of heterosis -

breeding hybrid varieties, hybrid seed production, male sterility, breeding through induced polyploidy. Breeding through induced mutations. Role of inter-specific and intergeneric hybridization in plant breeding. Breeding for resistance to insects and diseases. Breeding for special characters such as quality, drought and lodging. Seed testing and seed certification. Breeding work in South India on rice, maize, sugarcane, cotton, coconut and tapioca with special emphasis on work done in Kerala.

Practical

Techniques of selfing and crossing important cultivated crops. Seed testing for germination and purity - estimation of sterility.

Ag. Bot. 405

Plant Physiology I

2+1

Absorption of water - the absorbing region of roots, root hairs, mechanism of absorption of water, Translocation of water - the path of translocation through the plant - mechanism of translocation of water. Transpiration - significance of transpiration. Absorption of solutes - mechanism of absorption. Mineral deficiency and deficiency symptoms. Enzymes - nature of enzyme action, types of enzymes. Photoperiodism. Vernalisation. Growth and growth correlations. Action of plant hormones and their practical application. Germination, dormancy and methods of breaking dormancy.

Practical

Experiments in transpiration, hydroponics, enzyme action, growth hormones, germination and dormancy.

Ag. Bot. 406 *Plant Physiology-II (Plant Metabolism)* 2+1

Photosynthesis - chlorophyll, chemical pathways of photosynthesis. Chemosynthesis. Chemosynthesis

and bacterial photosynthesis. Efficiency of photosynthesis. Respiration - aerobic and anaerobic - chemical pathways of respiration - significance of respiration - efficiency of respiration. Fat metabolism. Nitrogen metabolism.

Practical

Experiments in photosynthesis and respiration.

Ag. Bot. 407 *Plant Physiology* 2+1
(Growth and Development)

Introduction to growth and development, Mobilisation and growth correlation. Plant growth regulators - their importance in agriculture. Weedicides and their mechanism of action. Flowering and senescence. Photoperiodism. Vernalisation. Tuber and bulb formation.

Practical

Simple experiments for measurement of growth of plants and organs. Demonstration of abnormal action and use of weedicides.

Ag. Bot. 408 *Embryology of angiosperms* 2+1

Detailed study of male and female gametogenesis, anthesis, pollination and fertilization. Development of endosperm, embryo, seed and fruits. Natural and induced parthenocarpy. Failure of seed formation. Apomixis and parthenogenesis. Culture of floral organs and embryo. Causes and remedies of seed dormancy.

Practical

Study of floral parts - pollen grains, pollination, pollen tube growth. Parthenocarpy. Culture of stamens, pollen grains and embryo.

Ag. Bot. 409 *Economic Botany* 2+1

Study of the following crops with special reference to their origin, ecological requirements, morphology, processing and grading of produce quality components and uses: Cholan, cumbu, maize, redgram, soybean, jute, coriander, fenugreek, kaempferia, yams and important medicinal plants.

Practical

Identification and description of the above plants and their products - making sketches.

Ag. Bot. 410 *Seed physiology and seed production* 2+1

Structure and development of seeds. Germination and dormancy - role of seed coats, seed components and environmental factors. Biochemical aspects of seeds - seed vigour, seed viability. Factors affecting seeds in storage. Pre-treatment of seeds. Seed testing, seed certification and seed multiplication.

Practical

Identification of crop and weed seeds. Study of factors affecting germination and seed deterioration - viability tests.

PLANT PATHOLOGY

Pl. Path. 301 *Plant Pathology-I.* 2+2

Economic importance of plant diseases - General classification of plant diseases.

Study of the symptoms, causal organisms, mode of survival, spread and control of the diseases of the following crop plants, viz rice, wheat, sorghum, bajra, ragi, potato, sweet potato, tapioca, yams,

chilli, tomato, brinjal, bhindi, cucurbits, sugarcane, tobacco, groundnut, sesamum and pulses.

Practical

Familiarization of the diseases of crops studied. Symptoms, causal organisms and host-parasite relationships. Isolation and inoculation.

Pl. Path. 302 *Plant Pathology - II* 2+2

Study of the symptoms, causal organisms, mode of survival, spread and control of the diseases of following crops: Pepper, ginger, turmeric, cardamom, nutmeg, clove, coconut, arecanut, coffee, tea, rubber, cashew, mango, banana, grape, pineapple, cacao and citrus. Diseases caused by Phanerogamic parasites and deficiency diseases.

Practical

Familiarization of the diseases of crops studied - symptoms, casual agent and host-parasite relationships. A collection of diseased plant materials should be submitted by each candidate at the time of final examination.

Pl. Path. 401 *Plant Disease Control* 1+1

Principles of plant disease control - Exclusion, Eradication, Protection and Immunization. Different groups of fungicides and antibiotics used for the control of plant diseases. Methods of application and formulation of plant protection chemicals. Cultural methods of plant disease control.

