**U.G. Degree - B.Sc. (Hons.) Agriculture**
**Curriculum and Syllabus**
**2021-2025 BATCH**

## I Semester

| S. no. | Course code | Course title | Course Credits |
|---|---|---|---|
| 1 | 21AGR01 | Fundamentals of Horticulture | 1+1 |
| 2 | 21AGR02 | Fundamentals of Plant Biochemistry | 2+1 |
| 3 | 21AGR03 | Fundamentals of Soil Science | 2+1 |
| 4 | 21AGR04 | Introduction to Forestry | 1+1 |
| 5 | 21AGR05 | Comprehension & Communication Skills in English | 1+1* |
| 6 | 21AGR06 | Fundamentals of Agronomy and Agricultural Heritage | 2+1 |
| 7 | 21AGR07 | Introductory to Agricultural Botany | 1+1 |
| 8 | 21AGR08 | Rural Sociology & Educational Psychology | 2+0 |
| 9 | 21AGR09 | Human Values & Ethics (non gradial) | 0+1** |
| 10 | 21AGR10 | NSS/NCC ** | 0+1** |
| 11 | 21AGR11 | Physical Education ** | 0+1** |
| 12 | 21AGR12 | Yoga Practices** | 0+1** |
| | | **TOTAL**<br>***R: Remedial course; **NC: Non-gradial courses** | **12+07 = 19 (04**)** |

## II Semester

| S. no. | Course code | Course Title | Course Credits |
|---|---|---|---|
| 1 | 21AGR13 | Soil and Water Conservation Engineering | 2+1 |
| 2 | 21AGR14 | Fundamentals of Crop Physiology | 2+1 |
| 3 | 21AGR15 | Fundamentals of Agricultural Economics | 1+1 |
| 4 | 21AGR16 | Fundamentals of Microbiology | 2+1 |
| 5 | 21AGR17 | Fundamentals of Agricultural Extension Education | 2+1 |
| 6 | 21AGR18 | Production Technology for Vegetables and Spices | 2+1 |
| 7 | 21AGR19 | Introductory Agro-meteorology & Climate Change | 2+1 |
| 8 | 21AGR20 | Principles of Food Science and Nutrition | 2+1 |
| 9 | 21AGR21 | Elementary Mathematics | 1+1* |
| 10 | 21AGR10 | NSS/NCC | 0+1** |
| 11 | 21AGR11 | Physical Education | 0+1** |
| | | **Total** | **16+9=25** |
| | | ***R: Remedial course; ** Non-gradial courses compulsory courses** | |

**SYLLABUS**

## I SEMESTER COURSES

## 21 AGR01 FUNDAMENTALS OF HORTICULTURE

**Credits 1:0:1**

**Course Objectives**

- To study the basics of horticulture and horticultural practices
- To expose the students to different horticulture divisions
- To impart knowledge on different types of plant propagation and propagating structures

**Course Outcome**

- Basics of horticulture and classification of crops learned
- Different types of plant propagation techniques and propagating structures studied
- Gain practical knowledge in special horticultural practices

**TheoryUnit I**

***History, evolution and scope of horticulture***

Origin of horticulture – history – evolution – definitions – scope and importance of horticulture – division and classification of horticultural crops – fruits, vegetables, spices and plantation crops, floriculture, landscaping, ornamental gardening, medicinal and aromatic crops – nutritive value and global and national scenario of horticultural crops.

**Unit II**

***Sexual propagation***

Sexual propagation – importance, advantages and disadvantages – methods of enhancement of seed viability – types of dormancy – seed invigoration – seed treatments

**Unit III**

***Asexual propagation***

Asexual propagation, importance, advantages and disadvantages - Asexual propagation types *viz*., Types of cutting, layering, grafting and budding. Use of specialized plant parts inpropagation. Propagation structures and their role. Rootstock influence – stock / scion relationship in fruit crops. Scope and importance of micro propagation in horticultural crops. Direct and indirect organogenesis – media for micro propagation and hardening.

**Unit IV**

***Planting systems and pollination***

Principles of orchard establishment - Methods of planting systems including HDP and UHDP in horticultural crops – crop regulatory practices for horticultural crops – training, pruning, special operations in horticultural crops – off season production of horticultural crops. Flowering, pollination, fruit set, fruit drop, parthenocarpy, fruit ripening and senescence – Unfruitfulness and its causes.

**Unit V.**

***Principles and types of garden***

Principles and types of garden – principles and types of parks – principles of herbal

garden

**Practical**

Features of orchard, planning and layout of orchard, tools and implements, identification ofvarious horticultural crops, layout of nutrition garden, preparation of nursery beds for sowing

of vegetable seeds, digging of pits for fruit plants, planting systems, training and pruning of orchard trees, preparation of fertilizer mixtures and field application, preparation and application of growth regulators, layout of different irrigation systems, identification and management of nutritional disorder in fruits, assessment of bearing habits, maturity standards, harvesting, grading, packaging and storage, visit to Private and Govt. nursery and orchard.

**Text books**

1. Jitendra Singh, 2004. Basic of horticulture. Kalyani publishers, Ludhiana.
2. Kumar, N.1997. Introduction to Horticulture, Rajalakshmi Publication, Nagercoil,TamilNadu.

**References**

1. Sadhu, M.K.1989. Plant Propagation. Wiley Eastern Ltd., 4835/24, Ansari Road, Daryaganj, New Delhi- 110 002.Bose, T.K., S.K. Mitra, M. K. Sadhu and B. Mitra. 1991. Propagation of Tropical and Subtropical Horticultural Crops. Naya Prakash 206,Bidhan Sarani, Calcutta-6, IndiaHartmann, H.T., D.E. Kester, F.T. Davies and R.L. Greneve. 1997. Plant Propagation - Principles and Practices. Prentice Hall of India Private Ltd., New Delhi.Nanda, K.K and V.K. Kochhar. 1995. Vegetative Propagation of Plants. Kalyani Publishers, Ludhiana.
2. George Acquaah, 2002. Horticulture – principles and practices. PrenticeHall of India Pvt. Ltd., New Delhi.
3. Hartman, H.T. and Kester, D.E. 1986. Plant propagation – Principles andPractices – Prentice Hall of India Ltd., New Delhi.
4. Jules Janick.1979.Horticultural Science. Surjeet Publications. New Delhi.

## 21AGR02 FUNDAMENTALS OF PLANT BIOCHEMISTRY

**Credits : 2:0:1**

**Course Objectives:**

- The students will know, why the broad spectrum of biochemistry is important inmedicine, agriculture, pharmaceuticals, and ethics;
- To educate on the importance of Biomolecules with structure classification and function.
- To understand about the generation and storage of metabolic energy

**Course Outcome:**

- Knowledge about developments in biochemistry Cell structure, water and major molecules of life.
- Understand overall aspects of the integration of metabolic processes;
- Basics of carbohydrates proteins enzymes vitamins nucleic acids minerals and lipidswill be understood

**Theory**

**UNIT I**

**Carbohydrates**

Carbohydrates - occurrence and classification. Structure of monosaccharides, oligosaccharides and polysaccharides. Physical and chemical properties of carbohydrates – optical isomerism, optical activity, mutarotation, reducing property, reaction with acids and alkalies. Glycoconjugates - Glycoproteins and Lectin - structure and significance.

**UNIT II**

***Lipids***

Lipids - occurrence and classification. Storage lipids - fatty acids, triacyl glycerol, essential fatty acids, waxes. Structural lipids - role of lipids in biological membrane - glycolipids and phospholipids - types and importance; Sterols - basic structure and their importance. Physical and chemical constants of oils. Rancidity of oils.

**UNIT III**

***Proteins and Enzymes***

Amino acids - classification and structure. Essential amino acids. Properties of amino acids - amphoteric nature and isomerism. Classification of proteins based on functions and solubility. Structure of proteins: primary structure, secondary structure, tertiary structure and quaternary structure - protein folding and denaturation. Properties and reactions of proteins. Enzymes - Properties, classification and nomenclature. Mechanism of enzyme action. Factors affecting enzyme activity. Enzyme inhibition - Competitive, Non-competitive and Uncompetitive inhibition; Allosteric enzymes. Coenzymes, cofactors and isoenzyme.

**UNIT IV**

***Metabolism***

Carbohydrate metabolism - breakdown of starch by amylases, glycolysis, TCA cycle and pentose phosphate pathway. Respiration - electron transport chain and oxidative phosphorylation. Bioenergetics of glucose. Lipid metabolism - lipases and phospholipases. Beta-oxidation of fatty acids and bioenergetics. Biosynthesis of fatty acids and triacyl glycerol. General catabolic pathyway for amino acids - transamination, deamination and decarboxylation. Ammonia assimilating enzymes. Metabolic inter-relationship.

**UNIT V**

***Secondary metabolites***

Secondary metabolites - occurrence, classification and functions of phenolics, terpenes andalkaloids.

**Practical**

Preparation of normal solution of acid and base, buffers and reagents. Qualitative determination of carbohydrates, proteins and lipids. Estimation of total nitrogen and total protein. Estimation of carbohydrates in foods. Determination of specific gravity of oil. Extraction and estimation of total lipids in seeds. Determination of saponification value, iodine value and free fatty acid value.

**Text books**


1. Thayumanavan. B, Krishnaveni S, Parvathi K. Biochemistry for Agricultural Sciences,Galgotia Publications, New Delhi.
2. Jain, J. L.2001.Fundamentals of Biochemistry, 5th Edition,. S.Chand & company,New Delhi.


**References**


1. Lehninger, A.1984. Principles of Biochemistry, Published by CBS publishers andDistributors, New Delhi.

2. Verma, S.K .2000 A Text Book of Plant Physiology and Biochemistry, S .Chand &company, NewDelhi-110055.

## 21AGR03 FUNDAMENTALS OF SOIL SCIENCE

**Credits : 2:0:1**

**Course Objectives:**

- To impart knowledge about the soil forming process.
- To learn about physical properties of soil.
- To have a general understanding on soil chemical properties reactions.
- To study the impacts of soil pollution and the remediation measures.

