

Syllabus

SPACES Degree College (A), Payakaraopeta

Department of Agriculture

B.Sc. Hons. Agriculture and Rural Development Single Major

Course structure & curricular frame work for I & II semesters

FIRST year

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
I	I	1	Fundamentals of Agricultural Science & Agronomy (Theory)	3	3
			Fundamentals of Agricultural Science & Agronomy (Practical)	2	1
		2	Basics of Rural Development and Rural Sociology (T)	3	3
			Basics of Rural Development and Rural Sociology (P)	2	1
	II	3	Fundamentals of Soil Science and Soil Fertility Management (T)	3	3
			Fundamentals of Soil Science and Soil Fertility Management (P)	2	1
		4	Fundamentals of Entomology(T)	3	3
			Fundamentals of Entomology(P)	2	1
			Total		16

SEMESTER-I

Course 1. Fundamentals of Agricultural Science & Agronomy (Theory)

Credits: 3

3 hrs./week

.....

Course Objectives:

- To orient students with basics of agriculture, its scope and development in India.
- To understand the principles of crop production including soil-plant-climate relations.
- To introduce the science of agronomy and crop husbandry practices.
- To impart knowledge on input management in field crops for efficient productivity.
- To familiarize students with modern/precision agriculture concepts and sustainability.

Course outcomes

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

CO1: Explain the scope, branches, and national importance of agricultural sector.

CO2: Describe fundamentals of crop growth, production factors and yield determinants.

CO3: Select and adopt appropriate agronomic practices for major agro-ecosystems.

CO4: Recommend suitable nutrient, water, seed and weed management strategies.

CO5: Demonstrate basic field agronomy skills and modern precision interventions.

Unit I: Introduction to Agricultural Science and Agronomy

- Agriculture – meaning, scope, national importance; link of agriculture with rural development.
- Branches of Agricultural Sciences (Agronomy, Horticulture, AH, Ag. Eng, Ag. Econ, Ag. Extn) and their inter-relationships.
- Agronomy – definition, scope and importance; relationship of agronomy with other agricultural sciences.
- History and development of agriculture and agronomic research in India.
- Agro-climatic and agro-ecological zones of India and of Andhra Pradesh, and their role in crop/farming systems planning.
- Classification of crops (season, life cycle, botanical, use) ; factors affecting agricultural & crop productivity (climatic, edaphic, biotic, socio-economic).

Unit II: Soil and Tillage

- Soil as a natural resource and its role in plant growth.
- Soil types of India and their characteristics.
- Physical, chemical, and biological properties of soil influencing crop growth.
- Tillage: objectives, principles, and types (primary, secondary, special).
- Modern concepts: conservation tillage, zero tillage, minimum tillage.
- Implements used in tillage operations.
- Preparation of seedbed and its importance for crop establishment.

Unit III: Crop Establishment and Management

- Seed: definition, quality parameters (purity, viability, germination, vigor).
- Sowing and planting methods: Broadcasting, Dibbling, Drilling, Transplanting.; Seed rate, spacing, and planting geometry.
- Crop growth stages and factors influencing growth and yield.
- Irrigation methods: surface, sprinkler, drip; irrigation scheduling and efficiency.
- Nutrient management: essential nutrients, functions, deficiency symptoms, manures, fertilizers and biofertilizers; Integrated Nutrient Management (INM) and its relevance in sustainable farming.

Unit IV: Weed and Pest Management (Agronomic Perspective)

- Definition and characteristics of weeds; their effects on crops.
- Classification of weeds based on life cycle and habitat.
- Principles and methods of weed control: mechanical, cultural, chemical, and biological.
- Herbicides: classification, mode of action, selectivity, and precautions in use.
- Introduction to integrated weed and pest management (IWM, IPM).

Unit V: Cropping Systems and Sustainable Agriculture

- Concepts: cropping pattern, cropping system, crop rotation, mixed, inter-, and relay cropping.
- Cropping intensity and indices of multiple cropping.
- Problematic soils and their agronomic management (saline, sodic, acidic, waterlogged).
- Sustainable agriculture: concepts, need, and principles.
- Conservation agriculture and organic farming.
- Designing cropping systems suitable for diverse agro-ecological and socio-economic conditions.