Practical

Familiarization with the different types of sprayers and dusters. Preparation and application of different chemicals used for plant disease control.

Electives

Pl Path. 402 *Phytopathological techniques* 1+2

Common methods employed for the study of fungal, bacterial, viral and deficiency diseases. Preparation

of culture media and methods of sterilization. Isolation and pure culturing of plant pathogens. Micrometry. Nutritional requirements of microorganisms. Koch's postulates. Methods of preservation of diseased plant materials. Staining techniques, preparation of semi-permanent and permanent slides.

Practical

Preparation of media and sterilization. Isolation, purification and preservation of cultures. Inoculation. Preparation of semi-permanent and permanent slides.

Pl. Path. 403 *Principles of Plant Pathology* 2+1

Growth, reproduction, survival and dissemination of pathogens. Predisposition and infection, host-parasite relationships. Variation. Physiology and biochemistry of defence mechanisms. Toxins and enzymes. Physiologic specialization and disease resistance. Forecasting crop diseases. Field evaluation of disease incidence.

Practical

Germination of spores of plant pathogens. Infection. Testing of the reaction of different crop varieties to infection by fungi

Pl. Path. 404 *Morphology and Taxonomy of fungi* 2-1

A detailed study of the morphology and taxonomy of fungi. A general account of the following orders of fungi with special reference to plant pathogens. Plasmodiophorales, Peronosporales, Mucorales, Aspergillales, Saccharomycetales, Taphrinales, Pseudosphaeriales, Sphaeriales, Clavicipitales, Uredinales, Ustilaginales, Agaricales, moniliales, Melanconiales, Sphaeropsidales and Mycelia Sterilia.

Practical

Laboratory study of the morphology, reproduction and other characters of typical species in each order. Micrometry and use of camera lucida.

Pl. Path. 405 *Plant Virology* 2+1

Historical development. Detailed study of the methods of transmission, vector-virus relationships. Variation. Purification. Serology. Properties and classification of plant viruses. General methods of controlling viral diseases of crop plants. Bacteriophages. Mycoplasma-characteristics and control.

Practical

Different methods of transmission of plant viruses. Thermal and chemical inactivation and dilution end points. Familiarity with techniques employed in the study of plant viruses.

Pl. Path. 406 *Plant Bacteriology* 2+1

Introduction - Development of plant bacteriology. Morphology, physiology and taxonomy. Detailed study of the following genera: *Xanthomonas*, *Pseudomonas*, *Erwinia*, *Agrobacterium*, *Corynebacterium* and *Streptomyces*. Study of the bacterial diseases of crop plants and their control.

Practical

Isolation, purification and staining. Study of the morphological and physiological characters. Examination of bacterial diseases of crop plants.

Pl. Path. 407 *Physiology of Fungi* 2+1

Nutritional requirements (organic and inorganic) of fungi for growth and sporulation. Factors affecting growth and sporulation. Respiration. Vitamin requirements. Action of physical and chemical agents on fungi.

Practical

Preparation of culture media - growth of fungi in different media - study of the nutritional requirements. Effect of temperature and pH on growth and reproduction. Action of other physical and chemical agents.

Pl. Path. 408 *Microbiology of stored Products* 2+1

Post harvest spoilage during transit and storage and the micro-organisms associated with the spoilage. Different types of spoilage and the factors which favour them. Biochemical changes brought about by micro-organisms. Food poisoning. Different methods used for the preservation of stored products.

Practical

Familiarity with different types of spoilage. Examination and identification of organisms associated with storage products. Laboratory evaluation of different preservation techniques.

Pl Path. 409 *Fungicides and their action* 2+1

Historical development. A study of the common groups of fungicides and also of their mode of action. Laboratory and field evaluation of fungicides. Compatibility of different fungicides with insecticides. Phytotoxicity. Precautionary measures against hazards. Ground and aerial application of fungicides. Seed and soil treatments. Spreaders, stickers and emulsifiers. Use of antibiotics for plant disease control.

Practical

Laboratory and field testing of different fungicides. Evaluation of the efficacy of different types of equipment for fungicidal application.

- Pl. Path. 410 *Non-parasitic diseases and
phanerogamic plant parasites* 2+1

Diseases caused by unfavourable environmental conditions. Deficiency diseases and diseases due to toxicity. Diseases caused by phanerogamic parasites and methods of control.

Practical

Study of the symptoms and control of diseases caused by phanerogamic parasites.

- Pl. Path. 411 *Principles of plant disease control* 2+1

History and importance of plant protection. Its organization in India. Various methods of controlling plant diseases - exclusion, eradication, protection and immunization. Quarantine and regulatory measures of control. Control by cultural, mechanical and biological methods and control by the cultivation of resistant varieties. Assessment of loss due to diseases. Forecasting and epidemiology of diseases.

Collection, preservation and despatch of diseased plant materials for identification.

Practical

The students should familiarize themselves with the different methods of plant disease control.