**Course Outcomes:**

- Knowledge gained about the soil forming process.
- Physical properties of soil studied.
- Various soil chemical properties and reactions understood.
- Impact of soil pollution and remediation measures learnt.

**Theory**

**Unit I**

***Soil Components***

Soil as a natural body, Pedological and edaphological concepts of soil. Components of soil. Soil genesis: Composition of Earth's crust- soil forming rocks and minerals – Primary and secondary minerals. Weathering of rocks and minerals. Factors of soil formation. Soil forming processes. Soil Profile.

**Unit II**

***Soil physical properties***

Soil physical properties: Soil texture, structure, density and porosity, soil colour, consistence and plasticity. Soil water retention, movement and availability. Soil air, composition, gaseous exchange-problem and its effect on crop growth. Source, amount and flow of heat in soil, Soiltemperature and crop growth.

**Unit III**

***Soil physico chemical and chemical properties***

Soil physico chemical and chemical properties: Soil reaction-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability. Electrical conductivity. Soil colloids - inorganic and organic. Silicate clays: constitution and properties, sources of charge, ion exchange, cation and anion exchange capacity and base saturation.

**Unit IV**

***Soil organic composition***

Soil organic matter: composition, properties and its influence on soil properties. Humic substances - nature and properties. Soil Biology: Soil organisms : macro and micro organisms,their beneficial and harmful effects. Soil enzymes. Soil pollution – Types and behaviour of pesticides. Inorganic contaminants. Prevention and mitigation of soil pollution.

**Practical**

Study of soil profile in field. Study of soil sampling tools, collection of representative soil sample, its processing and storage. Study of soil forming rocks and minerals. Determination of soil density, moisture content and porosity. Determination of soil texture by feel and Bouyoucos Methods. Studies of capillary rise phenomenon of water

in soil column and water movement in soil. Determination of soil pH and electrical conductivity. Determination of cation exchange capacity of soil.Study of soil map. Determination of soil colour. Demonstration of heat transfer in soil.Estimation of organic matter content of soil.

**Text books**

1. Das, D.K. 1997. Introductory Soil Science. Kalyani Publishers New Delhi

**References**


1. Biswas, T.D. and Mukherjee, S.K. 1987. Text Book of Soil Science. Tata McGrawHill Publishing Co., New Delhi
2. Black, C.A. 1982. Methods of Soil Analysis, Part I ASA, Madison, USA.
3. Brady, N.C. and Raymond, C.Weil. 2013. The Nature and Properties of Soils (14$^{th}$Edition). Pearson Education, Inc. Publishing as Prentice Hall.


## 21AGR04 INTRODUCTION TO FORESTRY

**Credits: 1:0:1**

**Course objectives**

- To study the importance of forest and agroforestry systems in sustaining the landproductivity
- To understand the crop tree interactions in different types of agroforestry systems
- To get an idea of the productive and protective functions of agroforestry

**Course outcome**

- Students learnt about the concepts of agroforestry practiced in various agroecosystems
- Basic understanding of the multipurpose trees in agroforestry systems
- Beneficial effects of agro forestry such as nitrogen fixing, soil conservation, litterdynamics and nutrient cycles will be studied

**Theory**

**UNIT I**

***Forest and Forestry***

Introduction - Definition of Forest and Forestry - Role of Forest (Production, Protection and Amelioration) - Classification of Forest (Regeneration, Age, Composition. ownership, object of management, growing stock) - National Forest Policy 1988.

**UNIT II**

***Silviculture and Forest plantation***

Forest regeneration - Natural regeneration- Seeds and vegetative parts (Coppice , Root suckers) - Artificial regeneration , Objectives - Nurseries - Types of nurseries, Quality seedling production techniques - Silvicultural practices for *Eucalyptus spp, Casuarina equisetifolia, Tectona grandis*, *Ailanthus excelsa, Melia dubia, Leucaena leucocephala*. Tending operations - Weeding, Cleaning, Thinning and pruning.

**UNIT III**

***Forest Mensuration***

Forest Mensuration - Objectives- Diameter measurements, instruments used in diameter measurement-Height measurement, instrumental methods of height measurement - Tree form,form factor, Volume estimation of standing and felled trees.

**UNIT IV**

***Social forestry and Agroforestry***

Social Forestry and its branches - Extension Forestry, Urban forestry - Agroforestry, definition- Importance- Agroforestry systems - Shifting Cultivation, Taungya, Alley cropping, Wind break, Shelter belt, Home garden - Tree and crop combination in Agroforestry - Tree crop interaction in Agroforestry - National Agroforestry Policy 2014.

**UNIT V**

***Forest Utilization***

Forest Utilization - Definition - Wood products - solid wood and composite wood.- Non Wood Forest Products - fibres , floss, bamboo, tan, dye, resin, oleoresin.

**Practical**

Identification of tree-species. Diameter measurements using calipers and tape. Height measurement of standing trees by shadow method, single pole method and hypsometer. Nursery lay out, seed sowing, vegetative propagation techniques. Different agroforestry systems likes Agrisilvicultural systems, Silvopastoral systems, Agrosilvopastoral systems andtheir interactions

**Text books**

1. Puri, S and Panwar, P. (ed.). 2007. Agroforestry Systems and Practices. New IndiaPublishing Agency, New Delhi, 643p

**References**

2. Gupta, R.K. 1993. Multipurpose Trees for Agroforestry and Wasteland Utilization.Oxford and IBH, 562p
3. Nair, P.K.R. 1993. An Introduction to Agroforestry. Kluwere Academic Publications,Dordrecht, The Netherlands, 499p

## 21AGR05 COMPREHENSION & COMMUNICATION SKILLS IN ENGLISH

**Credits: 1:0:1**

**Course objectives**

- To enable the learner to communicate effectively and appropriately in real life situation.
- To comprehend the content and able to express with clarity.
- To develop and integrate the use of four language skills i.e. Listening, Speaking,Reading and Writing.

**Course outcome**

- Students learn about the mechanics of writing, grammar, use of vocabulary and correct pronunciation.
- Students should be able to listen, speak, read, and write in English with understanding.
- Students are able be form the habit of reading for pleasure and for information andface exams with confidence.

**Theory**

**Unit I**

***Introduction (Prose)***

War Minus Shooting- The Sporting Spirit- George Orwell, A Dilemma- A Layman looks at Science Raymond B. Fosdick, You and Your English -Spoken English and Broken English-
G.B. Shaw.

**Unit II**

***Vocabulary Enrichment***

Reading Comprehension, Vocabulary- Antonym, Synonym, Homophones, Homonyms, often confused words, Exercises to help the students in the enrichment of vocabulary based on TOEFL and other competitive examinations.

**Unit III**

***Functional Grammar***

Functional grammar: Articles, Prepositions, Verb, Subject verb Agreement, Transformation,

Synthesis, Direct and Indirect Narration.

**Unit IV**

***Forms of Composition***

Writing Skills: Paragraph writing, Precise writing, Report writing and Proposal writing, The Style: Importance of professional writing. Preparation of Curriculum Vitae and Job, applications. Synopsis writing.

**Unit V**

***Interview Skills***

Interviews: kinds, Importance, and process.

**Practical**

Listening Comprehension: Listening to short talk, lectures, speeches (scientific, commercial and general in nature). Oral Communication: Phonetics, stress and intonation, Conversation practice. Conversation: rate of speech, clarity of voice, speaking and listening, politeness & Reading skills: reading dialogues, rapid reading, intensive reading, improving reading skills. Mock Interviews: testing initiative, team spirit, leadership, intellectual ability. Group Discussion.

**Text books**


1. Sundararajan, N, Attentive Listening: How it Matters, University News, March 19-25, 2005.
2. Greenbaum Sidney, Oxford English Grammar, New Delhi, OxfordUniversity Press. Peregoy, 2009.


**References**


1. Goodale, Malcolm, Professional Presentations, Cambridge University,2005.
2. Jones Daniel, English Pronouncing Dictionary, Cambridge University Press,2006.
3. Lynch, Tony and Kenneth Anderson, Study Speaking, Cambridge University, 1992.
4. Martin Cutts, Oxford Guide to Plain English, Oxford University Press,2004.
5. Sahaneya Wandy, et.al., IELTS, Preparation and Practice, Oxford University, 2005.


## 21AGR06 FUNDAMENTALS OF AGRONOMY & AGRICULTURAL HERITAGE

**Credits: 2:0:1**

**Course objectives**

- To have a general understanding of the Agronomy, seasons, crop and its classification
- To appraise the students about crops, planting/sowing, growth and factors influencinggrowth and crop nutrition and its general management
- To study the impact of weeds on crop production and its management

**Course outcomes**

- Basics of crop characteristics and its classifications understood
- Fundamentals of growth, factors influencing and its relationship with nutrients studied
- Scientific knowledge on weeds its impacts on crop growth and the Integrated weedmanagement studied

**Theory**

**Unit – I**

***Importance of agriculture***

Agriculture - Definition - Importance and scope - Branches of agriculture - Evolution ofhuman and agriculture - History of agricultural development in the World and India.

**Unit – II**

***Agricultural heritage***

Agriculture heritage - Agriculture in ancient India - Chronological agricultural technologydevelopment in India - Kautilya's Arthasasthra - Sangam literature - Kambar Eaer Ezhupathu

- Development of scientific Agriculture - National and International Agricultural ResearchInstitutes in India - Indian agriculture

**Unit – III**

***Agroclimatic zones, crops and soils***

Agronomy - Definition - Importance and scope - Agro-climatic zones of Tamil Nadu - Agro ecological zones of India - Crops and their classification - Economic and agronomic - Major crops of India and Tamil Nadu - Major soils of Tamil Nadu - Factors affecting crop production - climatic - edaphic - biotic - physiographic and socio economic factors.

**Unit – IV**

***Tillage and after cultivation***

Tillage - Definition - Types - Objectives - Modern concepts of tillage - Main field preparations - Seeds - seed rate - sowing methods - Crop establishment methods - Planting geometry and its effect on growth and yield - After cultivation -Thinning - Gap filling - Weeds - Definition - Weed control methods.