Suggested Text/Reference Books

1. Reddy, S.R. (Latest Ed.). *Principles of Agronomy*. Kalyani Publishers.
2. Ghai, S.S. (Latest Ed.). *Fundamentals of Agronomy*. Oxford & IBH Publishing Co. Pvt. Ltd.
3. ICAR. *Principles of Agronomy and Agricultural Heritage*. ICAR, New Delhi.
4. Subba Reddy, A. & Reddy, S. (Latest Ed.). *Farming Systems and Sustainable Agriculture*.
Oxford & IBH.
5. Pandey, S.N. & Kumar, A. *Textbook of Agronomy*. Agrobios Publications.
6. ICAR e-Course Material: *Fundamentals of Agronomy* (ebook.icar.org.in)

SEMESTER-I

Course 1. Fundamentals of Agricultural Science & Agronomy (Practical)

Credits: 1

2 hrs./week

.....

Practical Syllabus

1. Familiarization with farm implements and their uses in tillage and sowing.
2. Identification and classification of major crops and seeds.
3. Identification of common manures, fertilizers, and biofertilizers.
4. Identification and study of common weeds in agricultural fields.
5. Determination of soil moisture content, bulk density, and infiltration rate.
6. Handling and calibration of sprayers and dusters.
7. Weed flora survey and estimation of weed biomass.
8. Recording growth stages and yield estimation in field crops.
9. Design of simple cropping plans and crop rotations for smallholder farms.
10. Visit to agricultural research station or organic/sustainable farm.

SEMESTER-I

Course 2. Basics of Rural Development and Rural Sociology (Theory)

Credits: 3

3 hrs./week

.....

Course Objectives:

- Understand the concepts, scope, and importance of rural development in India.
- Learn the basic principles of rural sociology, including social structure, culture, and institutions in rural society.
- Analyze the problems and challenges of rural communities and strategies for sustainable development.
- Explore participatory approaches, rural organizations, and government programs aimed at rural upliftment.
- Apply sociological concepts to real-world rural development projects and community engagement.

Course Outcomes (COs):

- CO 1:** Understand the social structure and behavior of rural society.
- CO 2:** Identify key factors influencing rural development.
- CO 3:** Evaluate institutions and programs driving rural transformation.
- CO 4:** Apply sociological and communication principles in extension and fieldwork.
- CO 5:** Contribute to sustainable and inclusive rural development initiatives.

Unit I – Introduction to Rural Development and Rural Sociology

- Meaning, definition, nature, and scope of rural sociology and rural development.
- Importance and interrelationship between sociology and rural development.
- Characteristics of rural society and rural–urban differences.
- Evolution and historical background of rural development in India.
- Concept of community and village as a social system.

Unit II – Structure and Organization of Rural Society

- Social groups and social institutions: family, caste, religion, and marriage.
- Social stratification – caste, class, and gender relations.
- Rural leadership – meaning, types, and importance in rural development.
- Role of youth, women, and farmers’ organizations in rural progress.
- Social control and rural social values.

Unit III – Culture, Social Change, and Rural Life

- Concept and elements of culture; folkways, mores, and traditions in rural India.
- Social change: meaning, factors (education, communication, legislation, technology).
- Processes of social change – modernization, urbanization, westernization,
- Barriers to social change in rural areas.
- Role of education and extension in social transformation.

Unit IV – Rural Development Approaches, Institutions, and Programs

- Concepts, objectives, and principles of rural development.
- Major approaches: Gandhian, Integrated, Participatory, and Target-group approach.
- Panchayati Raj Institutions (PRIs) and decentralization of power.
- Role of NGOs, Self-Help Groups (SHGs), and Cooperatives.
- Major government programs: CDP, IRDP, MGNREGA, NRLM, PMGSY, and current schemes.
- Role of institutions: NIRDPR, NABARD, KVIC, DRDA.

Unit V – Education, Communication, and Contemporary Issues

- Educational psychology: learning, motivation, and attitude in rural context.
- Communication process: types, elements, and barriers in rural communication.
- Role of extension education in rural development.
- Contemporary issues: rural employment, migration, gender equity, poverty alleviation.
- ICT in rural development: Digital India, Smart Villages, and e-Governance.
- Sustainable rural livelihoods and climate-resilient development

Suggested Text / Reference Books:

1. Katar Singh (2016): *Rural Development: Principles, Policies & Management*, SAGE Publications.
2. A.R. Desai (2010): *Rural Sociology in India*, Popular Prakashan.
3. S.V. Prasad (2006): *Fundamentals of Rural Sociology and Educational Psychology*, ANGRAU.
4. Rajneesh Rajoria (2011): *Rural Sociology and Educational Psychology*, S.V. Agricultural College, Tirupati.
5. B.S. Bhatia (2003): *Rural Development Management*, B.R. Publishing.

SEMESTER-I

Course 2. Basics of Rural Development and Rural Sociology (Practical)

Credits: 1

2 hrs./week

.....

Practical / Field Work

1. Visit to rural communities to study social and economic structure.
2. Preparation of village social and resource maps.
3. Study of Panchayati Raj Institutions and SHGs through case studies.
4. Observation of rural leadership and communication patterns.
5. Field report on any rural development program or project.
6. Group presentation and viva based on field exposure.

SEMESTER II

COURSE 3: Fundamentals of Soil Science and Soil Fertility Management (Theory)

Credits: 3

3 hrs./week

.....

Course Objectives:

1. Introduce students to the basic principles of soil formation, classification, and properties.
2. Explain the physical, chemical, and biological characteristics of soils influencing plant growth.
3. Provide knowledge of soil fertility, essential plant nutrients, and soil fertility evaluation methods.
4. Develop understanding of soil management and conservation techniques for sustainable agriculture.
5. Equip students with practical skills for soil sampling, analysis, and fertilizer management at the farm level.

Course Outcomes:

After successful completion, students will be able to:

CO 1: Describe the processes of soil formation, components, and classification systems.

CO 2: Analyze soil physical, chemical, and biological properties affecting fertility and productivity.

CO 3: Identify essential plant nutrients and understand their roles, deficiencies, and management.

CO 4: Recommend soil fertility improvement and fertilizer management practices for different cropping systems.

CO 5: Apply field and laboratory techniques for soil testing, fertility evaluation, and nutrient management planning.

UNIT I – Introduction to Soil Science

- Definition, importance, and functions of soil in agriculture and ecosystems
- Soil formation: weathering of rocks, soil forming factors, and processes
- Soil profile and horizons
- Soil components: mineral, organic matter, water, and air
- Classification of soils of India (with emphasis on major soil types of the region)

UNIT II – Physical Properties of Soils

- Soil texture, structure, bulk density, and porosity
- Soil color and temperature
- Soil water: forms, movement, and retention
- Soil air and its importance in plant growth
- Soil consistency and tilth — management for good soil health

UNIT III – Chemical and Biological Properties of Soils

- Soil reaction (pH), saline, sodic, and acid soils
- Soil colloids and cation exchange capacity (CEC)
- Soil organic matter and its role in fertility
- Soil microorganisms and biological activity
- Nitrogen fixation and nutrient cycling processes

UNIT IV – Soil Fertility and Plant Nutrition

- Concept of soil fertility and productivity
- Essential plant nutrients: classification and functions
- Nutrient deficiency symptoms and their identification in crops
- Factors affecting soil fertility
- Soil fertility evaluation methods (soil testing, plant analysis, and biological indicators)

UNIT V – Soil Fertility Management

- Principles of fertilizer use and integrated nutrient management (INM)
- Organic manures: types, composition, and benefits
- Chemical fertilizers: types, methods of application, and efficient use
- Biofertilizers and green manuring
- Soil and water conservation practices for maintaining soil fertility
- Site-specific nutrient management and precision farming concepts

Suggested reference/text books:

1. Brady, N.C. & Weil, R.R. (2017). *The Nature and Properties of Soils*. Pearson.
2. Sehgal, J. (2013). *Soils of India: World Reference Base for Soil Resources*. IARI, New Delhi.
3. Tisdale, S.L., Nelson, W.L., Beaton, J.D. & Havlin, J.L. (2011). *Soil Fertility and Fertilizers*. Pearson.
4. Yawalkar, K.S., Agarwal, J.P. & Bokde, S. (2019). *Manures and Fertilizers*. Agri-Horticultural Publishing.
5. Indian Council of Agricultural Research (ICAR). (Latest). *Soil Science and Agronomy Handbooks*.
6. Gupta, P.K. (2018). *Soil, Plant, Water and Fertilizer Analysis*. Agrobios, India.