AGRICULTURAL ENTOMOLOGY

- Ent 301 *General Entomology* 3+1

Position of insects in the animal kingdom; their dominance as a group. Insects in relation to man. External morphology - body wall and derivatives, body regions, appendages and their adaptive modifications with special reference to mouth parts.

wings and modifications. Internal anatomy - an elementary knowledge of digestive, circulatory, respiratory, excretory, reproductive and nervous systems. Sense organs. Types of reproduction and nature of metamorphosis in insects. Classification of insects - important orders and mention of families of economic importance.

Practical

Dissections of alimentary, reproductive and nervous systems of cockroach. Chief types of mouth parts. Important modifications of antennae, legs and wings. Different types of metamorphosis and immature stages. Identification of important orders and families. Insect collection and preservation.

Ent. 302

Insect control

2+1

Balance of life in nature. Pest outbreaks. Principles of insect control including modern methods. Insecticides - formulations, dose and limitations of important insecticides; insecticide hazards - precautions. Insect resistance to insecticides. Various types of application equipment.

Practical

Acquaintance with insecticides and their formulations - structure and maintenance of plant protection equipment.

Ent. 401

Economic Entomology

2+1

Biology and control of the important insect and mite pests of rice, coconut, vegetables, spices, oil seeds, sugarcane, plantation crops, garden plants and narcotics. Pests of stored products and their control. Principles of grain storage. An elementary knowledge of important house-hold pests and cattle pests and their control. Biological control of weeds.

Practical

Study of the insect pests and their immature stages and the nature of damage caused by them. Collection and preservation of crop pests. Every student to submit insect pest collections.

ELECTIVES

Ent. 402 *Plant Protection - Pest control* 2+1

Importance of plant protection in crop production. Methods of pest management. Assessment of damage done by insects to cultivated crops and stored products. Important insecticides, acaricides, nematocides and rodenticides; their properties, mode of action and use. Detailed study of plant protection equipment, their use and maintenance. Recognition and control of major pests of crops - insects and non-insects with stress on integrated control schedules.

Practical

Acquaintance with various types of insecticides, their formulations and application in the field. Detailed study of various types of plant protection equipment, their parts and maintenance. Identification of more important crop pests in Kerala.

Ent. 403 *Nematology* 2+1

History and development of Agricultural Nematology. Importance of nematodes in Agriculture. Types of damage caused to cultivated crops. Basic structure and morphology of nematodes. Techniques for processing soil and plant materials for the study of nematodes. General principles of control. Detailed study of important types of plant parasitic nematodes of crops in India.

Practical

Types of damages done to cultivated crops by nematodes. Collection and processing of nematodes from soil and plant materials for identification. Identification of more important genera of parasitic nematodes.

Ent. 404 *Economic Zoology* 2+1

Studies on the following animal groups harmful to man and agriculture - pathogenic protozoa, flatworms, nematodes, earthworms, crustaceans, millipedes, mites, snails and slugs, fishes, reptiles, birds and mammals.

Important methods of control of the above pests.

Practical

Identification of the important non-insect pests of cultivated crops in Kerala. Field experience in using different methods adopted in controlling these pests.

Ent. 405 *Chemical control of insect pests* 2+1

History of the development of insecticides. Classification of insecticides. Formulations and dosage, limitations in use, hazards, mode of action of insecticides. Attractants, repellents and chemosterilants.

Practical

A detailed study of various types of insecticides, their formulations, dosage and field application. Evaluation of insecticidal efficacy of chemicals in laboratory and field.

Ent. 406 *Insect parasitology and Biological control* 2+1

Historical development of biological control - Insect parasites, predators and micro-organisms and their scope in biological control. Ecological basis of biological control. Mass culturing of parasites

and predators, methods of colonisation, recovery and evaluation. Bacterial, fungal, virus, protozoan and nematode diseases of insects and their utilization for microbial control. Principles of biological control of insect pests and weeds.

Practical

Collection, preservation and identification of the parasites and predators associated with insect pests of crops. Mass culturing, colonisation and evaluation of the eulophid and braconid parasites of *Nephantis serinopa*.

Ent. 407 *Ecology* 2+1

Ecology in relation to pest control - Effect of temperature, humidity, rainfall, light, pressure, sound, air current, electrical field, food and other factors on pest population. Forecasting of pest outbreaks.

Practical

Methods of estimation of pest populations in the field with reference to climatic and biotic factors.

Ent. 408 *Insect Pathology* 2+1

Definitions: Scope and brief history - Common insect diseases caused by bacteria, fungi, viruses, protozoa and nematodes. Techniques of mass production of insect pathogens. Use and limitations of micro-organisms in biological control of insect pests.

Practical

Techniques of culturing and inoculating insect pathogens like bacteria, fungi, virus and protozoa. Detailed observations on symptoms caused by pathogens and examination of preparation depicting histo-pathology of the diseased insects.