**Unit – V**

***Cropping and farming systems***

Manures and fertilizers (organic, in-organic, green manure) - time and method of application

– Irrigation - Principles and concepts - Cropping patterns and cropping systems - Sustainable agriculture - integrated farming systems - Organic agriculture - Principles and concepts - Dry farming - Principles and concepts.

**Practical**

Visit to college farm - Study of farm features and measurements - identification of

crops and seeds - working out seed rate - Study of seed treatment practices - Study of tillage implements; practicing ploughing, puddling operations, practicing seeding different methods of sowing and planting - Study and practicing inter-cultivation implements; Practicing fertilizer applications - Participation in ongoing field operations.

**Textbooks**


1. Sankaran, S. and Subbiah Mudaliar, V.T. 1991.Principles of Agronomy. Bangalore,Printing & Publishing Co., Bangalore
2. Chandrasekaran. B, Annadurai. K and Somasundaram. E. A textbook of agronomy 2010 reprint 2016. New international (P) limited, publishers, New Delhi


**References**


1. Reddy. T.Y and Reddy, G.H.S.1995. Principles of Agronomy, Kalyani Publishers, Ludhiana.
2. Balasubramaniyan, P and Palaniappan, S.P. 2001. Principles and Practices of Agronomy. AgroBios (India) Ltd., Jodhpur.
3. De, G.C.1989. Fundamentals of Agronomy. Oxford & IBH Publishing Co., New Delhi.
4. Gupta, O.P. 2000. Weed Management - Principles and Practices. Agrobios (India) Ltd., Jodhpur
5. Havlin, J. L., Beaton, J. D., Tisdale, S.L., and Nelson, W.L. 2006. Soil Fertility and Fertilizers: An Introduction to Nutrient Management (7th ed.). Pearson Education, Delhi.
6. Rao, V.S. 2000. Principles of Weed science. Oxford & IBH Publishing Co. NewDelhi.


## 21AGR07 INTRODUCTION TO AGRICULTURAL BOTANY

**Credits: 1:0:1**

**Course objectives**

- To have a general understanding of the botanical names, crops and its systematicclassification
- To appraise the students about crops, botanical importance and their floral parts
- To study the economic important parts of agricultural plants

**Course outcomes**

- Basics of crop characteristics and its classifications understood
- Fundamentals of growth, factors influencing and its relationship with nutrients studied Scientific knowledge on weeds its impacts on crop growth and the Integrated weed management studied

**TheoryUnit I**

***Systems of classification and general morphological description***

Bentham and Hooker's classification of plant kingdom — International code of nomenclature and its major guidelines – author citation – Agricultural classification of crops; General morphology: Life span, habit, root, stem, leaf - petiole, leaf margin, leaf apex, leaf shape, venation and phyllotaxy; Modification of roots and leaf; Floral morphology: Kinds of bracts, inflorescence; Structure of flower, androecium, gynoecium, placentation, types of fruits.

**Unit II**

***Botanical description and economic uses of Poaceae***

List of cultivated crops, economic parts, chromosome number and family description of Poaceae: Key botanical features of Rice, Wheat, Sorghum, Maize, Pearl millet, Finger millet, list of small millets, Guinea grass, Napier grass, Cenchrus and Sugarcane

**Unit III**

***Botanical description and economic uses of Papilionaceae***

List of cultivated crops, economic parts, chromosome number and family description of Papilionaceae: Key botanical features of Red gram, Bengal gram, Soybean, Black gram, Green gram, Cowpea, Lablab, Horse gram, Groundnut, Lucerne, Stylosanthes, Clitoria, Agathi and Sunnhemp

**Unit IV**

***Botanical description and economic uses of Pedaliaceae, Asteraceae, Oleaceae, Brassicaceae, Euphorbiaceae,Arecaceae and Malvaceae***

List of cultivated crops, economic parts, chromosome number and family description of the following families and Key botanical features of the crops given against them:Pedaliaceae - Gingelly; Asteraceae - Sunflower, Safflower, Chrysanthemum; Oleaceae – Jasmine; Brassicaceae - Rapeseed and Mustard, Cabbage, Cauliflower; Euphorbiaceae: Castor; Jatropha and Tapioca; Arecaceae: Coconut, Arecanut, Oilpalm, Sugarpalm; Malvaceae: Cotton, Mesta and Bhendi.

**Unit V**

***Botanical description and economic uses of Tiliaceae, Piperaceae, Chenopodiaceae, Solanaceae, Mimosae, Moraceae,Cucurbitaceae, Alliaceae, Musaceae, Rubiaceae, Theaceae***

List of cultivated crops, economic parts, chromosome number and family description of the following families and key botanical features of the crops given against them. Tiliaceae: Jute; Piperaceae: Betelvine; Chenopodiaceae: Sugar beet; Solanaceae: Tobacco, Potato, Chilli, Tomato and Brinjal; Mimosae: Desmanthes, Subabul and Acacia; Moraceae: Mulberry;Cucurbitaceae: Cucumber, Pumpkin, Ashgourd; Alliaceae: Onion and Garlic; Musaceae: Banana, Manila hemp;Rubiaceae: Coffee; Theaceae: Tea

**Practical**

Family features - observation and description of habit, morphology of root, stem, leaves, inflorescence, flowers, floral diagram, floral formula and economic parts of Poaceae: Rice, Wheat, Sorghum, Maize, Pearl millet, Finger millet, Guinea grass, Napier grass, Cenchrus and Sugarcane; Papilionaceae: Redgram, Bengal gram, Soybean, Blackgram, Greengram, Cowpea, Lab-lab, Horse gram, Groundnut, Lucerne, Stylosanthes, Clitoria, Agathi and Sunnhemp; Pedaliaceae: Gingelly; Asteraceae: Sunflower, Safflower and Chrysanthemum; Oleaceae: Jasmine; Brassicaceae: Rape and Mustard, Cabbage, Cauliflower;Euphorbiaceae: Castor, Jatropha, Tapioca; Arecaceae: Coconut, Arecanut, Oilpalm and Sugar palm; Malvaceae: Cotton, Mesta, Bhendi; Tiliaceae: Jute; Piperaceae: Betelvine; Chenopodiaceae: Sugar beet;Solanaceae: Tobacco, Potato, Chilli, Tomato and Brinjal; Mimosae: Desmanthes, Subabul and Acacia;Moraceae: Mulberry; Cucurbitaceae: Cucumber, Pumpkin, Ashgourd; Alliaceae: Onion and Garlic; Musaceae: Banana, Manila hemp; Rubiaceae: Coffee; Theaceae: Tea

**Text books**

1. Sambamurthy, V.S. and N.S. Subramanian, 1989. Text Book of Economic Botany, Wiley Eastern, New Delhi

2. John Joel, A., C. Vanniarajan, T.S. Raveendran, and A. Gopalan 2006. Fundamentals of Crop Botany, Directorate of ODL, Tamil Nadu Agricultural University, Coimbatore–641 003.

**References**

1. Purse glow, 1988. Tropical Crops - Monocotyledons. The English Language bookSociety and Longman Co., Singapore
2. Albert F. Hill and O.P. Sharma, 1996. Economic Botany. Tata McGraw - Hill Publishing Co. Ltd., New Delhi.
3. Daniel Sundararaj, D. and G. Thulasidas, 1993. Botany of field crops. MacMillanIndia Ltd., New Delhi.

## 21AGR08 RURAL SOCIOLOGY AND EDUCATIONAL PSYCHOLOGY

**Credits : 2:0:0**

**Course objectives**

- To get an idea of sociological behaviour of rural population
- To familiarize the functions of rural society social stratification and social changes
- To understand the behaviour pattern and theories of motivation

**Course outcomes**

- Students learnt the rural society and their behaviour pattern
- Students gained the practical knowledge of functions of social institution
- Familiarize the concept of agricultural extension practices

**Theory**

**Unit I**

***Introduction to Sociology, Social groups, Culture and Social Values***

Sociology and Rural Sociology – definitions; Society – rural and urban, characteristics, differences and relationships, important characteristics of Indian rural society; Social groups

– definition, classification, role of social groups in extension; Culture – concept, cultural traits, characteristics, functions, Ethnocentrism, Acculturation, Cultural lag, Cultural diffusion, Marginal man, Ethos. Social Values – definition, values and norms, characteristics of values, functions;

**Unit II**

***Social Structure, Social Stratification and Migration***

Structure of Rural Society – patterns of rural settlement, social institutions, social organizations, ecological entities (Region, Community, Neighbourhood, Family); Social Stratification – concept, functions, types, differences between class and caste system; Migration – concept, factors influencing migration.

**Unit III**

***Social Control, Social Customs***

Social Control – definition; Customs – conventions, folkways, mores, rituals, taboos; Social Interaction Process – definition, basic social processes; Social Change – concept, factors influencing social change, indicators of social change; Social development:

**Unit IV**

***Introduction to Educational Psychology, Intelligence, Teaching-Learning Process***

Education – Psychology – Educational Psychology – Social Psychology – definitions, importance in extension; Basic principles of Human behaviour – Sensation, Attention,

Cognitive, affective, psychomotor domain Perception – meaning, characteristics; Intelligence
– concept, types, measurement, factors affecting intelligence; Personality – concept, types, measurement, factors influencing personality; Teaching–Learning Process – Teaching – definition, meaning, principles of teaching, steps in extension teaching; Learning – definition,meaning, principles, types of learning, learning situation.

**Unit V**

***Motivation, Attitude***

Motivation – concept, Maslow's hierarchy of needs, intrinsic and extrinsic motivation, techniques of motivation, importance in extension; Attitude – concept, factors influencing thedevelopment of attitudes.

**Text books**


1. Chauhan, S.S. 2001. Advanced Educational Psychology, Vikas Publishing HousePvt. Ltd., New Delhi.
2. Chitambar, J.B.1997. Introductory Rural Sociology, New Age International (P)Ltd., Publishers, New Delhi.


