LIST OF COURSES

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course Code</th>
<th>Name of the Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>17AG1001</td>
<td>Principles of Agronomy and Agricultural Heritage</td>
<td>3:0:1</td>
</tr>
<tr>
<td>2</td>
<td>17AG1002</td>
<td>Agricultural Microbiology</td>
<td>3:0:1</td>
</tr>
<tr>
<td>5</td>
<td>17AG1003</td>
<td>Fundamentals of Plant Biochemistry</td>
<td>3:0:1</td>
</tr>
<tr>
<td>6</td>
<td>17AG1004</td>
<td>Agricultural Meteorology</td>
<td>3:0:1</td>
</tr>
<tr>
<td>7</td>
<td>17AG1005</td>
<td>Irrigation Water Management</td>
<td>3:0:1</td>
</tr>
<tr>
<td>8</td>
<td>17AG1006</td>
<td>Crop Physiology</td>
<td>3:0:1</td>
</tr>
<tr>
<td>9</td>
<td>17AG1007</td>
<td>Principles of Genetics and Genomics</td>
<td>3:0:1</td>
</tr>
<tr>
<td>10</td>
<td>17AG1008</td>
<td>Principles of Agricultural Economics</td>
<td>3:1:0</td>
</tr>
<tr>
<td>11</td>
<td>17AG1009</td>
<td>Dimensions of Agricultural Extension</td>
<td>2:0:1</td>
</tr>
<tr>
<td>12</td>
<td>17AG1010</td>
<td>Principles of Horticultural Sciences</td>
<td>2:0:1</td>
</tr>
<tr>
<td>13</td>
<td>17AG1011</td>
<td>Introduction to Soil Science</td>
<td>3:0:1</td>
</tr>
<tr>
<td>14</td>
<td>17AT1001</td>
<td>Introduction to Agriculture</td>
<td>2:0:0</td>
</tr>
<tr>
<td>15</td>
<td>17HO1001</td>
<td>Botany of Horticultural Crops</td>
<td>3:0:0</td>
</tr>
<tr>
<td>16</td>
<td>17HO1002</td>
<td>Propagation of Horticultural Crops</td>
<td>2:0:1</td>
</tr>
<tr>
<td>17</td>
<td>17HO1003</td>
<td>Production Technology of Tropical Fruit Crops</td>
<td>2:0:1</td>
</tr>
<tr>
<td>18</td>
<td>17HO1004</td>
<td>Production Technology of Tropical Vegetable Crops</td>
<td>2:0:1</td>
</tr>
</tbody>
</table>

17AG1001 PRINCIPLES OF AGRONOMY AND AGRICULTURAL HERITAGE

Credits: 3:0:1

Course Objectives:
- To have a general understanding on the crops and their classification
- To apprise the student about planting of crops and application of fertilizers
- To familiarize the students with the traditional agricultural practices in the world

Course outcome:
- Basics of crop characteristics and classification understood
- Fundamentals of soil-water-plant relationship studied
- Best traditional practices learned

Description:

Practical:
References:
2. Patil, J.V. et. al., 2015, Key Notes on Agronomy, Daya Publishing House, Delhi

17AG1002 AGRICULTURAL MICROBIOLOGY

Credits: 3:0:1

Course Objectives:
- To learn about germ theory of the diseases
- To have a general understanding on soil microbiology
- To study the beneficial use of micro-organisms

Outcome:
- Germ theory studied
- Action of microbes in soils understood
- Beneficial use of microbes learned

Description:

Practical
Familiarization with instruments, materials, glassware etc. in a microbiology laboratory - practice of aseptic methods: I - evaluation of aseptic technique with nutrient broth tubes. II- evaluation of aseptic technique with a nutrient agar plate - methods of sterilization and preparation of media I - preparation of nutrient broth, nutrient agar plates, nutrient agar slant and nutrient agar stabling; II- sterilization of glassware by dry heating; III - sterilization of nutrient broth by filtration - plating methods for isolation and purification of bacteria I - isolation of bacteria by streak plate method. II - isolation of aerobic spore forming bacteria by enrichment using streak plate method. III -