Ent. 409 *Acarology* 2+1

General morphology, classification, biology and control of phytophagous mites. Important mite pests of crops. Predatory species of mites and their value in biological control. Miticides and their use.

Practical

Identification of important mite pests in Kerala - Acquaintance with the predatory species of mites and their bionomics.

Ent. 410 *Apiculture* 2+1

History and development of bee-keeping. Honey bees in India. Bionomics, domestication and management of apiaries. Enemies of bees and methods of controlling them. Behaviour of bees. Role of bees in crop production. Appliances used in the industry. Extraction, storage and marketing of honey. Bee keeping as a small scale industry.

Practical

A detailed study of bee appliances. Hiving a bee colony. Acquaintance with a model apiary. Knowledge of extraction and storage of honey.

Ent. 411 *Recent trends in insect control* 2+1

The theory and practice of integrated control. Insect fertility control methods and their utilization in applied pest management. Chemicals controlling insect behaviour and their use in insect control. Sex pheromones, attractants and repellents. Hormone mimics.

Practical

Studies on the behaviour of insects with reference to attractants, repellents and sex pheromones.

AGRICULTURAL ECONOMICS

Ag. Econ. 101 *Introduction to Agricultural Economics* 2+1

Definition, scope and importance. Agriculture in the economic system. Economics of agriculture and industry. Land - peculiarities of land as a factor of production - Law of diminishing returns and its effects. Subdivision and fragmentation of holdings - size of holdings - economic holdings. Land tenures and Land reforms. Agricultural Labour - efficiency of labour, wage rates and methods of payment - minimum wages in agriculture. Theories of population. Farm mechanization. Agricultural capital - Function of capital - forms of capital - capital in agriculture - classification of agricultural credit - agencies providing agricultural credit. State and agriculture - State assistance in agriculture. Agricultural planning.

Practical

Library work, economic survey of holdings and preparation of family budgets of farm labourers.

Ag. Econ. 201 *Agricultural Co-operation* 2+1

Role of co-operation in economic development - origin and development - structure and organization. Agricultural Credit Societies - short, medium and long term supply of agricultural credit. Agricultural marketing, processing and irrigation societies. Service co-operatives. Central banks. State Co-operative bank. Land Development Banks - primary land development banks and central land development banks - their functions and operation with special reference to Kerala. Agricultural Refinance Corporation. Co-operative farming.

Practical

Visit to co-operative organizations and submission of reports.

livestock insurance. Problems of irrigation. Rural unemployment. Cottage and small scale industries. Land utilisation and cropping pattern in India with special reference to Kerala. Intensive and extensive cultivation - scope in India. Problems of mechanisation. State in relation to agriculture. Problem of food in India (quantitative and qualitative aspects).

Practical

Each student is to undertake a detailed survey of a village.

Ag. Econ. 403 *Agricultural Marketing* 2+1

The importance of good system of marketing. Classification of markets. Concentration, equalisation and dispersion. Characteristics of farm products. Marketing services or functions. Drawbacks in the marketing system. Lines of improvement of agricultural marketing in India. Regulated markets. Storage and warehousing. Market intelligence. Improvement of transport facilities. Grading and standardisation. Forward markets. Co-operative marketing - structure of co-operative marketing societies, cooperative marketing societies in Kerala. National Agricultural Cooperative Marketing Federation, steps taken to improve the co-operative marketing in Kerala.

Practical

Visit to agricultural marketing institutions to study the organisation and working. Review of marketing reports.

Ag. Econ. 404 *Agricultural Co-operation* 2+1

Forms of business organisation, comparison. Principles of co-operation, Rochdale principles, Raiffeisen and Schultz Delitzsch type of societies. Development co-operation in Denmark, U. K., U.S.A.

and India. Origin and development of co-operation. Structure and organisation. Types of co-operative organizations. Agricultural credit and non-credit societies. Central banks and state co-operative bank. Land mortgage/development banks - development and progress - Co-operative credit/Consumers' societies. Rural credit survey report. Co-operative farming. Weakness of the co-operative movement, problems and prospects, conditions for success of co-operative movement.

Practical

Visit to co-operative institutions, submission of field reports of selected co-operative institutions in the State.

Ag. Econ. 405 *Farm Business Management* 2+1

The role of farm Manager. Economic principles and farm management. Farm records - their purpose and description. The farm budget. Acquisition and organisation of the factors of production. Managing the organised farm in management of crop, soil, water and livestock.

Practical

Case study of farms with reference to farm management.

Ag. Econ. 406 *Farm planning and budgeting* 2+1

The concept of farm planning and budgeting. Study of the farm as a unit. Decision making process. Guiding principles in farm planning and budgeting. Principle of comparative advantage. Combination of production elements and combination of farm enterprises. Cost principles. Farm planning procedures - preliminary survey, diagnosis of defects, preparing the plan. Credit in relation to farm planning.

Practical

Exercises in budgeting - each student will be required to study the resource position of farm and prepare alternate plants.