**References**


1. Adivi Reddy, A. 2001. Extension Education, Sree Lakshmi Press, Bapatla, Andhra Pradesh. Chatterjee, S. 2000. Advanced Educational Psychology, Books & Allied (P) Ltd., Calcutta.
2. Dahama, O.P. and O.P. Bhatnagar. 2007. Education and Communication for Development, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
3. Kundu, C.L and Tutoo, D.N. 2001. Educational Psychology, Sterling Publishers Pvt. Ltd., New Delhi.
4. Lester Crow, D and Alice Crow. 1973. Educational Psychology, Eurasia Publishing House Pvt. Ltd.,
5. New Delhi.
6. Madumita Gupta. 2011. Fundamentals of Sociology, Pacific Publications, NewDelhi. Mangal, S.K. 2000. Educational Psychology, Prakash Brothers, Ludhiana.
7. Shankar Rao, C.N. 2012. Sociology – Principles of Sociology with an Introduction to Social Thought, S.Chand & Co. Ltd., New Delhi.
8. Sharma, R.N. 1968. Principles of Sociology, Asia Publishing House, New Delhi.
9. Supe. S.V. 2012. Text book of Extension Education, Agrotech Publishing Academy, Udaipur. Usha Rao. 2008. Advanced Educational Psychology, Himalaya Publishing House, New Delhi.
10. Vidya Bhushan and Sachdeva, D.R. 2003. An Introduction to Sociology, Kitab Mahal, Allahabad.


## 21AGR09 HUMAN VALUES & ETHICS** (non gradial)

**Credits: 0:0:1**

**Theory**

**Unit I**

**Basic principles of learning**

Basic principles of learning - discussion - Bloom's classification of educational objectives – cognitive, affective, psychomotor domain(s) - teaching and learning.

**Unit II**

**Career development**

Career development – growth and development, education – for – life and life – long education, motivation and morale - occupation and profession, training and education, lateral thinking and convergent thinking.

**Unit III**

**Entrepreneurship**

Entrepreneur- intrapreneur – managing an intrapreneur – motivation and entrepreneurship - development – planning, monitoring and evaluation.

**Unit IV Communication skills**

**Interpersonal communication** – transactional communication - role – play - brainstorming – demonstration -the conduct of symposium - conferencing – the concept and presentation of a paper - scientific article writing and editing - popular article writing, editing and blogging - project proposal - project report – writing.

**Unit V**

**Simulation exercises**

Simulation - educational simulation-Interactive teaching - business simulation – company's annual report for analysis.

**21AGR10 NSS/NCC** (non gradial)**

**Credits: 0:0:1**

**NATIONAL SERVICE SCHEME NSS**

**I Year**

Orientation – NSS origin – motto – symbol – NSS administration at different levels – programme planning – Rural Projects – Urban projects – Government schemes – Career guidance – Self help groups – Environment protection – Use of natural energy – Conventional energy resources – Soil and Water conservation – Community health programmes – Women and child welfare – Education for all – National days – Commemorative days – NSS thematic programmes – literacy & computer awareness campaigns

**II Year**

Popularization of agro techniques – Self employment opportunities – Animal health, Dairy and Poultry farming – Road safety – Training on First aid and emergency cell. Popularizationof small savings – communal harmony and National integration – Care of Senior citizens – Personality development – meditation, Yoga Art of living – Activities on the preservation of National monuments, cultural heritage and folklore – special camp activities – National days- commemorative days – NSS thematic programmes – literacy & computer awareness campaigns.

Besides the above, NSS volunteers will attend work during important occasions like Convocation, Farmers day, Sports meet and other University / College functions.

NSS Volunteers will attend one special camp in the selected village for a duration of 10 days and undertake various activities based on the need of that village.

For all out door regular activities villages / slums nearby the campus may be selected to avoidtransport cost (cycle able distance). Special camp activity will be conducted in a village situated within a radius of 15 – 20 KM.

**Evaluation**

A. Regular activities

60 marks

| | |
|---|---|
| I Semester | 15 marks |
| II Semester | 15 marks |
| III Semester | 15 marks |

IV Semester 15 marks

(Written test 10 marks – participation in programmes and behavior 5 marks) 80% attendance is mandatory for attending special camp

B. Special camp activities
   a. Attendance in daily activities during special camp: 30 marks
   b. Special camp activity report : 5 marks
   c. Viva-voce on the 10th day of special camp : 5 marks

Total : 40 marks

## NATIONAL CADET CORPS NCC

**I Year**

General - Military History – Introduction to NCC – Aims of NCC – Principles of NCC, NCC organization, Duties of good citizen – system of NCC training – Foot drill – Arms drill – Guard of Honour – Ceremonial Drill – Weapon training – First aid – Rifle and Light machinegun – Map reading – Civil defence – Leadership.

**II Year**

Drill – Weapon drill – Weapon training and firing – Introduction to National Integration – Historical – geographical – Religions back ground of India – Health and Sanitation – Aid to Civil Authorities – Civil defence – Ecology / Nature awareness – Map reading – Social service – Adventure Activities – Leadership qualities.

Besides the above schedule, NCC cadets will be involved during important occasions during convocation, Independence day, Republic day, etc.

**Evaluation:**

| | | **Sem I** | **Sem II** | **Sem III** | **Sem IV** | **Total** |
|---|---|---|---|---|---|---|
| A. | Regular activities and Behaviour | 10 | 10 | 10 | 10 | 40 |
| B. | Participation in camps and special assignments | 5 | 5 | 5 | 5 | 20 |
| C. | Written test and viva | 10 | 10 | 10 | 10 | 40 |
| | **Total** | **25** | **25** | **25** | **25** | **100** |

## 21AGR11 PHYSICAL EDUCATION** (non gradial)

**Credits: 0:0:1**

**Practical**

(17 Practical classes – 2½ hours each class – 17 classes will be converted into 40 practicalhours and 2½ hours for evaluation)

**I Semester (20 Hours)**

Exercises for strength, agility, co-ordination, flexibility, co-operation, vitalcapacity endurance, speed and for various systems of our body and team spirit.

Exercise for Good Posture – Conditioning and calisthenics for various Athletic activities *i.e*

*(a)* Before start – Arm stretch, hand stretch and cat stretch (b) Loosening up jogging, bending and twisting (c) Standing – Lateral Arc, triangle and hands to feet pose (d) Sitting – camel kneel, spinal twist and supine knee bend (e) Relaxation – The corpse pose, quick and deep relaxation. Basic gymnastic exercises – participation of athletic events – running, throwing and jumping events.

Skill development in anyone of the following games
Warming up, suitable exercise, lead up games, advance skill for all the games.

Basket Ball : Dribbling, pass, two or three men pass, pivot, lay up shot, shooting, pass break,hook pass, screening, positional play, defence and offence tactics.

Volley Ball : Fingering, under arm pass, over head pass, setting, spiking, back pass, jump pass, stunts, elementarty dive, flaying dive, roll, blacking and various types of services.

Ball Badminton : Grip, service, foot work, fore hand stroke, back hand stroke, lob, smash,volley, wall practice, spin service and defence tactics.

Foot ball : Dribbling, passing, dodging, kicking, heading, screening, chest pass, throwing,dragging, goal kick, defence and offence tactics.

Hockey : Grip, bully, dribbling, hitting, drive, push strokes, scoop, flick, stopping, varioustypes of passes, dodging, defence and offience tactics.

Kho-Kho : Quadra ped, bi-ped, how to given kho, taking a direction, recede, parallel toe method, bullet tow method, distal method, foot out, dive, ring game, chains and persue anddefence skills.

Chess : Moves, move of king, move of pawns, move of rooks, move of bishops, move ofqueen, move of knights, en passant, castling, check and notation.

Kabaddi : Raid, touch, cant, catch, struggle, various types of defence and offence tactics.

Cricket : Grip, bowling, spin, leg spin, off spin, medium, batting, dive, sweep, mode ofdelivery, fielding, rolling etc.

Tennis : Grip, forehand drive, back hand drive, stroke, backhand ground stroke, service,volley, smash, wall practice, foot work, defence and offence tactics.

Table Tennis : Grip, tossing and serving, spin serve, rally, smash, flick, defence and offencetactics.

Shuttle Badminton : Grip, foot work, service, setting, smash, volley, forehand and back handstroke, back hand serve and defence.

Gymnastics : Balanced walk, execution, floor exercise, tumbling/acrobatics, grip, release,swinging, parallel bar exercise, horizontal bar exercise, flic-flac-walk and pyramids.

**Athletics**

(a) Sprint : Medium start, long start, bunch start, set, pick up, finish, upsweep

downsweep, placement, receiving and exchanging.

(b) Jumps : Western roll, belly roll, eastern cut off, fass ferry flop, approach, take off, straddle, hitch-kick, handging, clearance, landing, strides etc.

(c) Throws : Grip, momentum, pre shift, sub phase, the wind up, foot work, entry to the turn, shift, angle of release, follow throw, delivery, front cross step, rear cross step, hop step, fuck method pary obraine, discoput, rotation, carry and glide.

(d) Hurdles : Finding lead leg, use of lead leg and trial leg, flight, clearing, finish.

Lead up games, advance skills and game for any one of the above games.

**II Semester (20+ 2 ½ hours)**

Rules and regulations of anyone of the games and athletic events.

Aims and objectives of yoga – asanas : ie. padmasana, pujankasana, sarvangasana, chakrasana,dhanurasana, halasana, mayurasana and savasana, asanas for ailments, back pain, arthritis, abdominal problesm, stress, fatiguel, Insomnia, obsity, circulation, hypertension, varicose veins, respiration, heart, digenstion, headaches, depression, addiction and eye problems.

Mental balance and importance – development of concentration suriyanamaskar – advanceskills of any one of the games which were taught in the I semester.

**METHOD OF EVALUATION:**

| | | |
|---|---|---|
| a. | Attendance | 60 Marks |
| b. | Behavior | 10 Marks |
| c. | Participation in Sports and Games | 20 Marks |
| d. | Final *Viva Voce* | 10 Marks |

Marks will be awarded at the end of the IV Semester based on the above method of evaluation procedure. Final class grade chart of each student will be sent to the Dean of Agricultural Sciences, DSU.