References
1. Ram Chandra, 2015, Microbial Biodiversity in Sustainable Agriculture, Daya Publishing House, Delhi
2. Lakhman, H. C., 2015, Recent Trends in Microbiology Mycology and Plant Pathology, Daya Publishing House, Delhi

17AG1003 FUNDAMENTALS OF PLANT BIOCHEMISTRY

Credits: 3:0:1

Course Objectives:
- To impart knowledge on plant cells, proteins and biosynthesis
- To educate on the importance of proteins, enzymes and lipids
- To impart knowledge on biosynthesis

Course Outcome:
- Basic understanding imparted on plant cells, proteins, industrial applications and biosynthesis
- The students learnt the importance of plant cells
- Basics of protein enzymes and lipids understood
- Familiarized with the application of bio-molecules in industry

Description:

Practical
Amino acid models (atomic); Paper electrophoresis for the separation of plant pigments; Protein denaturation – heat, pH, precipitation of proteins with heavy metals, Protein estimation by Lowry method; Enzyme kinetics, competitive inhibition, enzyme41 immobilization; Extraction of nucleic acids, column chromatography of RNA hydrolysate; Characterization of lipids by T.L.C.; Extraction of oil from oil seeds; Estimation of fatty acids by G.L.C.; Models of sugars, sucrose and starch; Quantitative determination of sugars; Paper chromatography for the separation of sugars; Determination of phenols.

References
1. Dutcher, Raymond Adams et. al., 2014, Biotech Books, New Delhi

17AG1004 AGRICULTURAL METEOROLOGY

Credits: 3:0:1

Course Objectives:
- To understand the role of meteorology in plant science
- To learn climatic parameters and their measurements
- To study the fundamentals of global warming and climate change

Course Outcome:
- Agro-climatic factors understood
- Measurement and estimation techniques for climatic parameters learned
- Fundamentals of global warming and climate change studied

Description:

Practical:

References:

17AG1005 IRRIGATION WATER MANAGEMENT

Credits: 3:0:1

Course Objectives:
- To introduce soil-water-plant relationships in the context of irrigation
- To introduce the concepts of scheduling, water distribution, design and methods of irrigation
- To have practical knowledge on drip and sprinkler irrigation

Course Outcome:
- Students learnt estimation of crop water and irrigation requirements
- Students enabled in implementing irrigation schemes
- Students capacitated in selecting appropriate irrigation methods

Description:
Irrigation: need, importance, impact on development of humanity, development in India; National Water Policy and irrigation. Canal, tank irrigation. Crop water requirement of different crops; infiltration; soil-water-plant relationships; soil quality; Duty of water; supply and demand based water distribution; irrigation scheduling; frequency and interval of irrigation; Warabandhi system. Different irrigation methods: border irrigation, furrow irrigation, basin irrigation, drip and sprinkler irrigation; irrigation methods: consideration of slope, soils and climate, evaluation, wetting pattern and planting techniques, efficiency; case studies.

Practicals
Visit to farm and demonstration of basin, drip and sprinkler irrigation in the field; conducting pumping test; planning, design and estimation related to drip irrigation.

Reference
1. Lamm, Freddie R., et. al., 2013, Microirrigation for Crop Production: Design Operation and Management, Bio-Green Elsevier (Exc)

17AG1006 CROP PHYSIOLOGY

Credit 3:0:1

Course Objectives:
- To introduce the students to seed physiology and biochemical changes during seed development.
- To understand growth and growth characteristics
- To impart knowledge on basic nutriphysiology

Course Outcome:
- Knowledge gained on different aspects of seeds
- Study growth pattern of plants
- Learned nutriphysiology
Description:

Practicals:
Study of plant cells; Preparation of standard solutions; Structure and distribution of stomata, imbibition, osmosis and plasmolysis, measurement of root pressure, rate of transpiration; Separation of photosynthetic pigments through paper chromatography; Estimation of chlorophyll; Rate of transpiration; Photosynthesis, respiration, tissue test for mineral nutrients; Estimation of RWC; Measurement of rate of photosynthesis by IRGA; Estimation of hormone using bioassay.