Ag. Econ. 407 *Banking and Agricultural Finance* 2+1

Evolution of banks. Kinds of banks. Role of banks in economic development. Nationalisation of banks. Central banking, functions. Main features of agricultural finance. Need for credit. Classification of rural credit. Co-operative credit societies. Central and Primary land mortgage/development banks. Reserve Bank of India and rural credit. Rural credit survey. Agricultural Refinance Corporation

Practical

Study of the functioning of banks dealing with agricultural credit. Case study of utilisation of agricultural credit.

Ag. Econ. 408 *Co-operative farming* 2+1

Introduction. Co-operative farming - need for co-operative farming in India, types of co-operative farming societies - joint farming societies, collective farming societies, co-operative better farming societies and co-operative tenant farming societies. Co-operative farming in foreign countries - U.S.S.R., U.S.A., Yugoslavia, Poland, Sweden, China and Italy. Scope of co-operative farming in India, merits of co-operative farming societies, objections to co-operative farming, growth and progress of co-operative farming, progress made during the first plan period, causes of slow growth of co-operative farming societies, prerequisites for the success of co-operative farming, principles for organising co-operative farming societies.

Practical

Visit to co-operative farming societies and submission of reports.

Ag. Econ. 409 *Agricultural Labour* 2+1

Distinction between agricultural labour and industrial labour. Kinds of agricultural workers. Nature of the work. Condition of agricultural workers. Hours of work. Wages, fixation of minimum wages. Housing of agricultural workers. Agricultural labour enquiries by the Government. Efficiency of agricultural labour. Consumption and cost of living.

Practical

Preparation of family budgets of farm labourers, survey of holdings surrounding the college with regard to labour utilisation.

Ag. Econ. 410 *Agricultural Planning* 2+1

Place of agriculture in National Economy. Role of agriculture in economic development. Agriculture under the five year plans. Approach to agricultural planning in India. Development under the five year plans. Rate of growth of agricultural production, factors affecting the growth of Indian agriculture. Agriculture in Fourth Plan (with special reference to Kerala).

Practical

Library work, seminars, group discussions relating to agricultural planning.

Ag. Econ. 411 *Land Problems in Agriculture* 2+1

Land as a factor of production. Importance of land in agriculture. Law of diminishing returns. Land utilisation. Intensive and extensive methods of cultivation. Agricultural holdings, sub division

AGRICULTURAL EXTENSION

Ag. Ext. 201 *Rural Sociology* 2+1

Rural sociology – its definition, scope and relationship with other sciences with special reference to extension. Rural society of India – characteristics and trends. Structure of rural society. Rural organisation and institutions – their definition, classification and functions. Religion and culture and their influence on rural society. Leadership in rural society – definition, classification. Role and qualities of leadership. Selection, training and use of leaders in extension work. Social action and social change. Diffusion of innovations in rural society. Impact of agriculture on social change. Social control in agriculture.

Practical

Village visit to study rural society. Social surveys and library work.

Ag. Ext. 301 *Communication and Extension methods* 1+2

Communication – its definition, nature and importance in extension. Communication process. Elements in communication process.

Extension teaching and learning. Steps in extension teaching. Extension methods, nature and classification – individual, group and mass methods. Characteristics, advantages and disadvantages of home visit, meeting, group discussion, method demonstration, result demonstration, campaign, working with leaders, field trip, tour, exhibition, literature and other audio-visual aids.

Practical

Practice in individual, group and mass methods. visit to farmers, conducting group discussions, meetings, demonstrations, exhibitions, public speaking. Preparation of visual aids and literature.

Ag. Ext. 302 *Philosophy and principles of Extension Education & Community Development* 2+0

Definition, nature, objectives, principles and philosophy of Extension Education. Extension Education in India - Need, history and organisation. Definition, nature, history, objectives, principles and philosophy of community development. Extension Education in C. D. Community Development programme in India. The C. D. Organisation.

Ag. Ext. 401 *Extension programme planning and Evaluation* 1+1

The nature and importance of programme planning, definition, principles and procedures - steps in programme planning. Evaluation - its nature and importance in extension, principles, types of evaluation, methods and steps in evaluation.

Practical

Preparation of family, village and block plans with special reference to agricultural production. Practice in evaluation and in writing evaluation reports.

ELECTIVES

Ag. Ext. 402 *Agricultural Journalism* 2+1

Importance of publications in agricultural extension - publications as a mass medium - role of publications in rural development. Principles and techniques of writing news stories, feature articles, magazine articles, technical articles, news letters, pamphlets bulletins etc. Layout of publications editing and publishing publications including technical journals and different kinds of printing processes.

Practical

Writing news stories, feature articles, popular magazine articles, technical articles, pamphlets, editing articles. Visit to publication centres.

Ag. Ext. 403 *Extension Administration and Supervision* 3+0

Nature, purpose and types of administration. Basic principles of administration and administrative organisation. Administration in agricultural extension and community development in India - organisational set up, role and functions. Supervision in extension, its purpose and functions.