**21AGR12 YOGA PRACTICES** (non gradial)**

**Credits: 0:0:1**

**UNIT - 1:**

**Physical health and rejuvenation of life-force**

Significance of Value Education - Types of Education – Yoga for Human

Excellence.- Principles and Purpose of living - Body structure – Body functions – Reasons for Diseases and Prevention - Concept of Health – Role of limit and method in five deeds for good health - Importance of Naturopathy - Objectives of physical exercises Benefits of physical exercises - Kayakalpa yoga philosophy - Youthfulness practices Enriching bio-magnetism.

**UNIT - 2:**

**Mental prosperity and social welfare**

Mind functions – Mental frequency – Thought – Brain and Memory power – Problem solving and Decision making skills - Need and benefits for meditation - SKY Yoga types of meditation Part 1: Eye brow centre meditation - Genetic centre meditation - Spinal cord clearance - Crown centre meditation - Analysis of thoughts – Moralization of desires - Neutralization of Anger – Eradication of Worries – Benefits of blessings - Human culture and values – Five-fold culture - Time management – Personality Assessment - Environment awareness and protection - Family peace – World peace - Five duties - Harmonious friendship – Greatness of Womanhood.

**UNIT - 3:**

**Yoga practices – I**

PHASE I - Simplified Physical Exercises: Hand exercise - Leg exercise – Neuro muscular breathing exercise – Eye exercise – Kapalabathi - PHASE II – Makarasana Part 1 & 2 – Body massage - Acu-pressure – Relaxation exercise - Youthfulness practices (Kayakalpa) - SKY Yoga types of meditation Part 1: Eye Brow centre meditation - Genetic centre meditation - Spinal Clearance - Crown centre meditation.

## Syllabus for II Semester courses

### 21AGR13 SOIL AND WATER CONSERVATION ENGINEERING

**Credits: 2:0:1**

**Course objectives**

- To understand the water resources of the country and state
- To study the soil water plant relationship and soil moisture constant
- To introduce the concept of water requirement of crops and irrigation management

**Course outcomes**

- Students learnt the estimation of the irrigation requirement by various methods
- Students gained the practical knowledge of implementation of surface, pressurizedand micro irrigation
- Familiarize the concept of water productivity and principles of drainage

**TheoryUNIT I**

***Surveying***

Surveying and levelling – chain and compass – levelling – land measurement – difference inelevation.

**UNIT II**

***Soil erosion***

Soil Erosion – causes and evil effects of soil erosion – geologic and accelerated erosion – universal soil loss equation - water erosion - causes - stages of water erosion - splash, sheet, rill and gully erosion - ravines - land slides – wind erosion - factors influencing wind erosion

- mechanics of wind erosion – suspension, saltation, surface creep

**UNIT III**

***Soil conservation and watershed management***

Erosion control measures for agricultural lands – biological measures – contour cultivation – strip cropping – cropping systems – vegetative barriers - windbreaks and shelterbelts - shifting cultivation - mechanical measures – contour bund – graded bund – broad beds and furrows – basin listing – random tie ridging – mechanical measures for hill slopes – contour trench – bench terrace – contour stone wall – Rain water harvesting — Runoff computation - rational formula - water harvesting – farm ponds and percolation ponds -watershed concept –integrated approach and management

**UNIT IV**

***Irrigation and drainage***

Irrigation - measurement of flow in open channels - velocity area method - rectangular weir - Cippoletti weir - V notch - orifices - Parshall flume - duty of water - irrigation efficiencies - conveyance of irrigation water - surface irrigation methods - borders, furrows and check basins - drip and sprinkler irrigation component– agricultural drainage - surface and sub- surface drainage systems - drainage coefficient

**UNIT V**

***Wells and pumps***

Types of wells– pump types – reciprocating pumps – centrifugal pumps – turbine pumps –submersible pumps – jet pumps – airlift pumps

**PRACTICAL**

Study of survey instruments - chains and cross staff surveying - linear measurement - plotting and finding areas. Compass survey - observation of bearings - computation of angles- radiation, intersection. Levelling – fly levels – determination of difference in elevation – contouring. Design of contour bund and graded bund. Drip systems and Sprinkler irrigation systems. Problems on water measurement. Problems on duty of water, irrigation efficiencies. Problems on water requirement - agricultural drainage. Study of different types of wells and its selection.- Study of pumps and its selection- Measurement of irrigation water through flumes and weirs; Calculation of irrigation water requirement (Problems); Determination of infiltration rate; Demonstration of furrow method of irrigation; Demonstration of check basin and basin method of irrigation; Operation of sprinkler, drip and common micro irrigation systems; Visit to a water management research station. Visit to soil and water conservationareas

**Text books**

1. SankaraReddi, G.H. and Yellamananda Reddy, T. 2003. Efficient Use of IrrigationWater.Kalyani Publishers, Ludhiana.

**References**

1. Michael, A.M. 2007. Irrigation Theory and Practice (2nd Ed.). Vikas PublishingHouse Pvt.Ltd., New Delhi.
2. Lenka, D. 2005. Irrigation and Drainage (3rd Ed.). Kalyani Publishers, Ludhiana.

## 21AGR14 FUNDAMENTALS OF CROP PHYSIOLOGY

**Credits: 2:0:1**

**Course Objectives:**

- To introduce the students to crop physiology and biochemical changes during cropdevelopment.
- To impart knowledge on transport system in plants, photosynthesis and respiration
- To understand growth and growth characteristics

**Course Outcome:**

- Knowledge gained on different aspects of crop physiology.
- Learned detailed understanding of the physiological mechanisms involved in the uptake and transport of water and the translocation of food by plants.
- Study growth pattern of plants and growth parameters in crop production.

**Theory**

**Unit I**

***Introduction to Crop Physiology and importance of Crop Physiology in Agriculture***

Introduction to Crop Physiology and importance of Crop Physiology in Agriculture – Plant cell: an overview, organelles- plasma membrane, chloroplast, mitochondria, peroxisome and vacuole, Structure and role of water, water potential and its components, diffusion and osmosis; imbibition, plasmolysis, Field Capacity and Permanent Wilting Point, Absorption of water, Mechanisms of water absorption, Pathways of water movement, Apoplast and symplast, Translocation of water, ascent of sap and its mechanisms - Transpiration and Stomatal physiology: structure of stomatal pore, mechanisms of stomatal opening and

closing, guttation,antitranspirants.

**Unit II**

***Mineral nutrition of plants***

Mineral nutrition of plants: Criteria of essentiality, classification of nutrients, macro, micro, mobile, immobile and beneficial elements, Physiological functions and deficiency symptoms of nutrients, nutrient uptake mechanism; Hidden hunger, Foliar nutrition, root feeding and fertigation, sand culture, hydroponics and aeroponics.

**Unit III**

***Photosynthesis***

Photosynthesis: Light and dark reactions, Photosystems, red drop and Emerson enhancementeffect, Photolysis of water and photophosphorylation, Z scheme, C3, C4 and CAM plants;

Photosynthetic pathways of C3, C4 and CAM plants, difference between three pathways, Factors affecting photosynthesis, Photorespiration – pathway and its significance, Phloem transport, Munch hypothesis, Phloem loading and unloading, Source and sink strength and their manipulations. Respiration: Glycolysis, TCA cycle and electron transport chain; Oxidative phosphorylation – difference between photo and oxidative phosphorylation –- energy budgeting - respiratory quotient. Fat metabolism: fatty acid synthesisand breakdown.

**Unit IV**

***Plant growth regulators***

Plant growth regulators: physiological roles and agricultural uses, Hormones-classifications

- Biosynthetic pathway and role of auxins, gibberellins, cytokinins, ethylene and ABA, Novel and new generation PGRs, Brassinosteroids and salicylic acid, Growth retardants, Commercial uses of PGRs. Photoperiodism - short, long and day neutral plants, Chailakhyan's theory of flowering, Forms of phytochrome, Pr and Pfr, regulation of flowering, Vernalisation - Theories of vernalisation, Lysenko theories, Seed germination - physiological and biochemical changes, seed dormancy and breaking methods, Senescence and abscission, physiological and biochemical changes, Physiology of fruit ripening, climacteric and non-climacteric fruits, factors affecting ripening, Manipulations. Physiological aspects of growth and development of major crops: growth analysis, role of physiological growth parameters in crop productivity.

**Unit V**

***Classification of stresses***

Classification of stresses - Physiological changes and adaptations to drought, flooding, high and low temperature, salinity and UV radiation – compatible osmolytes – membrane properties - compartmentalization – stress alleviation - Global warming – green house gases

– physiological effects oncrops - Carbon Sequestration.

**Practical**

Study of plant cells, structure and distribution of stomata, imbibition, osmosis, plasmolysis, measurement of root pressure, rate of transpiration, Separation of photosynthetic pigments through paper chromatography, Rate of transpiration, photosynthesis, respiration, tissue test for mineral nutrients, estimation of relative water content, Measurement of photosynthetic $CO_2$ assimilation by Infra Red Gas Analyser (IRGA).

**Text books**

1. Pandey, S. N. and B. K.Sinha, 2006. Plant Physiology. Vikas Publishing House Private Limited, New Delhi.

**References**

1. Jain, J.K. 2007. Fundamentals of plant physiology, S.Chand& Company Ltd., NewDelhi.
2. Ray Noggle, G. and Fritz, G. J., 1991. Introductory Plant Physiology. Prentice Hall ofIndia Pvt. Ltd., New Delhi.
3. Taiz. L. and Zeiger. E., 2006. Plant Physiology. Publishers: Sinauer Associates, Inc.,Massachusetts, USA.

## 21AGR15 FUNDAMENTALS OF AGRICULTURAL ECONOMICS

**Credits: 1:0:1**

**Course objective**

- To study the significance of agriculture in economic development.
- To expose the students to economics principles and their applications.
- To train the students in economics tools for agricultural decision making

**Course outcome**

- Students will gain knowledge in application of economics tools for agricultural decision making.
- Students will be able to understand the links between household behaviour and the economic models of demand
- Students will get knowledge of market activities and behaviour: production, distribution, selling, purchasing etc. in relation to agriculture.