References

17AG1007 PRINCIPLES OF GENETICS AND GENOMICS

Credits 3:0:1

Course Objectives:
- To impart knowledge on structure of genes and type of genes action
- To make the student understand chromosome, structure, morphology, number and types
- To learn basics of DNA, RNA and fundamentals of transcription, translation, genetic code and outline of protein synthesis

Course Outcome:
- Mendel’s laws and types of gene action studied
- Basics of DNA, RNA and fundamentals of transcription, translation, genetic code and protein synthesis learned, as also evolution of different crop species understand
- Chromosomal aberrations and evolutions of different crop species studied

Description:
Mendel’s laws of inheritance and exceptions to the laws. Types of gene action, Multiple alleles, Pleiotropism, Penetration and expressivity; Quantitative traits and Qualitative traits. Multiple factor hypothesis: cytoplasmic inheritance – important features and difference from chromosomal inheritance. Mutation and it’s features; Methods of inducing mutations and CIB technique. Fine structure of gene; gene expression regulation and differential gene activation; Ultra structure of cell and cell organelles and their functions. Study of chromosome structure - morphology, number and types, Karyotype and Idiogram; Mitosis and meiosis - their significance and differences. DNA - its structure and function – types of DNA – modes ofreplication and repair. RNA - its structure, function and types; transcription, translation,genetic code and outline of protein synthesis. Linkage and crossing: types of linkage,over estimation of linkage; Numerical chromosomal aberrations (Polyploidy) and evolution of different crop species like cotton, wheat, tobacco, triticale and brassicas. Structural chromosomal aberrations.
Practicals:
Microscopy- Preparation and use of fixatives and stains for light microscopy; Preparation of micro slides and identification of various stages of mitosis and meiosis; Monohybrid ratio and its modifications; Dihybrid ratio and its modifications; Trihybrid ratio; Chi-square analysis, Interaction of factors; Epistatic factors, Supplementary factors and duplicate factors; complementary factors; additive factors and inhibitory factors.

References:
1. Singh, Upadhyaya Bisht, 2015, Genetic and Genomic Resources of Grain Legume Improvement, Elsevier-Biogreen

17AG1008 PRINCIPLES OF AGRICULTURAL ECONOMICS

Credits: 2:1:0

Course Objectives:
- To highlight the importance of agricultural economics
- To familiarize with different theories and laws in economics applicable to agriculture
- To learn the basics of public finance and welfare economics in relation to agriculture

Course Outcome:
- Basics of agricultural economics and fundamentals of welfare economics studied
- Theories and laws applicable to agriculture economics learned
- Gained knowledge on public finance and welfare economics in relation to agriculture

Description:
References:
1. Sharma, Pawan Kumar, Dwivedi, Sudhakar, Bhat, Anil, 2014, Practicals in Agricultural Economics, Daya Publishing House, Delhi
2. Chavan, U.D. et. al., 2015, Key Notes on Agricultural Economics, Business Management and Statistics (PB), Daya Publishing House, Delhi
4. Dewett,K.K.,Verma. 2004 Elementary Economic Theory, S.Chand, New Delhi

17AG1009 DIMENSIONS OF AGRICULTURAL EXTENSION

Credits: 2:0:1

Course Objective:
- To orient the students with the concept of extension education and its importance in agriculture development
- To expose the students with various rural development programmes aimed at poverty alleviation and to increase employment opportunities and their analysis
- To make the students learn about the new innovations being brought into the Agricultural Extension in India

Course Outcome:
- Students learned the concepts of agricultural extension and rural development programs
- New innovations in the area of agricultural extension in India understood
- Gained practical knowledge on watershed development and self-help groups

Description:
Education: meaning, definition, types. Formal, Informal and Non-formal education and their characteristics.