Ag. Ext. 404 *Evaluation in Extension* 1+2

Purpose, nature and importance of evaluation in extension. Principles in evaluation - steps in evaluation - methods of evaluation - evaluation as a tool of programme improvement and development.

Practical

Developing evaluation tools. Critical evaluation of extension programmes.

Ag. Ext. 405 *Training for Development* 2+1

Need for training of extension personnel - types of training. Elements of training - trainees, trainer, content, method, place, duration and time. Training facilities in India.

Practical

Preparation of plans for various training programmes, participation in training programmes.

Ag. Ext. 406 *Rural Leadership* 1+2

Role and function of leadership in society. Leadership and developmental activities. Concepts of leadership. Types of leadership. Identification, selection and training of potential leaders for

leadership development - leader group relations in rural society.

Practical

Case study of rural leaders and training programmes for rural leadership.

Ag. Ext. 407 *Vocational Education in Agriculture* 3+0

Meaning, nature, importance and scope of vocational education in agriculture. Principles of vocational education. Philosophy of vocational education. Problems of vocational education. Vocational education for adults.

Principles and methods of institutional teaching of agriculture - planning for teaching. Selection and organisation of materials, their application and evaluation. Teaching methods and use of class room aids.

Ag. Ext. 408 *Community Development* 3+0

Origin, meaning, nature and scope of C. D. Objectives of C. D. Differences between Extension Education and C. D. C. D. programmes with special reference to five year plans. C. D. programmes in other countries.

Ag. Ext. 409 *Extension Teaching* 2+1

Objectives and principles of extension teaching. Characteristics of extension teaching and learning processes. Steps in extension teaching. Relationship of different extension teaching methods to extension teaching steps. Selection of extension teaching methods. Combination of teaching methods. Choice and use of various teaching methods and teaching aids.

Practical

Practice in the selection and use of teaching methods and teaching aids for effective extension teaching.

Ag. Ext. 410 *Methods in Extension Research* 2+1

Scientific approach in solving problems. Need for research in Extension Education. Classification of the area of research in Extension Education. Formulation of problem. Formulation and testing hypothesis. Methods and techniques of collecting data analysis and interpretation. Preparation and writing of reports and thesis.

Practical

Selection of problem. Formulation of hypothesis. Developing methods of data collection. Collection of data, tabulation, analysis and report writing.

Ag. Ext. 411 *Audio-visual Methods* 1+2

Contribution of audio visual aids to teaching. Classification of audio-visual aids. Relative effectiveness of various aids. Factors influencing the choice and use of aids in formal teaching and in extension teaching. Exhibitions, demonstrations, campaigns etc.

Practical

Acquiring skill in the preparation and handling of audio-visual aids. Practice in the conduct of exhibitions, demonstrations, campaigns etc.

Ag. Ext. 412 *Communication Process* 3+0

Nature and importance of communication. Communication process. Key elements of communication. Key communicators—their location, identification. Types of communication media and their role in extension work. Problems in communication. Communication in agricultural extension programme.

Ag. Ext. 413 *Programme planning* 2+1

Role of planning in democratic society. Planning for development. Basic assumptions. Different types

of plans and methods of planning. Principles of planning – steps in programme planning; programme planning process. Basic requirements in planning.

Practical

Preparation of family, village and block plans. Critical analysis of prepared plans.

ANIMAL HUSBANDRY AND VETERINARY SCIENCE

AH. 201 *Livestock Husbandry and Veterinary Science* 3+2

Importance of cattle in Indian agricultural economy. Classification of cattle – important breeds of cattle and their characteristics. Care and management of cows, bulls, young stock and calves. Housing of cattle – Dairy records. Poultry industry in India – classes – breeds etc. of poultry. Housing of poultry – systems of rearing birds. Incubation of eggs. Preservation and marketing of eggs. Important breeds of swine, their care and management. Important breeds of goats, their care and management.

Anatomy and physiology of digestive, circulatory, respiratory, reproductive, mammary and endocrine systems. Signs of health and disease. Principles of epidemiology. Diseases of cattle, swine, goat and poultry.

Practical

Parts of the cow. Grooming, casting, castration, identification. Dehorning, milking. Determination of age and body weight. Parts of the fowl. Selection of eggs. Grading of eggs. Incubator management. Methods of examination of animals. Determination of temperature, pulse and respiration. First aid.

AH. 202 *Animal Nutrition and Dairy Science* 3+2

Properties, functions, utilisation and deficiency symptoms of essential nutrients. Composition and

nutritive value of feeds. Nutrient requirements of livestock. Livestock feeds and fodders—feeding standardards—computation of balanced rations. Fodder conservation and pasture management.

Physical and chemical qualities of milk and colostrum. Factors affecting the quality and quantity of milk. Nutritive value of milk. Microbiology of milk. Hygienic milk production—pasteurisation, sterilisation, filtration. Classification, homogenisation and standardisation. Legal standards and adulteration of milk. Dairy products and their management.

Practical

Physical examination of milk. Sampling of milk, determination of acidity. Specific gravity and fat. Detection of adulteration in milk. Determination of T. S. and S. N. F. Determination of butter moisture. Butter making and ice cream making. Preparation of indigenous products.

AH. 301 *Animal Breeding* 2+0

History of animal breeding. Systems of breeding. Co-efficient of inbreeding and relationship. Quantitative inheritance. Principles of selection. Systems and methods of selection. Progeny testing and sire indices. Determination of sex. Artificial insemination. Reproductive efficiency.

AGRICULTURAL ENGINEERING

Ag. Engg. 201 *Surveying and Farm structures* 3+1

Surveying. Chain surveying—units of measurement—chain and arrows, tapes, pegs, poles and ranging rods, cross staff, optical square—ranging straight lines, chaining offsets, triangulation, field book—calculation of areas—conventional signs for various types of boundaries—trees, buildings, ponds, roads etc. Plotting the survey to scale.

Plane table surveying - plane table and its accessories - methods of plane tabling viz., radiation, intersection and traversing.

Compass survey - magnetic and true bearings, prismatic compass - its description and adjustments - measurement of angles between chain lines with prismatic compass - local attraction and its correction - simple traverse. Plotting of compass survey.

Levelling - principles - types of levels commonly used - dumpy level - its adjustments and uses - levelling staff - differential levelling - recording levels and reduction.

Elementary ideas about contours and use of contour maps.

Farm structures. Building materials used in construction of farm buildings: stone, brick, lime, cement, concrete, timber, flooring, plastering and roofing.

Farmstead planning - layout of farm buildings and farm roads - general principles. General principles of planning and design of residence, poultry house, cattle barn, grain bins, silos and implement sheds. General details of septic tank for farm houses. Fencing - need, types, erection, care and maintenance.

Practical

Measurement of area with chain and type. Radiation, intersection and traversing with prismatic compass to calculate area. Calculation of area by radiation, intersection and traversing with plane table. Differential levelling with dumpy level.

Ag. Engg. 202 *Soil and Water conservation* 2+1

Rainfall and runoff, soil erosion - erosions by

water and wind. Types of water erosion - rain drop, sheet, rill, gully and stream channel erosions. Factors affecting erosion by water. Results of erosion by water. Practices of control erosion by water - contouring, strip cropping, conservation tillage, terracing and bunding. Types of terraces. General principles of terrace design, construction and maintenance.

Objectives and benefits of agricultural drainage, surface drainage systems in a farm - general principles of design, construction and maintenance. Subsurface drainage - its advantages over surface drainage systems. Tile drainage systems - types, general principles of design, construction and maintenance.

Sources of irrigation water - wells - different types - open wells and tube wells - elementary idea about their design and construction. Basic idea about the construction of farm ponds. Water lifting devices. reciprocating and centrifugal pumps - principles of their working and operation. Pump selection, installation, repair and maintenance. Simple calculations on pumps. Elementary ideas about conveyance, distribution, measurement and the control of irrigation water on the farm. Farm irrigation structures. Methods of irrigation - surface irrigation, sprinkler irrigation.

Practical

1. Measurement of irrigation water
2. Study of centrifugal pumps

Ag. Engg. 301

Farm Power and Machinery

2+1

Sources of farm power - human power, animal power, wind power, flowing water, electricity, heat engines and tractors - their comparative utility. Elementary knowledge of internal combustion

engines, their types, main parts and their functions. Working cycles of engines - four stroke and two stroke cycle engines. Terminology, simple calculations and classification of engines. Elementary knowledge of the working of the following systems in I. C. engines: Ignition, cooling, lubrication, fuel supply and carburation.

Types of tractors and their uses. Basic knowledge of the following components of the tractor: transmission, differential and final drives, clutches and brakes, steering, belt pulley and hydraulic lift. Methods of starting and stopping the tractor with general care and maintenance.

Soil tillage and its functions. Types of tillage and weed control implements - ploughs, harrows, cultivations, hoes etc. - their uses, care, operation and maintenance.

Seeding and fertilizing equipment - their use, care and maintenance - Dusters and sprayers, their types, care, maintenance and uses. Machinery for harvesting, threshing and winnowing - their types and uses.

Processing equipments like chaff cutters, rice hullers and sugar cane crushers - their care and maintenance. Dairy equipments such as boilers, refrigerators, cream separators, pastuerisers and incubators - their principles and uses.

Practical

Dismantling, studying main parts and assembling of I. C. engines. Starting and stopping of I. C. engines. Study of the different components of tractors - Practice in the operation of tractor, its care and maintenance. Study of different tillage, weed control and seeding equipments, sprayers and dusters, harvesting and threshing equipments

and other miscellaneous implements. Practice in the use of some tillage implements, their fitting, care and maintenance.

Engg. 401 *Plant Protection Equipment* 2+1

(For candidates who take Plant Protection as an elective)

Spraying equipment: Parts of a sprayer and their functions - tanks - pumps - compression chamber - pressure gauge - valves - agitators - fitters - nozzles - engines.

Handsprayers:- atomizer, pneumatic hand sprayer, knapsac sprayer, bucket sprayer, rocking type sprayer, foot sprayer.

Power operated sprayers: hydraulic sprayer, mist sprayer, fog or smoke generator

Ultra low volume equipment.

Controlling the spray application, calibration of sprayers, formulae for sprayers.

Dusting equipment: Parts of duster and their functions. Types of dusters - plunge type, crank type knapsac type. Power dusters - tree duster, all purpose duster, duster cum sprayer.

Aeroplane dusting and spraying - Types of air craft in use, spraying equipment for air craft; measurement of efficiency.

Other appliances: Seed dressing machines, fumigators and soil injectors.

Practical

Students should learn the working, care, repair and maintenance of various types of sprayers and dusters.

**TRIMESTER-WISE DISTRIBUTION OF COURSES FOR
THE B.Sc. (Ag) DEGREE PROGRAMME**

FIRST YEAR

Trimester I

1	Eng. 101	English - Composition	1+1
2	Chem. 101	Basic Chemistry	3+1
3	Zool. 101	Zoology	2+1
4	Bot 101	Botany - Morphology - Embryology and Anatomy	} 2+1
5	Soc. & Psy. 101	Sociology & Psychology	3+1
6		Orientation	1*
			16+1

Trimester II

1	Nut. 101	Basic Nutrition	2+0
2	Geo. 101	Basic Geology	1+1
3	Agron. 101	Elementary Agronomy - I	3+2
4	Ag. Chem. 101	Agricultural Biochemistry	2+1
5	Bot. 102	Systematic Botany	1+1
6	Econ. 101	Basic Economics	1+1
			16

Trimester III

1	Agron. 102	Elementary Agronomy - II	3+1
2	Hort. 101	Introductory Horticulture	2+1
3	Math. 101	Mathematics for students of Agriculture	} 3+1
4	Ag. Econ. 101	Introduction to Agricultural Economics	} 2+1
5	Mic. 101	General Microbiology	2+1
			17

SECOND YEAR

Trimester I.

1	Ag. Engg. 201	Surveying and Farm structurers	3+1
2	Ag. Chem. 201	Analytical chemistry	1+1
3	Ag. Bot. 201	Economic Botany	2+1

4	Agron. 201	Soil fertility and Management	3+0
5	AH. 201	Livestock Husbandry and Veterinary Science	3+2
			17

Trimester II

1	Ag. Bot. 202	Plant Physiology	2+1
2	Agron. 202	Soil and Water Management	2+1
3	AH. 202	Animal Nutrition and Dairy Science	3+2
4	Hort. 201	Pomology - I	2+1
5	Ag. Econ. 201	Agricultural Co-operation	2+1
			17

Trimester III

1	Ag. Engg. 202	Soil and water conservation	2+1
2	Stat. 201	Introduction to the theory of Statistics	2+1
3	Ag. Ext. 201	Rural Sociology	2+1
4	Ag. Bot. 203	Cytogenetics	2+2
5	Ag. Chem. 202	Fundamentals of soils	3+1
			17

THIRD YEAR**Trimester I**

1	Hort. 301	Plantation crops - I	2+1
2	Agron. 301	Crop production	3+1
3	Stat. 301	Experimental design for Agricultural workers	2+1
4	Ag. Chem. 301	Soil Microbiology	1+1
5	Pl. Path. 301	Plant Pathology	2+2
			16

Trimester II

1	Ent. 301	General Entomology	3+1
2	Ag. Ext. 301	Communication and Extension methods	1+2
3	Ag. Engg. 301	Farm power and Machinery	2+1

4	AH. 301	Animal Breeding	2+0
5	Pl. Path. 302	Plant Pathology - II	2+2
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Trimester III

1	Ag. Bot 301	Plant Breeding	2+1
2	Hort. 302	Plantation crops - II	2+1
3	Ent. 302	Insect control	2+1
4	Ag. Chem. 302	Soil Fertility and Fertilizers	3+2
5	Ag. Ext. 302	Philosophy and principles of Extension Education	2+0
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FOURTH YEAR**Trimester I**

1	Ent. 401	Economic Entomology	2+1
2	Pl. Path. 401	Plant disease control	1+1
3	Hort. 401	Olericulture and Ornamen- tal Gardening.	2+1
4	Ag. Econ. 401	Economics of Farm Management and Agricultural marketing	3+1
5	Agron. 401	Farm operation and management	2+1
6	Ag. Ext. 401	Extension programme planning and evaluation	1+1
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Trimester II

Practical Field Training 16*

Trimester III

Electives 18

Total credits 200

* The credits assigned for Orientation and Practical field training will not be taken into account for calculating the overall Grade Point Average.