**Theory**

**Unit 1:**

***Nature and Scope of Economics***

*Economics:* Meaning, scope and subject matter, definitions, activities, approaches to economic analysis; micro and macroeconomics, positive and normative analysis. Nature of economic theory; rationality assumption, concept of equilibrium, economic laws as generalization of human behavior. Basic concepts: Goods and services, classification and characteristics, desire, want - meaning and characteristics, demand, utility, cost and price, wealth, capital, income and welfare. Agricultural economics: meaning, definition, characteristics of agriculture, importance and its role in economic development. Agriculturalplanning anddevelopment in the country.

**Unit 2:**

***Theory of Consumption***

*Demand:* meaning, kinds of demand, law of demand, demand schedule and demand curve, determinants; *Utility theory* - cardinal and ordinal utility; law of diminishing marginal utility, equi-marginal utility principle, Indifference curve analysis and properties - budget line: definition, assumptions, limitations andapplications - consumer's equilibrium and derivation of demand curve. Concept of consumer surplus and its importance. *Elasticity of demand*: concept and measurement of price elasticity, income elasticity and cross elasticity. Factors influencing elasticity of demand - Importance of elasticity of demand – Standard of Living: Definition, Engel's Law of Family Expenditure.

**Unit 3:**

***Theory of Production***

*Production:* process, creation of utility, factors of production definition and characteristics – Input Output Relationship. *Laws of returns*: Law of variable proportions and Law of returns to scale. *Cost:* Costconcepts, short run and long run cost curves. *Supply:* Stock versus supply, law of supply, supply schedule,supply curve, determinants of supply, elasticity of supply.

**Unit 4:**

***Exchange and Theory of Distribution***

Market structure: meaning and types of market, basic features of perfectly competitive and imperfect markets. Price determination under perfect competition; short run and long run equilibrium of firm and industry, shut down and break even points. *Distribution theory*: meaning, factor market and pricing of factors of production - Concepts of Rent and Quasi rent - *Wages:* Real wage and money wage -*Interest:* Pure interest and gross interest – *Profit:* Meaning of economic profit.

**Unit 5:**

***Macroeconomic Concepts***

*National income:* Meaning and importance, circular flow, concepts of national income - accounting and approaches to measurement, difficulties in measurement. *Population:* Importance, Malthusian and Optimum population theories, natural and socio-economic determinants, current policies and programmeson population control.*Money:* Barter system of exchange and its problems, evolution, meaning and functions of money, classification of money, money supply, general price index, inflation and deflation. *Banking:* Role in modern economy, types of banks, functions of commercial and central bank, credit creation policy. *Agricultural and public finance:* meaning, micro versus macro finance, need for agricultural finance, public revenue and public expenditure. *Tax:* meaning, direct and indirect taxes, agricultural taxation, VAT and GST. *Economic systems:* Concepts of economy and its functions, important features of capitalistic, socialistic and mixed economies, elements of economic planning.

**Practical**

Law of Diminishing Marginal Utility - Law of Equi-Marginal Utility - Indifference Curve analysis - consumer equilibrium; Individual and market demand- Measurement of Arc and Point elasticities of demand - own price, income and cross price elasticities of demand – Estimation of Consumer surplus – Law of Diminishing Marginal Returns: Relationship among TPP, APP and MPP - Cost concepts and graphical derivation of cost curves - Estimation of total revenue and profit- Producer surplus - Supply elasticity – Exchange: Market Structure and Price determination – Computation of National Income – Study of structural changes in the economy - Estimation of Growth Rate - Money: Quantity theory of money - Measures of standard of living – Indices of human development.

**Text books**


1. Dewett, K.K. 2005. Modern Economic Theory. S. Chand, New Delhi.
2. Dewett, K.K. and Verma. 2004. Elementary Economic Theory, S. Chand, New Delhi
3. Reddy,S., Raghuram,P., Neelakantan,T.V. and Bhavani D. I. 2004. Agricultural Economics. Oxford and IBH Publishers, New Delhi.


**References**


1. Dewett, K. K. 2004. Modern Economic Theory, Syamlal Charitable Trust, NewDelhi. Samuelson, P. 2004. Economics, (18/e), Tata Mc-graw-Hill, New Delhi
2. Seth, M. L. 2005.Principles of Economics, Lakshmi Narain Agarwal Co., Agra. NewDelhi..
3. Jhingam, M.L.2001. Micro Economic Theory. Konark publishers, New Delhi.


## 21AGR16 FUNDAMENTALS OF MICROBIOLOGY

**Credits: 2:0:1**

**Course objectives**

- To introduce students to the microbial world, their classification and functions
- To impart knowledge on the techniques of microbial isolation, purification, growth metabolism and preservation
- To illustrate bacterial genetics, mutation and immunology

**Course outcomes**

- The student gains knowledge on the microbial classification, morphology, genetics and function.
- The student could appraise the economic importance of microorganisms
- The student could investigate antigen antibody reactions and application of vaccines

**Theory**

**Unit I**

***Introduction***

Definition and scope of Microbiology. Milestones in Microbiology; biogenesis and abiogenesis theory; contributions of Antonie Van Leeuwenhoek, Louis Pasteur, John Tyndall, Robert Koch, Edward Jenner, Joseph Lister, Alexander Fleming and Waksman. Germ theory of diseases and fermentation.

**Unit II.**

***Microbiological Techniques***

General principles of light microscopy - magnification, resolving power and numerical aperture.Different types of light and electron microscopes; three dimensional imaging - Atomic force and Confocal scanning laser microscopy.Staining techniques - principle and types of stains; simple, negative, differential and structural staining.Sterilization and disinfection techniques; principles and methods of sterilization - physical methods – heat, filters and radiation; chemical methods.Isolation, enrichment and purification techniques of bacteria, yeast, molds and actinobacteria.Preservation of microbial cultures.

**Unit III.**

***Microbial World***

Evolutionary relationship among the living organisms. Whittaker's five kingdom concept of living organism and Carl Woese systems. Procaryotic and eukaryotic microorganisms. Three domains of life – similarities and differences; Modern approach to the bacterial systematics. Bergey's Manual of Systematic Bacteriology. Bacteria - bacterial size, shape and

arrangement; bacterial cell structure and function.Morphology of fungi and algae. General properties of viruses: different types; overview of bacteriophages; morphology of bacteriophages: Lytic and lysogenic cycles; lytic and temperate phages.

**Unit IV.**

***Microbial Growth and Metabolism***

Bacterial growth- population growth- growth cycles of population; environment on growth –temperature, oxygen, pH and salts; nutritional classification – chemoautotrophy and photo autotroph. Energy generation in bacteria.Aerobic and anaerobic respiration and fermentationin bacteria.

**Unit V.**

**Microbial Genetics and Immunology**

Central dogma of life. Genetic elements of bacteria; bacterial chromosomal DNA, plasmids,

IS elements and transposons; Mutation - types and mutagens. Genetic recombinations; transformation, transduction and conjugation.Genetic engineering – an introduction.Basic concepts of immunology – antigen – antibody reactions and vaccines.

**Practical**

Microbiological safety in the laboratory; introduction to microbiology laboratory and its equipments.Microscopes- handling with microscope.Micrometry.Methods of sterilizationand equipments used for sterilization. Nutritional media and their preparations.Enumeration of microbial population - bacteria, fungi and actinobacteria. Methods of purification and preservation of microbial cultures. Staining and microscopic observations; simple and differential staining - spore staining.Measurement of bacterial growth. Identification of microorganisms - morphological identification of yeasts, molds and algae. Identification- cultural, physiological and biochemical tests for bacteria and actinobacteria..Isolation of bacteriophages.Isolation of mutants employing physical or chemical mutagens.

**Text books**


1. Rangaswamy, G, 1992. Agricultural Microbiology, PHI Publication,
2. N.S. Subbarao, 1999.Soil Microbiology - Oxford and IBH publishing Co Pvt Ltd,
3. R.M. Aggarwal, 2013.Soil Microbiology - Wisdom Press/Dominant Publishers and Distributers,
4. Singh and Purohit, 2008.Biofertilizer Technology, Agrobios, Shalini Suri, Biofertilizers and Biopesticides, 2011. APH Publishing Corporation


**Reference :**


1. Michael T. Madigan , Kelly S. Bender Daniel H. Buckley , W. Matthew Sattley, David A. Stahl 2017. Brock Biology of Microorganisms, 15th edition
2. Prescott, Harley and Klein, 2013. Microbiology, 9th edition, McGraw Hill Publishing
3. Michael J. Leboffee and Burton E.Pierce 2011. A photographic Atlas for the Microbiology Laboratory 4th edition, Marton Publishing Company
4. Hans G. Schlegel, 2012. General Microbiology, 7 th edition
5. Ronald M. Atlas, 1997. Principles of Microbiology, Second edition
6. Tortora, G.J., B.R.Funke and C.L. Case, 2009. Microbiology- An Introduction, 9th edition
7. Stanier, R.Y., Adelberg, E.A. and Ingram, J.L. (1991). General Microbiology, 5th Ed., PrenticeHall of India Pvt. Ltd., New Delhi.


## 21AGR17 FUNDAMENTALS OF AGRICULTURE EXTENSION EDUCATION

**Credits: 2:0:1**

**Course objectives**

- To introduce the scope and importance of extension education and programme planning
- To impart knowledge on various rural development programmes aimed at poverty alleviation and to increase employment opportunities and their analysis.
- To sensitize about the extension system worldwide and new dimensions of Agricultural Extension in India.

**Course outcomes**

- Students gain knowledge about extension programmes for rural development
- Students will be able use efficient methods of technology transfer
- Students have knowledge about various types of communication skills and innovative approaches

**Theory**

**Unit I**

***Extension education and programme planning***

Education- meaning, definition & types; extension education –meaning, definition, scope and process; objectives and principles of extension education. Programme planning – definition, meaning, process, principles and steps in programme development

**Unit II**

***Extension System in India***

Extension efforts in pre-independence era (Sriniketan, Marthandam, Firka Development scheme, Gurgaon Experiment, etc.) Post – independence era (Etawah pilot project, Nilokheri Experiment, etc.,) Various extension/ agricultural development programmes launched byICAR/Govt. of India (IADP, IAAP, HYVP,KVK, ORP, ND, NATP, NAIP etc.,)

**Unit III**

***Rural Development, Administration, monitoring and evaluation***

Rural Development –Concept, meaning, definition: various rural development programmes launched by Govt. of India. Community development –meaning, definition, concepts and principles, physiology of community development. Rural leadership: concept and definition, types of leaders in rural context: extension administration: meaning, concept, principles and functions. Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programmes

**Unit IV**

***New Trends in Agricultural Extension***

New trends in agricultural extension –Privatization of extension, Cyber extension/ E-extension, (Internet, cyber cafes, video and teleconferencing, Interactive Multimedia Compact disk (IMCD), Agri portals, Information Kiosks, Kisan Call Centre (KCC), Mobile phone, Village Knowledge Centre (VKC), DEMIC, Geographical Information System (GIS), market led extension, farmer led extension, expert systems etc.,

**Unit V**

***Transfer of Technology, Diffusion of Innovations and extension methods***

Transfer of technology concept, models, capacity building of extension personnel, extension teaching methods: meaning, classification, individual, group and mass contact methods, media mix strategies: communication: meaning, definition, models elements, characteristics and barriers to communication Agricultural Journalism: Agricultural journalism (Print media)- definition, principles, importance, ABC of news, types of news. Diffusion of Innovations – definition, elements; Innovation – definition, attributes; Adoption – meaning, steps in adoption process, adopter categories, factors influencing adoption of innovations; process andstages of adoption, adopter categories.

**Practical**

To get acquainted with university extension system, group discussion- exercise, handling and use of audio visual equipments and digital camera and LCD projector: preparation and use of AV aids, preparation of extension literature-leaflet, booklet, folder, pamphlet newstories and success stories, Presentation skills exercise: micro teaching exercise: A visit

to village to understand the problems being encountered by the villagers/ farmers : to study organization and functioning of DRDA and other development departments at district level: visit to NGO and learning from their experience in rural development: understanding PRA techniques and their application in village development planning: exposure to mass media; visit to community radio and television studio for understanding the process of programme production: Script writing, writing for print and electronic media, developing script for radio and television.

**Text books:**


1. Dipak de, Basavaprabhu Jirli. 2010. A Handbook of Extension Education, Agrobios,India.
2. Katar Singh. 1999. Rural Development – Principles, Policies and Management, SagePublications India Pvt. Ltd., New Delhi.
3. Kelsey, L.D and C.C. Hearne. 1967. Cooperative Extension Work, Cornell UniversityPress, New York.
4. Manoharan Muthiah, P. and R. Arunachalam. 2003. Agricultural Extension, HimalayaPublishing House, Mumbai.
5. Narayanasamy, N. 2009. Participatory Rural Appraisal Principles, Methods andApplication, Sage Publications India Pvt. Ltd., New Delhi.
6. Neela Mukherjee. 1993. Participatory Rural Appraisal: Methodology andApplications, Concept Publishing Co.


**References:**


1. Pandey, B.K. 2005. Rural Development, ISHA Books, New Delhi.
2. Pandey, V.C. 2003. Information Communication Technology and Education (The Changing World ICT Governance), Isha Publishers.
3. Ray, G.L. 1999. Extension Communication and Management, Naya Prokash, 206, Bidhan Sarani, Calcutta.
4. Reddy Adivi, A. 1993. Extension Education, Shree Lakshmi Press, Bapatla, Andhra Pradesh.
5. Rishipal. 2011. Training and Development Methods, S.Chand and Co. Ltd., New Delhi.
6. Rogers, E.M. 1995. Diffusion of Innovations, The Free Press, New York.
7. Sagar Mondal and Ray, G.L. 2007. Text book of Rural Development, Kalyani Publishers, New Delhi.
8. Sandhu, A.S. 1996. Agricultural Communication: Process and Methods, Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi.
9. Sandhu, A.S. 1996. Extension Programme Planning, Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi.
10. Sanjay Prakash Sharma. 2006. Panchayat Raj, Vista International Publishing House, New Delhi.
11. Singh, A.K. 2012. Agricultural Extension, Agrobios, New Delhi.
12. Sivasudevaro, B and Rajannikanthu, G. 2007. Rural Development and Entrepreneurship Development, The Associated Publications, Ambala.
13. Supe, S.V. 1997. An Introduction to Extension Education, Oxford & IBH PublishingCo. Pvt. Ltd., New Delhi.
14. Van den Ban, A.W and H.S. Hawkins. 2002. Agricultural Extension, CBS Publishers& Distributors, New Delhi.


## 21AGR18 PRODUCTION TECHNOLOGY FOR VEGETABLES AND SPICES

**Credits: 2:0:1 Course Objective:**

1. To impart knowledge on basic cultural practices of Vegetables, Fruits and PlantationCrops.
2. To insist on modern techniques to increase the yield and production.
3. To learn about the economic estimation of commercial Horticultural crops.

**Course Outcome:**

1. The student gains a thorough knowledge on basic production technology.
2. Familiarize on basic pruning and training techniques of fruits and plantation crops.
3. Acquaintance on commercial oriented cultural practices.

**Theory**

**VEGETABLES**

***Unit I:***

***Scope, Importance and classification of vegetables***

Importance of vegetable growing –area and production of vegetables in India and Tamil Nadu- Nationaleconomy- nutritive value of vegetables and human nutrition.

**Unit II:**

***Production technology of tropical vegetable crops***

Origin - climate and soil – varieties and hybrids – seeds and sowing – transplanting – water and nutrient management – fertigation – weed management – use of micronutrients and plant growth regulators - physiological disorders - maturity indices – harvest – pest and diseases – seed production

**Crops:** Tomato, chilli, brinjal, bhendi, gourds (ash gourd, pumpkin, bitter gourd, ridge gourd, bottle gourd, snake gourd and watermelon) onion, cassava, amaranthus and moringa.

**Unit III:**

***Production technology of temperate vegetable crops***

Origin -climate and soil – varieties and hybrids – seeds and sowing – transplanting - water and nutrient management – fertigation – weed management – use of micronutrient and plant growth regulators- physiological disorders- maturity indices – harvest – pest and diseases – seed production

**Crops:** Cabbage, cauliflower, potato, carrot, radish, beetroot, peas and french beans, Protected cultivation of vegetables (tomato, capsicum and cucumber).

**SPICES**

**Unit IV:**

***Crop production techniques of major spices***

Spices- scope and importance - classification of spices - origin, area and production - role of commodity boards- export potential of spices. Climate and soil - varieties - propagation - nursery management and planting – cropping systems-trainingpractices - nutrient, water and weed management - shade regulation - maturity indices - harvest and yield pests and diseases - processing - value addition. Crops: Black pepper, Cardamom, Turmeric, Ginger and Garlic

**Unit V:**

**Crop production techniques in seed spices, tree spices and other spices**

Climate and soil- varieties - propagation, nursery management and planting- training , pruning canopy management- weed and water management- shade regulation- nutrient management including drip and fertigation – harvest and yield – pests and diseases – processing – value addition.

Crops: Coriander, Fenugreek, Cumin, Fennel, Clove, Nutmeg, Cinnamon, Curry leaf,

Tamarind and Herbal spices

**Practical**

**Vegetables**

Layout of kitchen garden – seed sowing – nursery management – grafting in vegetables waterand nutrientmanagement – fertigation – weed management – practices in use of plant growth regulators - Special horticultural practices in vegetable production - study of maturity indices- Identification of physiological disorders - protected cultivation - visit to vegetable nurseryunit/ protected cultivation unit.

**Spices**

Identification of spices - description of varieties - Propagation methods - rapid multiplication techniques. seed collection and extraction - raising of nurseries - seedsowing - seed treatment – fertilizer application - harvesting – pests and diseases - processing - cost economics - visit to spice gardens

## 21AGR19 INTRODUCTORY AGRO-METEOROLOGY & CLIMATE CHANGE

**Credits: 2:0:1**

**Course Objectives:**

- To understand the role of agricultural meteorology in crop production
- To learn climatic factors and their measurements
- To study the fundamentals of climate change
- To provide knowledge on the effect of climate change on crop production

**Course Outcome:**

- Agro-climatic factors understood
- Measurement and estimation techniques for climatic parameters learned
- Fundamentals of climate change studied
- Effect of climate change on crop production understood

**Theory**

**Unit - I:**

***Climate and weather***

Meteorology - Agricultural Meteorology - Importance and scope in crop production - Co-ordinates of India and Tamil Nadu - Atmosphere - Composition and vertical layers of atmosphere (stratification) - Climate - Weather - Factors affecting climate and weather - Climatic types - Different agricultural seasons of India and Tamil Nadu and climatic characteristics of India.

**Unit - II:**

***Solar radiation, RH and Wind***

Solar radiation - Light intensity, quality, direction and duration - Air and Soil temperature - Diurnal variation - importance in crop production. Heat unit and its importance in agriculture.Relative Humidity and its importance - vapor pressure deficit and its importance - Wind and its effect on crops.

**Unit - III:**

***Atmospheric pressure and precipitation***

Atmospheric pressure - cyclones, anticyclones, tornado, hurricane and storms - Wind systems of the world -. Clouds - types and their classification. Precipitation - forms - monsoon - Seasons of India- rainfall variability drought, flood and their effect - Cloud seeding - Evaporation - transpiration - Evapotranspiration - PET.

**Unit - IV:**

***Agroclimatic zones and remote sensing***

Agro climatic Zones of India and Tamil Nadu - Agro climatic normals - Weather forecasting - synoptic chart - crop weather calendar - Remote sensing - Impact of climate and weather oncrop production and pest and diseases.

**Unit - V:**

***Climate change***

Climate change- climate variability - definition and causes of climate change - Impact ofclimate change on Agriculture.

**Practical:**

Observatory - Site selection and layout. Acquiring skill in use of Pyranometers - Sunshine recorder - Maximum, Minimum, Grass minimum and Soil thermometers - Thermograph, Dry and wet bulb thermometers - Hygrograph - Psychrometers - Fortein's barometer - Barograph

- Altimeter; Wind vane, Anemometer - Raingauge - Ordinary and self-recording - Dew guage;Automatic weather station - Evaporimeters - Lysimeters, Automatic weather station - Preparation of synoptic charts and crop weather calendars. Rainfall probability analysis. Mapping of Agroclimatic Zones.

**Text books:**


1. Mavi, H.S., 1996. Introduction to Agrometeorology, oxford and IBH Publishing Co.,New Delhi. Gopalaswamy, N. 1994. Agricultural Meteorology, Rawat publications, Jaipur. Prasad, Reddy, S.R. and Reddy, D.S. 2014. Agro meteorology. Kalyani Publishers, NewDelhi
2. Reddy, S.R. 2014. Introduction to Agriculture and Agrometeorology. Kalyani Publishers, NewDelhi. Patra, A.K. 2016. Principles and applications of Agricultural Meteorology. NewIndia Publishing Agency, New Delhi.


**References**


1. Smith, J.W. 2013. Agricultural meteorology. Axis Books (India), Jodhpur
2. Rao, P.2008. Agricultural Meteorology. Prentice Hall of India Pvt. Ltd, New Delhi
3. Murthy, R.V. 2002. Basic Principles of Agricultural Meteorology. BS Publications, Hyderabad.
4. Singh, J. 2014. Textbook of Agricultural meteorology. Oxford Book Company, New Delhi.
5. Rao, G.S.L.H.V. 2005. Agricultural Meteorology. Kerala Agricultural University Press, Thrissur.


## 21AGR20 PRINCIPLES OF FOOD SCIENCE AND NUTRITION

**Credits: 2:0:1**

**Objectives**

- To equip the students to study the various processes involved in the development of products.
- To understand the correct unit operation for each product.
- To acquire knowledge on selection of suitable equipments for product development.

**Outcomes**

- The students will understand various processes involved in the development of products.

- The students will be able to identify suitable unit operation for processed product.
- The students will be able to evaluate selection of suitable equipments for productdevelopment.

**Theory**

**Unit I**

***Principles of Food Science and Nutrition***

Food Science - definition – classification of foods – functional and nutritional classification. Food groups and food pyramid. Methods of cooking - moist, dry and microwave - principles, merits and demerits. Importance and scope of nutrition – relation of nutrition to health.

**Unit -II**

***Carbohydrate, Protein and Fat***

Carbohydrate – classification, functions, digestion and absorption, sources and Recommended Dietary allowance (RDA). Energy value of foods – determination. Protein – classification, functions digestion and absorption, sources and requirements. Protein quality of foods – supplementary value of protein. Fat - classification functions, digestion and absorption, sources and requirements. Rancidity – types of rancidity and prevention. Deficiency states of protein, carbohydrate and fat nutrition – signs and symptoms.

**Unit III**

***Vitamin and Mineral Nutrition***

Fat Soluble vitamins – A, D, E and K- functions, sources, requirements and deficiency. Water soluble vitamins – thiamine , riboflavin , niacin, pyridoxine, folic acid, cyanacobalamin, biotin, pantothenic acid ascorbic acid – functions, sources, deficiency and requirements. Minerals - calcium, iron, phosphorus, iodine, magnesium, zinc, sodium, potassium, fluorine and chlorine – functions, sources, deficiency and requirements. Importance of water – maintenance of electrolyte balance. Dietary fibre - importance, health benefits, sources and requirements.

**Unit IV**

***Food Preservation and Processing***

Introduction – preservation by sugar - processing of jam, squash, jelly, marmalade and beverages. Preservation by using salt, chemicals, dehydration technology, canning technology, preservation by low temperature and irradiation techniques. Processing of puffed,flaked and extruded products. Quality control of raw and processed products.

**Unit V**

***Food Quality and Safety***

Food packaging materials – requirements- methods – nutrition labeling. Food adulterants and their detection methods. Food laws and regulations and quality control standards - FSSAI,ISO, EU standards, FDA, HACCP and Codex Alimentarius commission.

**Practical**

Determination of energy value of Foods, cooking quality tests – cereals and pulses. Estimation of moisture, protein, and fat. Processing of jam, jelly, squash, ready to serve beverages (RTS). Preparation of flaked, puffed, and extruded products. Visit to food industries and quality control laboratory.

**Text books**


1. Rao, D. G. Fundamentals of Food Engineering PHI Learning Pvt. Ltd, New Delhi.
2. Norman N. Potter and Joseph H. Hotchikss. Food Science. Chapman and Hall Pub.
3. Acharya, K T Everyday Indian Processed foods. National Book Trust.

**References:**


1. Srilakshmi, B. 2005. Food Science. New Age International (P) Ltd., Publishers, NewDelhi.
2. Srivastava, R.P., and Sanjeevkumar. S. 2013. Fruit and Vegetable preservation. International BookDistributing Co. Lucknow.
3. Srilakshmi .B. 2015. Nutrition Science. New Age International Pvt. Ltd. New Delhi.
4. Mudambi Sumati R., Shalini M. Rao and M V Rajgopal. Food Science. New Age International Publishers.
5. Negi H.P.S., Savita Sharma, K. S. Sekhon. Hand book of Cereal technology. KalyaniPub.


## 21AGR21 ELEMENTARY MATHEMATICS

**Credits : 1:0:1***

**Course objectives**

- To get an idea of sociological behaviour of rural population
- To familiarize the functions of rural society social stratification and social changes
- To understand the behaviour pattern and theories of motivation

**Course outcomes**

- Students learnt the rural society and their behaviour pattern
- Students gained the practical knowledge of functions of social institution
- Familiarize the concept of agricultural extension practices

**Theory**

**Unit - I**

***Algebra***

Permutation and Combination -meaning of nPr and nCr (simple problems). Matrices-Definition of Matrices, Addition, Subtraction, Multiplication, Transpose and Inverse up to $3^{rd}$order by adjoint method, Properties of determinants up to $3^{rd}$ order and their evaluation**.**

**Unit - II**

***Analytical Geometry***

Distance formula, section formula (internal and external division), Change of axes (only origin changed), Equation of co-ordinate axes, Equation of lines parallel to axes, Slope-intercept form of equation of line, Slope-point form of equation of line, Two point form of equation of line, Intercept form of equation of line, Normal form of equation of line, General form of equation of line, Point of intersection of two straight lines, Angles between two straight lines, Parallel lines, Perpendicular lines. Equation of circle whose centre and radius is known, General equation of a circle, Equation of circle passing through three given points, Equation of circle whose diameters is line joining two points (x1, y1) & (x2,y2).

**Unit - III**

***Differential Calculus***

Definition of function, limit and continuity, Simple problems on limit, Simple problems on continuity, Differentiation of $x^n$ , $e^x$ , sin x & cos x from first principle, Derivatives of sum, difference, product and quotient of two functions, Differentiation of functions of functions (Simple problem based on it), Logarithmic differentiation (Simple problem based on it), Differentiation by substitution method and simple problems based on it, Differentiation of Inverse Trigonometric functions. Partial differentiation with first and

second order -Maxima and Minima of the functions of the form y = f (x) and y = f(x1,x2) (Simple problems basedon it).

**Unit –IV**

***Integral Calculus***

Integration of simple functions, Integration of Product of two functions, Integration by substitution method, Definite Integral (simple problems based on it), Area under simple well-known curves (simple problems based on it).

**Unit-V**

***Mathematical Models***

Agricultural systems - Mathematical models - classification of mathematical models- Fitting of Linear, quadratic and exponential models to experimental data.

**Practical**

Simple problems in Permutation and Combination -meaning of nPr and nCr Problems in Algebra of matrices , Transpose and Inverse up to $3^{rd}$ order by adjoint method, evaluation of determinants up to $3^{rd}$ order**.** Problems in Straight lines using distance formula, section formula (internal and external division), Change of axes (only origin changed)- Equation of co-ordinate axes- Equation of lines parallel to axes. Problems in equation of a line in : Slope- intercept form, Slope-point form, two point forms, Intercept form, Normal form , General form, Point of intersection of two straight lines. Problems in Angles between two straight lines, Parallel lines, Perpendicular lines. Problems in Equation of circle whose centre and radius is known, General equation of a circle, Equation of circle passing through three given points, Equation of circle whose diameters is line joining two points (x1, y1) & (x2,y2). Simple problems in limit and continuity. Problems in differentiation of $x^n$ , $e^x$ , sin x & cos x, derivatives of sum, difference, product and quotient of two functions. Simple problem based on differentiation of functions of functions and Logarithmic differentiation. Simple problems based on differentiation by substitution method. Problems in partial differentiation and Maxima and Minima of the functions of the form y=f (x)and y=f(x1,x2). Problems in integration of simple functions and product of two functions - Definite Integral. Integration by substitution method - Problems in Area under simple well-known curves. Problems in fitting linear, quadratic and Exponential models to experimental data.

**Text books**


1. Mehta, B. C. and G. M. K. Madnani, 2014, Mathematics for Economists, SultanChand & Sons, New Delhi.
2. Kailasam.C, Pangayar Selvi. R and Vasanthi. R, 2010, Applied Mathematics, Agrobios (India), Jodhpur


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1. James Stewart and Barhara Frank, Calculus, 2008, International Thomson Publishers, Singapore
2. Duraipandian, 2007, Calculus and Analytical Geometry, Emerald Publishers, Chennai.
3. Ranganathan.C.R. 2006, A First Course in Mathematical Models of Population Growth (with MATLAB programs), Associated publishing company, New Delhi
4. Manickavasagam Pillai, T. K and Natarajan, T. 2004. Calculus, Viswanathan Publications, Madras.