Practicals:
Visits to a village and kisan mandal to study the ongoing development programmes. Visits to Panchayat Raj Institutions to study the functioning of Gram Panchayats (GP) and Zilla Praja Parishad (ZPP). Visit and study the District Rural Development Agency (DRDA). Participation in monthly workshops of Training and Visit (T&V) System. Visit to Watershed Development Project area. Visit to a village to study the Self Help Groups (SHGs) of DWCRA. Visit to a voluntary organization to study the developmental activities. Organizing PRA techniques in a village to identify the agricultural problems. Visit to villages.
Course Objectives:
- To teach fundamentals of horticulture and horticultural practices
- To impart knowledge on different types of plant propagation and also structures used in farms
- To expose the students to different horticulture vegetables, fruits, species, aromatic and medicinal crops

Course Outcome:
- Fundamentals of horticulture and classification of crops learned
- Different types of plant propagation techniques and structures used in the farm studied
- Gained practical knowledge in plant propagation and pest and disease control

Description:
Horticulture, vegetables, fruits, spices, aromatic and medicinal plants and floriculture, plantation crops, tuber crops, bamboo and mushroom - definition, evolution, art, science, vocation, hobby, etc. Importance, divisions, classification of crops; Commercial orchards, garden and plantations. Selection of site for crops - climate, soil, socio-economic factors; Orchard planning, layout, peg marking, planting systems, spacing, digging pits, age of planting materials, after care, inter cropping, mixed cropping, etc. Tree forms and functions training and pruning in horticultural crops, principles and methods. Techniques of training and pruning – root pruning, girdling, ringing, notching, smudging, and bending, thinning - chemical and mechanical. Phases of growth and development: vegetative / reproductive balance; flowering, bearing habit and its classification; Fruit set - carbon nitrogen relation, structure and process in relation to set and drop, factors affecting and measures to overcome drop; Problems of unfruitfulness - internal factors, external factors – measures to overcome; Seedlessness in horticultural crops - significance and induction; Plant growth regulators in horticulture - natural and synthetic regulators - preparation and methods of application; Plant propagation - definition and basic concepts, types - advantages and disadvantages; Potting and repotting - objectives and uses, containers and potting media/ mixture - kinds, qualities, pre-planting treatments; Propagation by seed - seed qualities, seed testing, seed germination - types of seed dormancy, pre-sowing treatments – factors affecting germination. Asexual propagation - apomixis, polyembryony, plant modifications for vegetative propagation - bud sports, chimeras. Propagation by cuttings - types of cuttings - factors affecting rooting of cuttings. Propagation by layering - advantages and disadvantages -types of layering. Propagation by grafting - advantages and disadvantages, stock - scion relationships, incompatibility; Grafting and budding - methods - advantages and disadvantages - separation and after care; Plant propagating structures - green house/ glass house, hot bed, cold frame, lath house, net house, mist chamber; Nursery - site selection, lay-out, components, progeny orchards, sales unit, display area, management, maintenance, commercial propagation of selected horticultural plants; Micro propagation of horticultural plants - definition, principles, methods, advantages and disadvantages, field of application in horticultural crops.

Practicals
Practice in propagation of plants through seeds. Familiarization with media , implements and containers for plant propagation. Studies on seed testing, certification and storage. Practice in rootstock production, vegetative propagation methods – cutting, budding, grafting layering etc. separation of propagules. Use of growth regulators for plant propagation. Study of propagation through tissue culture. Studies on preparation of designs and estimates for establishment of plant propagation unit, plant growing structures and tissue culture unit. Identification of common pests and diseases in nursery plants and their control. Visit to different types of nurseries, selection of site and
layout– Familiarization with components of nurseries– handling, display and sales of plants – cultural practices – Estimation of production costs for different kinds of planting materials. Practice of potting /bagging, re-potting etc. Packing and transport of nursery materials. Practice in tissue culture laboratory. Registers to be maintained in a commercial nursery. Visit to different nurseries (both government and private).