SEMESTER II

COURSE 3: Fundamentals of Soil Science and Soil Fertility Management (Practical)

Credits: 1

2 hrs./week

.....
Practical syllabus:

- Study of soil profile and horizon identification in the field
- Collection and preparation of soil samples for laboratory analysis
- Determination of soil texture by feel and hydrometer methods
- Measurement of soil pH, EC, and organic carbon, **NPK**
- **Study of Soil microflora**
- Identification of nutrient deficiency symptoms in plants
- Preparation and application of compost and FYM
- Calculation of fertilizer doses based on nutrient requirement
- Visit to Soil Testing Laboratory / Krishi Vigyan Kendra (KVK)

SEMESTER II

COURSE 4: Fundamentals of Entomology (Theory)

Credits: 3

3 hrs./week

Course Objectives:

- Introduce the science of entomology and its importance in agriculture and ecosystems.
- Familiarize students with insect morphology, anatomy, classification, and life cycles.
- Explain the role of insects in pollination, decomposition, and as pests of crops.
- Provide knowledge on integrated pest management (IPM) and safe pest control practices.
- Develop practical skills for insect collection, preservation, identification, and damage assessment.

Course Outcomes (CO):

- CO 1:** Define and explain the fundamentals of insect biology and classification.
- CO 2:** Identify major insect orders and agriculturally important species.
- CO 3:** Describe the external and internal structure of insects and their physiological systems.
- CO 5:** Understand the nature of insect pests, beneficial insects, and their management principles.
- CO 5:** Apply practical methods for insect collection, identification, and eco-friendly pest management.

UNIT I – Introduction to Entomology

- History and scope of entomology in agriculture
- Importance of insects in nature and farming systems
- General characteristics of insects and distinguishing features from other arthropods
- Role of insects in agriculture: pollinators, decomposers, and pests

UNIT II – Insect Morphology

- External body segmentation: head, thorax, and abdomen
- Structure and functions of insect mouthparts, antennae, legs, and wings and wing coupling apparatus.
- Modifications of body parts related to feeding and habitat
- Structure and functions of insect cuticle
- Types of metamorphosis and development stages (egg, larva/nymph, pupa, adult)

UNIT III – Internal Anatomy and Physiology

- Digestive, circulatory, respiratory, excretory, and nervous systems in insects
- Endocrine and reproductive systems – structure and functions
- Insect sense organs and behavior (communication, mating, aggregation)
- Physiology of growth, development, and molting

UNIT IV – Classification and Identification of Insects

- System of classification and nomenclature in insects
- Key characteristics of major insect orders: Orthoptera, Hemiptera, Lepidoptera, Coleoptera, Diptera, Hymenoptera.
- Important insect pests of field crops, horticultural crops, and stored products
- Beneficial insects: pollinators, predators, parasitoids, and decomposers

UNIT V – Insect Ecology and Integrated Pest Management

- Introduction to Insect Ecology: Scope, importance, ecological concepts, insect–environment relationships.
- Insect Population Dynamics: Factors influencing population growth, biotic and abiotic regulation, population forecasting.
- Insect Behavior and Habitat Relations: Migration, dispersal, feeding behavior, host selection, and ecological niches.
- Ecosystem Interactions: Food chains, food webs, trophic levels, predator–prey relationships, and natural enemies of pests.
- Principles of Integrated Pest Management (IPM): Concept, components, economic threshold levels (ETL), and decision-making.
- IPM Strategies and Tools: Cultural, mechanical, biological, chemical control methods; biopesticides; pheromones; ecological engineering.

Suggested Reference/Text Books:

1. Richards, O.W. & Davies, R.G. (2010). *Imms' General Textbook of Entomology*. Chapman & Hall.
2. Dhaliwal, G.S. & Singh, R. (2018). *Elements of Economic Entomology*. Kalyani Publishers.
3. Pedigo, L.P. & Rice, M.E. (2015). *Entomology and Pest Management*. Pearson.
4. Atwal, A.S. & Dhaliwal, G.S. (2017). *Agricultural Pests of South Asia and Their Management*. Kalyani Publishers.
5. ICAR (Latest). *Entomology Handbooks and Pest Management Manuals*.

SEMESTER II

COURSE 4: Fundamentals of Entomology (Practical)

Credits: 1

2 hrs./week

.....

PRACTICAL SYLLABUS

- Familiarization with insect collecting, pinning, and preservation techniques
- Study of insect morphology using specimens and diagrams
- Identification of important insect orders and representative species
- Observation of insect mouthparts and wings under microscope
- Preparation of an *Insect Collection* (minimum 25–30 specimens)
- Preparation of permanent mounts of different body parts and their appendages of taxonomic importance including male and female genitalia.
- Dissection of digestive system in insects (Grasshopper)
- Sampling techniques for estimation of insect population and damage.
- Field visits to crop fields, horticultural farms, and storage units to study pest damage symptoms
- Demonstration of IPM tools (light traps, pheromone traps, bio-control agents)