References:
2. Sharangi, Amit Baran, 2014, Seed Production of Selected Horticultural Crops, Regency Publications
3. Chavan, U. D. et. al., 2015, Key Notes on Horticulture and Agriculture Extension, Daya Publishing House, Delhi
17. 17AG1011 INTRODUCTION TO SOIL SCIENCE

Credits: 3:0:1

Course Objectives:
- To highlight the physical properties of soils
- To understand soil-water interaction and thermal properties of soil
- To study the chemical and biological aspects of soil

Course Outcome:
- Students made familiar with the role of soils in agriculture
- Familiarized with physical, chemical, biological aspects of soil and soil-water-plant interaction
- Learned soil biology including the beneficial and harmful role of soil organism

Description:

**Practical**

**References**

**17AT1001 INTRODUCTION TO AGRICULTURE**

**Credit:** 2:0:0

**Course Objectives:**
- To introduce the scope of agriculture to engineering students
- To impart knowledge on soil-water-plant relationship
- To familiarize with plant growth and fertilizer application and irrigation

**Course Outcome:**
- Basics of agriculture science learned
- Soil-water-plant relationship learned
- Different stages of plant growth and application of fertilizers studied

**Description:**

**References:**
1. Sharma, Rakesh Kumar et. al., 2014, Basics of Agriculture for Engineers, Daya Publishing House, Delhi

17HO1001  BOTANY OF HORTICULTURAL CROPS

Credits: 3:0:0

Course Objectives:
- To teach the fundamentals of botany of the horticultural crops
- To expose the student to systematic botany
- To learn the basics of morphology and taxonomy of crops

Course Outcome:
- The students learned the basics of botany
- The students familiarized with botanical terms in relation to horticultural crops
- This fundamental course helped students to understand the breeding of horticultural crops

Description:
Systematic botany – terminology, morphological description and classification – root, stem, leaf, inflorescence, flower and fruit – flowering mechanism – modes of pollination asexual/vegetative reproduction – floral biology – fertilization and fruit set. Principles involved in nomenclature, ICBN rules and recommendations with special reference to names of hybrids and names of cultivated plants. Floral biology, pollination, fruit set and economic part in the families; Anacardiaceae (mango, cashew), Rutaceae (acid lime, sweet orange and mandarin), Musaceae, Moraceae, Vitaceae, Caricaceae, Euphorbiaceae (aonla, cassava, rubber), Myrtaceae (guava, clove), Sapotaceae, Bromeliaceae, Punicaceae, Annonaceae (custard apple), Rhamnaceae and Rosaceae (apple, pear, plum, rose). Floral biology, pollination, fruit set and economic part in the families; Solanaceae (tomato, brinjal, chilli, potato), Malvaceae, Cucurbitaceae (pumpkin, watermelon, muskmelon, ridge gourd, bitter gourd, cucumber), Moringaceae, Fabaceae (peas, French beans), Alliaceae (onion, garlic), Brassicaceae (cabbage, cauliflower, radish), Chenopodiaceae, Amaranthaceae, Convolvulaceae (sweetpotato), Araceae (elephant foot yam, colocasia), Dioscoreaceae (yam, medicinal Dioscorea). Floral biology, pollination, fruit set and economic part in the families; Piperaceae (pepper, betelvine) Zingiberaceae (cardamom, turmeric, ginger), Orchidaceae (Vanilla, Dendrobium orchid), Apiaceae (Umbelliferae) (coriander), Myristicaceae, Lauraceae, Leguminosae, Caesalpiniaceae, Camelliaceae, Rubiaceae, Arecaaceae(Palmae) (coconut, arecanut, palmyrah, oil palm), Sterculiaceae(Cocoa). Floral biology, pollination, fruit set and economic part in the families; Oleaceae (malignai, mullai, jathimali), Asteraceae (chrysanthemum, marigold, marigolndu, gerbera, golden rod, aster, pyrethrum), Amaryllidaceae, Acanthaceae, Caryophyllaceae, Iridaceae, Apocynaceae, Poaceae (Graminae), (lemongrass, citrononella, palmarosa, vetiver), Geraniaceae, Lamiaeae (Labiatae) (coleus, patchouli, mint, maruvu), Scrophulariaceae.

Practical:
Observations and recordings of the morphology of root, stem, leaf, fruit and flower. Study of taxonomy and morphology of crops in the above families – herbarium (minimum 50 – covering not less than 25 families) - collection of the crops mentioned in theory.

References:

**17HO1002 PROPAGATION OF HORTICULTURAL CROPS**

**Credits: 2:0:1**

**Course Objectives:**
- To impart skill oriented knowledge on media preparation
- To teach students on propagation methods
- To familiarize with the maintenance and after care of propagated plants

**Course Outcome:**
- Students benefited with hands-on training in media preparation
- Students learned about mother plant selection and propagation techniques
- Students familiarized with the maintenance and after care of propagated plants

**Description:**

**Practical:**

**References:**

17HO1003 PRODUCTION TECHNOLOGY OF TROPICAL AND ARID ZONE FRUIT CROPS

Credits: 2:0:1

Course Objectives:
- To impart knowledge on the scenario of fruit cultivation in tropical and arid zones
- To impart knowledge on advanced production techniques
- To apprise on production constraints

Course Outcome:
- Practical knowledge on specialized production techniques of tropical and arid zone fruits
- Understanding the production constraints
- Skill management for solving field problems

Description:

**Practical:**
Description and identification of cultivars/varieties - nursery management - nursery preparation, seed sowing and raising seedlings / rootstocks, practicing propagation techniques of mango, banana, papaya, sapota, guava, acid lime, sweet orange, aonla, ber, pomegranate, date palm, custard apple, jamun, bael, wood apple and manila tamarind. Banana scoring techniques. Selection and pre-treatment of banana suckers - desuckering in banana –planting systems- manures, fertilizers and biofertilizers application in mango, banana, papaya, sapota, guava, acid lime, sweet orange and aonla – application of growth regulators - sex forms in papaya – sibmating and seed production in papaya – latex extraction and preparation of crude papain – training and pruning in mango, sapota, guava, acid lime and sweet orange, aonla, ber, pomegranate and date palm - practising harvesting methods - ripening of fruits - grading and packaging - visit to commercial orchards - project preparation on production economics for fruits.

**References:**

**17HO1004  PRODUCTION TECHNOLOGY OF TROPICAL VEGETABLE CROPS**

**Credits:** 2:0:1

**Course Objectives:**
- To teach the students on the scenario of vegetable cultivation
- To impart knowledge on advanced production techniques
- To apprise on production constraints

**Course Outcome:**
- Hands-on experience of vegetable cultivation
- Knowledge on quality requirement and production techniques
- Skill management for solving field problems

**Description:**
Overview of vegetable cultivation: Area, production, world scenario, industrial importance, export potential of tropical vegetable crops – institutions involved in vegetable crops research. Classification of vegetable crops - Effect of climate, soil, water and nutrients on vegetable crop production and their management– cropping systems. Vegetable production in nutrition garden, kitchen garden, truck garden, market garden, roof garden, floating garden – types of vegetable farming and contract farming- rice fallow cultivation, river bed cultivation, rain fed cultivation, organic farming – GAP in vegetable production – export standards of vegetables. Solanaceous vegetables and bhendi: Composition and uses – area and production- climate and soil requirements – season-varieties and hybrids – seed rate- nursery practices-containerized transplant production and transplanting –preparation of field-spacing-

Practical:

References: