



IFTM
UNIVERSITY

M O R A D A B A D

NAAC ACCREDITED

N.H-24 Lodhipur Rajput, Delhi Road, Moradabad, Uttar Pradesh-244102

www.iftmuniversity.ac.in

Effective from 2018-2019

Programme:

B.Sc. (Hons.) Agriculture

Programme Outcomes (POs):

Students completing this programme will be able to-

1. Apply the conceptual knowledge of agriculture in practical situation.
2. Ability to understand the effect of various biotic factors on the growth of crop plants.
3. Ability to understand different components of agriculture i.e. dairy, poultry, fisheries, piggery etc & their interaction with crop husbandry.
4. Develop entrepreneurial skills.
5. Choose the best possible agri-enterprise for a agro-ecosystem.

School of Agricultural Sciences & Engineering
IFTM UNIVERSITY, MORADABAD
STUDY & EVALUATION SCHEME
B. Sc. (Hons) Agriculture

YEAR I, SEMESTER- I

| S.N. | Course Code | Course Name | Periods | | | EVALUATION SCHEME | | | | Course Total | Credits |
|-----------------------------|--------------------|---|-----------|----------|-----------|-------------------|-----------|-------|---------------|--------------|-----------|
| | | | | | | Mid Term Exam | | | External Exam | | |
| | | | L | T | P | CT | AS +AT | Total | | | |
| THEORY | | | | | | | | | | | |
| 1. | BAG105 | Fundamentals of Agronomy, Horticulture & Forestry | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 2. | BAG106 | Fundamentals of Soil Science | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 3. | BAG107 | Introductory Agro-meteorology and Climate Change | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 4. | BAG108 | Fundamentals of Agricultural Extension Education | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 5. | BAG109 | Principle of Food Science and Nutrition | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 6. | BAG110/ BMAG104 | Elementary Biology / Mathematics | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 7. | PSD101 | Professional Skill Development – I | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| PRACTICALS / PROJECT | | | | | | | | | | | |
| | | | | | | IA | AT | | | | |
| 8. | BAG155 | Agronomy, Horticulture & Forestry Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| 9. | BAG156 | Soil Science Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| 10 | BAG157 | Agro-meteorology and Climate change Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| 11 | BAG159 | Food Science and Nutrition Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| 12 | BCS151 | Computer Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| TOTAL | | | 21 | 0 | 10 | - | - | - | - | 1200 | 26 |

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YEAR I, SEMESTER- II

| S.N. | Course code | Course Name | Periods | | | EVALUATION SCHEME | | | | Course Total | Credits |
|-----------------------------|-------------|---|-----------|----------|-----------|-------------------|-----------|----------|---------------|--------------|-----------|
| | | | | | | Mid Term Exam | | | External Exam | | |
| | | | L | T | P | CT | AS +AT | Total | | | |
| THEORY | | | | | | | | | | | |
| 1. | BAG207 | Weed Management | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 2. | BAG208 | Fundamentals of Genetics | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 3. | BAG209 | Production Technology of Fruit and Plantation Crops | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 4. | BAG210 | Fundamentals of Plant Pathology | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 5. | BAG211 | Fundamentals of Crop Physiology | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 6. | BAG212 | Fundamentals of Agricultural Economics, Farm and Natural Resources Management | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 7. | BAG213 | Renewable Energy and Green Technology | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| PRACTICALS / PROJECT | | | | | | | | | | | |
| | | | | | | IA | AT | | | | |
| 8. | BAG257 | Weed Management Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| 9. | BAG258 | Genetics Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| 10. | BAG259 | Fruit and Plantation Crops Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| 11. | BAG260 | Plant Pathology Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| 12. | BAG261 | Crop Physiology Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| TOTAL | | | 21 | 0 | 10 | - | - | - | - | 1200 | 26 |

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YEAR II, SEMESTER-III

| S.N. | Course Code | Course Name | Periods | | | EVALUATION SCHEME | | | | Course Total | Credits |
|-----------------------------|-------------|---|-----------|----------|-----------|-------------------|-----------|----------|---------------|--------------|-----------|
| | | | L | T | P | Mid Term Exam | | | External Exam | | |
| | | | | | | CT | AS +AT | Total | | | |
| THEORY | | | | | | | | | | | |
| 1. | BAG307 | Crop Production Technology- I (Kharif) | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 2. | BAG308 | Fundamentals of Plant Breeding | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 3. | BAG309 | Fundamentals of Entomology | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 4. | BAG310 | Geoinformatics, Nano-technology and Precision Farming | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 5. | BAG311 | Agricultural Microbiology | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 6. | BAG312 | Agriculture Cooperation & Business Management | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 7. | BAG313 | Environmental Science | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| PRACTICALS / PROJECT | | | | | | | | | | | |
| | | | | | | IA | AT | | | | |
| 8. | BAG357 | Production Technology of Kharif Crops Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| 9. | BAG358 | Plant Breeding Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| 10. | BAG359 | Entomology Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| 11. | BAG360 | Geoinformatics, Nano-technology and Precision Farming Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| 12. | BAG361 | Agricultural Microbiology Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| | | TOTAL | 21 | 0 | 10 | - | - | - | - | 1200 | 26 |

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YEAR II, SEMESTER-IV

| S.N. | Course Code | Course Name | Periods | | | EVALUATION SCHEME | | | | Course Total | Credits |
|-----------------------------|-------------|--|-----------|----------|-----------|-------------------|-----------|----------|---------------|--------------|-----------|
| | | | | | | Mid Term Exam | | | External Exam | | |
| | | | L | T | P | CT | AS +AT | Total | | | |
| THEORY | | | | | | | | | | | |
| 1. | BAG407 | Crop Production Technology - II (<i>Rabi</i>) | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 2. | BAG408 | Crop Improvement | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 3. | BAG409 | Manures, Fertilizers and Soil Fertility Management | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 4. | BAG410 | Production Technology of Vegetables and Spices | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 5. | BAG411 | Fundamentals of Plant Biochemistry and Biotechnology | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 6. | BAG412 | Rural Sociology & Educational Psychology | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 7. | BAG413 | Statistical Methods | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| PRACTICALS / PROJECT | | | | | | | | | | | |
| | | | | | | IA | AT | | | | |
| 8. | BAG457 | Production Technology Rabi Crops Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| 9. | BAG458 | Crop Improvement Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| 10. | BAG459 | Manures, Fertilizers and Soil Fertility Management Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| 11. | BAG460 | Vegetables and Spices Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| 12. | BAG461 | Plant Biochemistry and Biotechnology Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| TOTAL | | | 21 | 0 | 10 | - | - | - | - | 1200 | 26 |

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YEAR III, SEMESTER-V

| S.N. | Course Code | Course Name | Periods | | | EVALUATION SCHEME | | | | Course Total | Credits |
|-----------------------------|-------------|--|-----------|----------|-----------|-------------------|-----------|----------|---------------|--------------|-----------|
| | | | | | | Mid Term Exam | | | External Exam | | |
| | | | L | T | P | CT | AS +AT | Total | | | |
| THEORY | | | | | | | | | | | |
| 1. | BAG507 | Diseases of Field & Horticultural Crops & their Management-I | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 2. | BAG508 | Production Technology for Ornamental Crops, MAP and Landscaping | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 3. | BAG509 | Principles of Seed Technology | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 4. | BAG510 | Livestock and Poultry Management | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 5. | EHU501 | Human Values and Professional Ethics | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| PRACTICALS / PROJECT | | | | | | | | | | | |
| | | | | | | IA | AT | | | | |
| 6. | BAG557 | Diseases of Field & Horticultural Crops & their Management-I Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| 7. | BAG558 | Ornamental Crops, MAP and Landscaping Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| 8. | BAG559 | Principles of seed Technology Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| 9. | BAG560 | Livestock and poultry Management Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| 10. | BAG562 | Practical Crop Production - I (Kharif) | 0 | 0 | 4 | 20 | 10 | 30 | 70 | 100 | 2 |
| | | TOTAL | 15 | 0 | 12 | - | - | - | - | 1000 | 21 |

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YEAR III, SEMESTER-VI

| S.N. | Course Code | Course Name | Periods | | | EVALUATION SCHEME | | | Course Total | Credits | |
|-----------------------------|----------------|---|-----------|----------|-----------|-------------------|-----------|---------------|--------------|-------------|-----------|
| | | | | | | Mid Term Exam | | External Exam | | | |
| | | | L | T | P | CT | AS +AT | | | | Total |
| THEORY | | | | | | | | | | | |
| 1. | BAG607 | Rainfed Agriculture and Watershed Management | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 2. | BAG608 | Insect Ecology and Integrated Pest Management | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 3. | BAG609 | Diseases of Field & Horticultural Crops and their Management-II | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 4. | BAG610 | Protected Cultivation and Secondary Agriculture | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 5. | BAG611 (A/B/C) | Elective I | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 6. | EHU601 | Disaster Management | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| PRACTICALS / PROJECT | | | | | | | | | | | |
| | | | | | | IA | AT | | | | |
| 7. | BAG657 | Rainfed Agriculture and Watershed Management Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| 8. | BAG658 | Insect Ecology and Integrated Pest Management Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| 9. | BAG659 | Diseases of Field & Horticultural Crops & their Management-II Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| 10. | BAG660 | Protected Cultivation and Secondary Agriculture Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| 12. | BAG662 | Practical Crop Production - II (Rabi) | 0 | 0 | 4 | 20 | 10 | 30 | 70 | 100 | 2 |
| | | TOTAL | 18 | 0 | 10 | - | - | - | - | 1100 | 24 |

Note: Industrial Training of 4 – 6 Weeks after VI Semester which will be evaluated in VII Semester. Skill Development Training-II in summer breaks June-July after 6th Semester (Student READY)

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YEAR IV, SEMESTER-VII

| S.N. | Course Code | Course Name | Periods | | | EVALUATION SCHEME | | | | Course Total | Credits |
|-----------------------------|----------------|--|----------|----------|-----------|-------------------|-----------|----------|---------------|--------------|-----------|
| | | | L | T | P | Mid Term Exam | | | External Exam | | |
| | | | | | | CT | AS +AT | Total | | | |
| THEORY | | | | | | | | | | | |
| 1. | BAG704 | Farming Systems, Sustainable Agriculture and Organic Farming. | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 2. | BAG705 | Post-Harvest Management and Value Addition of Fruits and Vegetable | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 3. | BAG 706(A/B/C) | Elective II | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| PRACTICALS / PROJECT | | | | | | | | | | | |
| | | | | | | IA | AT | | | | |
| 7. | BAG754 | Farming Systems, Sustainable Agriculture and Organic Farming Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| 8. | BAG755 | Post-Harvest Management and Value Addition of Fruits and Vegetable Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| 10 | BAG757 | Experiential Learning Programme | 0 | 0 | 4 | 80 | 20 | 100 | 100 | 200 | 2 |
| 11 | BAG758 | Experiential Learning Programme | 0 | 0 | 4 | 80 | 20 | 100 | 100 | 200 | 2 |
| TOTAL | | | 9 | 0 | 12 | - | - | - | - | 900 | 15 |

*Educational tour during winter/January break

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YEAR IV, SEMESTER-VIII

| S.N. | Course Code | Course Name | Periods | | | EVALUATION SCHEME | | | | Course Total | Credits |
|---------------|---------------|------------------------------|-----------|----------|-----------|-------------------|-----------|----------|---------------|--------------|-----------|
| | | | | | | Mid Term Exam | | | External Exam | | |
| | | | L | T | P | CT | AS +AT | Total | | | |
| THEORY | | | | | | | | | | | |
| 1. | BAG805(A/B/C) | Elective – III | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 2. | BAG 806 | Dairy Technology | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| 3. | BAG807 | Farm Machinery and Power | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 |
| | | | | | | IA | AT | | | | |
| 4. | BAG856 | Dairy Technology Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| 5. | BAG857 | Farm Machinery and Power Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 100 | 1 |
| 6. | BAG 858 | RAWE | 0 | 0 | 20 | - | - | 300 | 200 | 500 | 20 |
| TOTAL | | | 09 | 0 | 24 | - | - | - | - | 1000 | 31 |

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List of Electives

BAG 611(A/B/C/D) Elective I

- A. Mushroom Cultivation
- B. Agri Informatics
- C. Food Safety and Standards
- D. Micro propagation Technologies

BAG 706(A/B/C/D) Elective II

- A. Agricultural Journalism
- B. Fundamentals of Soil and Water Conservation Techniques
- C. Micro- Irrigation Techniques
- D. Commercial Plant Breeding

BAG 805(A/B/C/D) Elective III

- A. Agrochemicals
- B. Biopesticides & Biofertilizers
- C. Agro Waste Management
- D. Agribusiness Management

BAG105 Fundamentals of Agronomy, Horticulture & Forestry L: T: P 3:0:0

Objective: To impart knowledge about basic agriculture science.

Unit I

Agriculture- meaning, importance and scope. Branches of Agriculture and their importance. Agro-climatic zones of India and Uttar Pradesh – Agro ecological zones of India. Chronological development of agriculture. Development of Scientific Agriculture. National and International Agricultural Research Institutes.

Unit-II

Agronomy and its scope, Crops and their classification, Tillage – Definition objectives – types of tillage - modern concepts of tillage – main field preparation. Seeds and sowing methods, crop density and geometry, Plant population and yield, Thinning and gap filling. Crop nutrition, manures and fertilizers, nutrient use efficiency.

Unit-III

Horticulture - Its definition and branches, importance and scope; horticultural and botanical classification, principles of orchard establishment; importance of plant bio-regulators in horticulture. Fertilizer application in horticultural crops.

Unit-IV

Forestry- Definitions of basic terms related to forestry, objectives of silviculture, forest classification, and salient features of Indian Forest Policies. Forest regeneration methods. Agroforestry – definitions, importance, criteria of selection of trees in agroforestry, different agroforestry systems prevalent in the country, shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens. Cultivation practices of two important fast-growing tree species of the region.

Unit-V

Growth and development of crops, factors affecting growth and development, different plant growth stages, plant ideotypes, crop rotation and its principles, adaptation and distribution of crops, crop management technologies in problematic areas, harvesting and threshing of crops. water resources, soil-plant-water relationship, crop water requirement, water use efficiency.

Course outcomes:

- Knowledge about Indian Agriculture and its importance, present status, scope and future prospect.
- Study of agronomy often involves a summoning of resources from related disciplines such as Botany, Soil Science, Irrigation, Plant protection, Genetics and Plant Breeding, Agrometeorology *etc.*
- Students will understand the basic principles, processes and plant propagation methods
- Students will understand how horticulture relates to the economy and environments in current and future prospects.
- Students will understand with the development and evaluate management plans with multiple objectives.
- Students will understand how to develop and apply silvicultural appropriate to management objectives.

References:

1. Ready S.R. 2000. Principles of Crop production. Kalyani Publishers, New Delhi.
2. Singh, Virendra; Singh, Satybhan and Thenua, OVS 2018. Silviculture, Agro- forestry and social forestry. Rama Publishing House, Meerut.
3. Sen, K.K. 1993. An Introduction to Economics. S. Chand and Sons Co. Ltd., New Delhi.
4. Chandra De, Gopal, 1989. Fundamentals of Agronomy. Oxford and IBH Pub. Co. Pvt. Ltd., New Delhi.
5. Pearson Lorentz, C., 1973. Principles of Agronomy. Kalyani Publishers, New Delhi.
6. Reddy, T.Y. and Reddy, G.H.C.1994. Principles of agronomy. The Bangalore Printing and Publication Co. Ltd., Bangalore.

Website Sources:

- <https://www.rku.ac.in>
- <https://uu-img.s3.ap-south-1.amazonaws.com>
- <http://du.ac.in/du/uploads/Revi>
- <https://agrimoon.com>
- <http://agcollegejagtial.weebly.com/>
- <https://iasri.icar.gov.in/>
- <https://tnau.ac.in/>

BAG155

Agronomy, Horticulture & Forestry Lab

L:T: P 0:0:1

List of Experiments. Minimum 08 of the following-

1. Identification of Agronomical and horticultural crops, seeds, fertilizers, pesticides and tillage implements, weeds in crops,
2. Identification of garden tools.
3. Preparation of seed bed/ nursery bed.
4. Layout and planting of orchard.
5. Study of agro- climatic zones of India,
6. Estimation of plant population
7. Use of tillage implements-reversible plough, one-way plough, harrow, leveler, seed drill, *etc.*
8. Practice of sexual and asexual methods of propagation including micro-propagation.
9. Preparation of potting mixture.
10. Identification of forest tree species.
11. Diameter measurements using calipers and tape,
12. Nursery layout, seed sowing, vegetative propagation techniques.
13. Forest plantations and their management.
14. Visits of nearby forest-based industries and commercial nurseries/orchard.

BAG106

Fundamentals of Soil Science

L: T: P 3:0:0

Objective: To impart comprehensive knowledge of soil and its fundamental science.

Unit I

Soil as a natural body, Pedological and edaphological concepts of soil; Soil genesis: soil forming rocks and minerals; weathering, processes and factors of soil formation.

Unit II

Soil Profile, components of soil; Soil physical properties: soil-texture, structure, density and porosity, soil colour, consistence and plasticity; Elementary knowledge of soil taxonomy classification and soils of India.

Unit III

Soil water retention, movement and availability; Soil air, composition, gaseous exchange, problem and plant growth, Soil temperature; source, amount and flow of heat in soil; effect on plant growth.

Unit IV

Soil reaction-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability; soil colloids- inorganic and organic; silicate clays: constitution and properties; sources of charge; ion exchange, cation exchange capacity, base saturation.

Unit V

Soil organic matter: composition, properties and its influence on soil properties; humic substances - nature and properties; soil organisms: macro and micro organisms, their beneficial and harmful effects; Soil pollution - behavior of pesticides and inorganic contaminants, prevention and mitigation of soil pollution.

Course Outcomes:

Students completing this course will be able to:

- Comprehensive knowledge of soil formation and classification.
- Knowledge of soil physical, chemical, and biological properties.
- Understand the relationship between soil water and crop growth.
- Knowledge of soil reaction like soil acidity and alkalinity.

References:

1. Biswas, T. D. and Mukherjee, S. K. 1994. Text Book of Soil Science. Tata Mc. Graw Hill Pub Co. Pvt. Ltd., New Delhi.
2. Brady, N. C. and Weil, R. R. 2007. The nature and properties of Soil (13th ed.) Pearson Prentice Hall.
3. Donahue, R. L., Miller, R. W. and Shickluna, J. C. 1992. An Introduction to Soils and Plant Growth (7th Ed.) Prentice Hall of India Pvt. Ltd., New Delhi.

Website Sources:

- <http://www.ecourses.icar.gov.in/>
- <http://www.agrimoon.com/>
- <http://www.ekrishishiksha/>
- <http://www.ecoursesonline.iasri.res.in/>
- <http://www.iaritoppers.com/>
- <http://www.agriglance.com/>
- <http://www.agritech.tnau.ac.in/>

BAG156

Soil Science Lab

L: T: P 0:0:1

List of Experiments. Minimum 08 of the following-

1. Identification and application of important tools and equipment in Soil Science laboratory.
2. Identification of Rocks, Minerals and Different soil.
3. Methods of collection of soil sample for analysis
4. Study of soil profile and horizons.
5. Determination of bulk density of soil.
6. Determination of particle density of soil.
7. Procedure and calculation of soil moisture by gravimetric method.
8. Methods of soil texture determination.
9. Estimation of soil pH.
10. Estimation of Electrical conductivity of soil.

BAG107 Introductory Agro-meteorology and Climate change L: T: P 3:0:0

Objective: To impart knowledge about agro-metrology and crop weather forecasting to meet the challenges of aberrant weather condition.

Unit I

Meaning and scope of agricultural meteorology; Earth atmosphere- its composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind: types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze;

Unit II

Nature and properties of solar radiation, solar constant, depletion of solar radiation short wave, long wave and thermal radiation, net radiation, albedo; Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature,

Unit III

Energy balance of earth; Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud; Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification; Artificial rainmaking. Monsoon- mechanism and importance in Indian agriculture,

Unit IV

Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold-wave. Agriculture and weather relations; Modifications of crop microclimate, climatic normals for crop and livestock production.

Unit V

Weather forecasting- types of weather forecast and their uses. Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture.

Course Outcomes:

Students completing this course will be able to:

- Understand the atmosphere of earth and its various components.
- Understand weather variables such as pressure, temperature, wind, solar radiation and their impact on agricultural crop production.
- Understand the precipitation and its different forms and concept of artificial rain making.
- Understand different weather hazards and their impact on agricultural crop production.
- Understand the concept of weather forecasting and climate change and its application for successful crop production.

References

1. Burrough, P.A. 1986. Principles of Geographical Information System for Land Resources Assessment. Clarendon press, Oxford, Univ. press.
2. Mavi, H.S. 1986. Introduction to Agro-meteorology (2nd Ed.). Oxford and IBH Pub. Co. Pvt. Ltd., New Delhi.
3. Panda, B.C. 2005. Remote Sensing- Principles and Applications. Viva Books Pvt. Ltd., New Delhi.

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- <http://du.ac.in/du/uploads/Revi>
- <https://agrimoon.com>
- <http://agcollegejagtial.weebly.com/>
- <https://iasri.icar.gov.in/>
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BAG157

Agro-meteorology and Climate Change Lab.

L:T: P 0:0:1

List of Experiments. Minimum 08 of the following-

1. Visit of Agro Meteorological Observatory, site selection of observatory, exposure of instruments and weather data recording.
2. Measurement of total, shortwave and long wave radiation, and its estimation using Planck's intensity law.
3. Measurement of albedo and sunshine duration, computation of Radiation Intensity using BSS.
4. Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis.
5. Measurement of soil temperature and computation of soil heat flux.
6. Determination of dew point temperature, vapor pressure and relative humidity.
7. Measurement of atmospheric pressure and analysis of atmospheric conditions.
8. Measurement of wind speed and wind direction, preparation of wind rose.
9. Measurement, tabulation and analysis of rainfall.
10. Measurement of open pan evaporation and evapo - transpiration.
11. Computation of PET and AET.

BAG108 Fundamentals of Agricultural Extension Education L: T: P 3:0:0

Objective: To inculcate the fundamental knowledge of agricultural extension education in order to extend science and technology of Agriculture amongst farmers.

Unit I

Education: Meaning, definition & Types; Extension Education- meaning, definition, scope and process; objectives and principles of Extension Education; Extension Programme planning-Meaning, Process, Principles and Steps in programme development.

Unit II

Extension systems in India: extension efforts in pre-independence era (Sriniketan, Marthandam, Firka Development Scheme, Gurgaon Experiment, etc.) and post-independence era (Etawah Pilot Project, Nilokheri Experiment, etc.); various extension/ agriculture development programmes launched by ICAR/Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND,NATP, NAIP, etc.). New trends in agriculture extension: privatization extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems, etc.

Unit III

Rural Development: concept, meaning, definition; various rural development programmes launched by Govt. of India. Community development-meaning, definition, concept & principles, Philosophy of C.D.

Unit IV

Rural Leadership: concept and definition, types of leaders in rural context; extension administration: meaning and concept, principles and functions. Communication: meaning and definition; Principles and Functions of Communication, models and barriers to communication Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programmes;

Unit V

Transfer of technology: concept and models, capacity building of extension personnel; extension teaching methods: meaning, classification, individual, group and mass contact methods, ICT Applications in TOT (New and Social Media), media mix strategies; Agriculture journalism; diffusion and adoption of innovation: concept and meaning, process and stages of adoption, adopter categories.

Course outcomes:

At the end of the course, students will be able to understand –

- Extension Education Programme planning. Process, Principles and Steps in programme development.
- Extension systems in India: Extension efforts in Pre- and post-independence era.

- New trends in agriculture extension: privatization of extension.
- Monitoring and evaluation – concept and definition, monitoring, and evaluation of Extension programmes, Transfer of Technology- Concept and models
- Role and importance of communication to interact with farmers and others.

References:

1. Dharma, O.P. and Bhatnagar, O.P (2003). Education and Communication for Development Oxford, IBH, New Delhi.
2. Desai, A.R. (2003). Rural Sociology in India. Popular Prakashan, Bombay.
3. Ensminger, Douglas (1957), A guide to Community Development, Ministry of Community Development, Government of India, Coronation Printing Works, Fatehpuri, Delhi-6.
4. Khana, B.S. (1991). Rural Development in South Asia-India. Deep and Deep Publication, New Delhi
5. Ray, G.L. 2006. Extension Communication and Management, New Delhi, Kalyani Publishers.
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BAG109

Principle of Food Science and Nutrition

L: T: P 3:0:0

Objective:

- To acquaint with importance of various foods and nutrients with different techniques used in processing and preservation.
- To understand the relationship between food, nutrition and health.
- To understand digestion, absorption, functions and food sources of various nutrients.
- To appreciate the concept of balanced and healthy diets.
- To be able to plan and prepare meals and nutritious dishes for various age groups.

Unit-I

Concepts of Food Science & Technology, Food and nutrition, Malnutrition (over and under nutrition), nutritional disorders; Energy metabolism (carbohydrate, fat, proteins); Balanced/ modified diets, Menu planning, New trends in food science and nutrition.

Unit-II

Principles and methods of food processing and preservation (use of heat, low temperature, chemicals, radiation, drying etc.).

Unit-III

Cereals: Composition of Cereals, pulses and oil seeds; Rice- Traditional and modern methods of rice milling. Wheat: Types of wheat, milling of wheat. Corn: Wet and dry milling, Barley- Malting and milled products. Pluses: Milling of pulses

Unit-IV

Egg and poultry: Composition of whole egg, egg white and yolk; preservation and processing of eggs; Meat: Composition of meat, types of meat proteins; tenderization of meat; curing, ageing and smoking of meat; cooking methods and changes during cooking, Fish: types, Composition, preservation methods- sun drying, pickling, freezing, canning; chemical and microbiological changes during storage.

Unit-V

Food Additives: Definition and types- preservatives; salt and sugar and their role in food preservation. Food packaging: Functions of packaging materials, definition of edible, biodegradable, active, aseptic, modified atmospheric package.

Course Outcomes:

The Students will be able to:

- Appreciate the relationship between food, nutrition and health.
- Explain digestion, absorption, functions and food sources of various nutrients.
- Understand the concept of balanced diets and menu planning.

- Understand the physicochemical properties of cereals, pulses, eggs, meat, fish and their products.
- Describe different methods of cooking and ways to prevent nutrient losses.
- Plan and prepare meals and nutritious dishes for various age groups.
- Understand the concept of food additives and food packaging system.

References:

1. De, S. 2002. Outlines of Dairy Technology. (1st ed.). Oxford University Press. New Delhi.
2. Khader, V. 2001, Text Book of Food Science and Technology. (1st ed.). ICAR New Delhi
3. Kalia, M and Sood, S. 1999, Food preservation and processing. (1sted.). Kalyani Publishers Ludhiana.
4. ShakuntlaManay, N and Shadaksharaswamy, M. Food Science: Facts and Principles (1sted.). New Age International, New Delhi.
5. Potter, N. N. 1996. Food Science. (5th ed). CBS Publisher & Distributions, New Delhi.

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- <https://www.futurelearn.com/courses/food-science-and-nutrition>

BAG159

Food Science sand Nutrition Lab

L:T: P 0:0:1

List of Experiments. Minimum 08 of the following-

1. Orientation to working in a food laboratory
2. To clean and sterilize all glassware's.
3. Estimation of pH and acidity of different food samples
4. To determine the specific gravity of given fats and oils sample.
5. Physical test of grain quality.
6. Estimation of Gluten Content of flour
7. Demonstration of the Soxhlet method for determination of fat content.
8. Demonstration of the Kjeldahl's method for estimation of protein content.
9. Study quality characteristics of foods preserved by drying/dehydration/ freezing.
10. Nutritional labeling of food products.
11. Testing of Food Packaging material.
12. Visit to any Food Processing industry.

BAG110

Elementary Biology

L: T: P 3:0:0

Objective: To impart the basic information on biological aspects relates to agricultural sciences.

Unit I

Introduction to the living world, diversity and characteristics of life, origin of life, Evolution and Eugenics.

Unit II

Binomial nomenclature and classification

Unit III

Cell and cell division.

Unit IV

Morphology of flowering plants. Seed and seed germination.

Unit V

Plant systematic- viz; Brassicaceae, Fabaceae and Poaceae. Role of animals in agriculture

Course outcomes:

After completion of this course students will be able to

- Understand the fundamental of biology
- Understand the system of binominal nomenclature and classification of living beings
- Know about the body's basic unit cell and its division
- Understand the morphology of the plants and role of animal in agriculture.

References:

1. Bendre, A. and Kumar, A. A text book of practical Botany. Vol.1 (8th Ed.) and Vol. II (6th Ed.). Rastogi publ. Meerut.
2. Dutta, A.C. A class book of Botany.
3. Ganguly, H.C., Das, K.S. and Dutta, C. College Botany. Vol. I and II. New Central Book Agency, Calcutta.
4. Lal, S.S. Practical Zoology: Vertebrates. Rastogi Publ., Meerut.
5. Singh, V., Pandey, P.C. and Jain, D.K. (1st Ed.) A text book of Botany (Complete). Rastogi publ. Meerut.

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BMAG104**Elementary Mathematics****L: T: P 3:0:0**

Objective: - The main aims of this course are to recall and remember basics of coordinate geometry, calculus, matrices and determinant. The focus of the course to understand the concepts of basic mathematical methods to solve problems and analyze in agriculture problems and evaluate the results.

Unit I

Straight lines: 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, Slope-point form, Two points form of equation of line, Intercept form, Normal form, General form of equation of line, Point of intersection of two straight lines, Angles between two straight lines, Parallel lines, Perpendicular lines, Angle of bisectors between two lines, Area of triangle and quadrilateral.

Unit II

Circle: 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 (x_1, y_1) & (x_2, y_2) , Tangent and Normal to a given circle at given point (Simple problems), Condition of tangency of a line $y = mx + c$ to the given circle $x^2 + y^2 = a^2$.

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. Maxima and Minima of the functions of the form $y = f(x)$ (Simple problems based on 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

Matrices and Determinants: Definition of Matrices, Addition, Subtraction, Multiplication, Transpose and Inverse up to 3rd order, Properties of determinants up to 3rd order and their Evaluation

Course Outcomes:

The student is able to

- Remember terminologies and formulae of Coordinate Geometry, calculus and matrices.
- Understand and interpret the concepts of Coordinate Geometry, calculus and matrices.
- Compare and analyze the methods in Coordinate Geometry, calculus and matrices.
- Predict and evaluate the problems in Coordinate Geometry, calculus and matrices.

References:

1. Mathematics Class -XI: NCERT.
2. Mathematics Class –XII: Part I, NCERT.
3. Mathematics Class –XII: Part II, NCERT.
4. Mathematics Class- XI: R.D. Sharma, Sultan Chand & Sons.
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- en.wikipedia.org

PSD101

PROFESSIONAL SKILL DEVELOPMENT-I

L:T: P 4:0:0

Course Objectives: The objectives of Professional Skill Development-I are:

- To develop knowledge and understanding of grammar.
- To develop abilities to make use of the grammar in own writing English.
- To increase understanding and recall of what is read and listen including facts and main idea.
- To enhance competencies in writing paragraph, gist or abstract/précis of the passage in own words/ language and in writing resume, bio-data, letters and applications of different kinds.
- To develop all the four skills of English language.

Unit I

Basic Applied Grammar and Usage

The Sentences: Parts – Subject and Predicate; Kinds of Sentences and their Transformation. Parts of Speech. Noun: Kinds; Gender; Case; Number; Usage. Pronouns: Definition; Kinds; Usage. Adjectives: Kinds, Degrees of Comparison, Transformation of Degrees. Determiners: Kinds: many, many a, a great many; less and fewer; each and every; elder, eldest and older, oldest; much, many; little, a little, the little. Articles: Kinds, Articles and Number system, Articles and Gender system, Omission of Articles, Repetition of Articles. Verbs: Kinds; Auxiliaries: Principal Auxiliaries; Modal Auxiliaries; Semi-Modals; Usage

Unit II

Basic Applied Grammar Continued

Non-Finite Verbs: Kinds; Infinitives; Gerund; Participle. Adverbs: Kinds and Usage. Prepositions: Kinds and Usage. Conjunctions: Kinds; Usage. Interjections: Definition; Usage.

Unit III

Clauses and Phrases, Tenses, Active and Passive Voice, Direct and Indirect Speech

Unit IV

Précis Writing: Techniques of Précis Writing; examples. Paragraph Writing: Structure of Paragraph, Construction of Paragraphs; Techniques of Paragraph Writing: Unity, Coherence, Emphasis. Reading Comprehension. Listening Comprehension.

Unit V

Writing of Resume, Bio-Data. Writing of Letters and Applications: Formats; Elements; Kinds: Leave Applications, Job Applications, Order Letters, Letters of Claims and Complaints, Letters of Adjustment.

Course Outcomes:

Students completing this course will be able to:

- Write paragraph, gist or abstract/précis of the passage in own words/ language and resume, bio-data, letters and applications of different kinds.
- Use targeted grammatical structures meaningfully and appropriately in oral and written production.
- Enhance competence in the four modes of literacy: writing, speaking, reading & listening.

- Understand and recall of what is read and listen including facts and main idea.

References:

1. Remedial English Language by Malti Agarwal, Krishna Publications, Meerut.
2. Professional Communication by Malti Agarwal, Krishna Publications, Meerut.
3. High School English Grammar & Composition by Wren & Martin, S. Chand & Company LTD., New Delhi.

Website Sources:

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- www.englishgrammar.org
- www.usingenglish.com
- www.grammarly.com

BCS 151 Computer Lab L:T: P 0:0:2

List of Experiments. Minimum 08 of the following-

1. To create a resume in MS – word
2. Prepare a time table of your class in MS – word
3. To create a cover page of a project report
4. Prepare 5 slides in MS – Power Point about fundamentals of computer
5. Create an E mail. Id in gmail.com. and operate it
6. To create a work sheet with four column, enter 10 records and find the sum of all columns
7. To create a report containing the pay details of the employee
8. To create a student result sheet in MS excel
9. To create a pie chart for a sample data in MS excel
10. To create sample table in MS access for result processing

BAG207

Weed Management

L: T: P 3:0:0

Objective:

- To study about the weed habitat, types of weeds, weed dissemination, weed management, IWM, different herbicides and their mode of action.
- Be able to define a weed and its stages of development, differences between weeds, cultural weed controls, advantages and disadvantages of the various methods of herbicide applications, herbicide carryover and how to prevent it.
- Know about the herbicide adjuvant.

Unit I

Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem. Classification, reproduction and dissemination of weeds.

Unit II

Concepts of weed prevention, control and eradication; Methods of weed control: physical, cultural, chemical and biological methods. Integrated weed management.

Unit III

Herbicide classification, concept of adjuvant, surfactant, herbicide formulation and their use. Introduction to mode of action of herbicides and selectivity. Allelopathy and its application for weed management.

Unit IV

Bio-herbicides and their application in agriculture. Concept of herbicide mixture and utility in agriculture. Herbicide compatibility with agro-chemicals and their application.

Unit V

Integration of herbicides with non-chemical methods of weed management. Herbicide Resistance and its management.

Course Outcomes:

- Students will able to differentiate the crop and weed plants.
- Students will able to identify the origin, distribution, propagation, dispersal and management methods of weeds.
- Understand the herbicides uses and their mode of action.
- Understand about the herbicide resistance and how to minimize risk of it.
- Understand the benefits of integrated weed management.

References:

1. Gupta, O.P. (2000): Modern Weed Management, Agrobios Publishers.

2. Gupta, O.P. (2007): Weed Management, Principles and Practices, Agrobios
3. Rao, V.S. (2007): Principles of Weed Science, Oxford & IBH
4. Zimdahl, R.L. (1999): Fundamentals of Weed Sciences 2nd Ed. Academic Press.
5. Devine, Duke and Fedtke (1988): Physiology of Herbicide action
6. U.S. Walia (1990): Weed management, Kalyani Publishers, New Delhi.
7. Saraswat, V.N.; Bhan, V.M. & Yaduraju, N.T. (2003): Weed Management, ICAR
8. Streibig, J.C. and Kudsk, P. (1993): Herbicide Bioassays, CRC Press Inc.
9. Naylor, R.E.L. (2002): Weed Management Blackwell Publishing Co

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- <http://www.agriglance.com>

BAG257

Weed Management Lab

L:T: P 0:0:1

List of Experiments. Minimum 08 of the following-

1. Study of weed identification and their losses.
2. Biology of important weeds.
3. Techniques of weed preservation.
4. Study of herbicide formulations and their mixtures.
5. Study of herbicides and agro-chemicals.
6. Shift of weed flora study in long term experiments.
7. Study of methods of herbicide application, spraying equipment.
8. Calculations of herbicide doses.
9. Calculation of weed control efficiency and weed index.

BAG208

Fundamentals of Genetics

L: T: P 3:0:0

Objective: This course is aimed at understanding the basic concepts of genetics, helping students to develop their analytical, quantitative and problem-solving skills from classical to molecular genetics.

Unit-I

Pre and Post Mendelian concepts of heredity, Mendelian principles of heredity. Architecture of chromosome; chromonemata, chromosome matrix, chromomeres, centromere, secondary constriction and telomere; special types of chromosomes. Chromosomal theory of inheritance- cell cycle and cell division- mitosis and meiosis.

Unit-II

Chi-square. Gene interaction, Multiple alleles, Sex determination and sex linkage, sex limited and sex influenced traits, Blood group genetics, Linkage and its estimation, crossing over mechanisms, chromosome mapping.

Unit-III

Structural and numerical variations in chromosome and their implications, use of haploids, di-haploids and doubled haploids in Genetics. Mutation, classification, Methods of inducing mutations & CIB technique, mutagenic agents and induction of mutation.

Unit-IV

Qualitative and Quantitative traits, multiple factor hypotheses, Cytoplasmic inheritance, Genetic disorders, Nature, structure & replication of genetic material.

Unit-V

Protein synthesis, Transcription and translational mechanism of genetic material, Gene concept: Gene structure, function and regulation, Lac and Trypoperons.

Course Outcomes:

- To understand the basic knowledge of plant genetics and increasing the ability to predict what disorders a person is likely to develop.
- The process of genetic inheritance (the transmission of characteristics or qualities from parents to offspring) allows farmers and breeders to improve food security by increasing both yield and the nutritive qualities of crop varieties and livestock breeds.

- The chief outcome of genetics; Genetic manipulation is a process of transferring (Genes) characters that are desirable from one plant to another plant. This is done for production of varieties with desirable characteristics like profuse branching in fodder crops, high yielding varieties in different crops.

References:

1. Chopra, V.L. 1990 Plant Breeding: Theory and Practices. Oxford and IBH pub. Co. Pvt. Ltd, New Delhi.
2. Choudhari, T.C. 1982. Introduction to Plant Breeding. Oxford A& IBH Publishing Co.,New Delhi.
3. Harihar Ram and Singh, H.G. 1994. Crop Breeding and Genetics. Kalayani Pub., New Delhi.
4. Phundan Singh, 1996. Essentials of plant breeding Kalyani Publishers. New Delhi/ Ludhiana.
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BAG258

Genetics Lab

L:T: P 0:0:1

List of Experiments. Minimum 08 of the following-

1. Study of microscope.
2. Study of cell structure.
3. Practice on mitotic and meiotic cell division.
4. Experiments on mono-hybrid, di-hybrid, tri-hybrid, test cross and back cross.
5. Study of Chi-square test.
6. Determination of linkage and crossing-over analysis (two-point test cross and three Point test cross).
7. Study on sex linked inheritance in *Drosophila*.
8. Study of models on DNA and RNA structures.
9. Study of qualitative and quantitative characters.

BAG209 Production Technology of Fruit and Plantation Crops L: T: P 3:0:0

Objective: To make the students aware about scientific production technology of fruit and plantation crops of different growing regions.

UNIT-I

Importance and scope of fruit and plantation crop industry in India; Classification of fruit and plantation crops, Plant propagation-methods and propagating structures; Importance of rootstocks; rootstock and scion relationship.

UNIT-II

Principles of orchard establishment; Principles and methods of training and pruning, juvenility and flower bud differentiation; unfruitfulness; pollination and fertilization; pollinizers and pollinators; polyembryony and parthenocarpy.

UNIT-III

Production technologies for the cultivation of major fruits-mango, banana, citrus, grape, guava, litchi, papaya, sapota, apple, pear, peach, walnut, almond.

UNIT-IV

Production technologies for the cultivation of minor fruits- date palm, ber, bael, pineapple, pomegranate, jackfruit, carambola, karonda, mulberry, phalsa, kiwi fruit, strawberry.

UNIT-V

Production technologies for the cultivation of plantation crops-coconut, cashew nut, arecanut, tea, coffee, cocoa, rubber, betel vine.

Course outcomes:

On the completion of the course, students will be able to:

- To know the importance of different fruit crops and plantation crops.
- Understand the scientific cultivation methods of different fruit crops like Mango, Banana, Guava, Pomegranate, Lime, Lemon, Sweet Orange, Sapota, Apple, Strawberry etc.
- Understand the scientific cultivation methods of plantation crops like Coconut, Areca nut, Tea, Coffee, rubber, Cashew nut, Oil palm etc.
- To know about different propagation techniques in fruit crops.
- To know about canopy management of different fruit crops.

References:

1. Bal, J.S., 1998. Fruit Growing. Kalyani Publication. Ludhiana (Punjab).
2. Bose, T.K. and Mitra, S.K. 1990. Fruits: Tropical and Sub-tropical, NayaPrakash, Calcutta.
3. Chadha, K.L. 2006. Handbook of Horticulture. Directorate of Information and Publications of Agriculture, ICAR, KAB, Pusa, New Delhi.
4. Kumar, N.; Khader, J.B.M., Rangaswami, P. and Irulappan, I. 1990. Introduction to spices, Plantation (crops), Medicinal and Aromatic Plants. Raja Lakshmi Publication, Nagercoli.
5. Mitra, S.K., Bose, T.K. and Rathore, D. 1990. Temperate Fruits. Horticulture and Allied Publishers, Calcutta

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BAG259

Fruit and Plantation Crops Lab

L:T: P 0:0:1

List of Experiments. Minimum 08 of the following-

1. Identification of garden tools and fruit crops.
2. Preparation of seed bed/ nursery bed.
3. Practice of sexual and asexual methods of propagation.
4. Techniques of micro-propagation in fruit and plantation crops.
5. Layout and planting of orchard.
6. Training and pruning of fruit trees.
7. Fertilizer application in fruit and plantation crops.
8. Selection of mother palm and seed nut in coconut.
9. Rejuvenation techniques in mango and litchi.
10. Study of products and by-products of fruits and plantation crops.
11. Visit to commercial orchards.

BAG210

Fundamentals of Plant Pathology

L: T: P 3:0:0

Objective: To study the disease (s) or disorders caused by biotic or abiotic agent, mechanism of disease development, interaction between the causal agent and host in relation to environmental conditions and develop strategies for disease management.

Unit-I

Introduction: Importance of plant diseases, scope and objectives of Plant Pathology. History of Plant Pathology with special reference to Indian work. Terms and concepts in Plant Pathology, classification of plant diseases

Unit-II

Important plant pathogenic organisms, different groups: fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasmas, viruses, viroids, algae and protozoa. Diseases and symptoms due to abiotic causes.

Unit-III

Fungi: general characters, definition of fungus, somatic structures, types of fungal thalli, fungal tissues, modifications of thallus, reproduction (asexual and sexual). Nomenclature, Binomial system of nomenclature, rules of nomenclature, classification of fungi. Key to divisions, sub-divisions, orders and classes

Unit-IV

Bacteria and mollicutes: general morphological characters. Basic methods of classification and reproduction. Viruses: nature, structure, replication and transmission. Study of phanerogamic plant parasites. Nematodes: General morphology and reproduction, classification, symptoms and nature of damage caused by plant nematodes (Heterodera, Meloidogyne, Anguina, Radopholusetc.)

Unit-V

Liberation / dispersal and survival of plant pathogens. Types of parasitism and variability in plant pathogens. Pathogenesis. Role of enzymes toxins and growth regulators in disease development. Defense mechanism in plants. Epidemiology: Factors affecting disease development. Principles and methods of plant disease management. Nature, chemical combination, classification, mode of action and formulations of fungicides and antibiotics.

Course outcomes:

- Student will know about concept of disease, causal agents of plant diseases, mechanism of disease development,
- Students will know about interaction between the causal agent and host in relation to environmental conditions and identification
- Methods and management of crop diseases.

References:

1. Singh, R.S. 1989, Plant Pathogens-The prokaryotes, Oxford and I.B.H Pub.Co Pvt. Ltd., New Delhi.
2. Singh, R.S. 1989, Plant Pathogens- The Virus, Oxford and I.B.H pub.Co Pvt. Ltd., New Delhi.
3. Singh, R.S. 1990, Plant Pathogens-The Fungi Oxford and I.B.H pub.Co Pvt. Ltd., New Delhi.
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- <https://iasri.icar.gov.in/>
- <http://www.agrilance.com>

BAG260

Plant Pathology Lab

L:T: P 0:0:1

List of Experiments. Minimum 08 of the following-

1. Acquaintance with various laboratory equipment and microscopy.
2. Methods of collection and preservation of disease specimen.
3. Preparation of media, isolation and Koch's postulates. General study of different structures of fungi.
4. Study of symptoms of various plant diseases.
5. Staining and identification of plant pathogenic bacteria.
6. Mechanical (Sap) transmission of plant viruses.
7. Study of phanerogamic plant parasites.
8. Study of fungicides and their formulations.
9. Methods of pesticide application and their safe use.

BAG211

Fundamentals of Crop Physiology

L: T: P 3:0:0

Objective: To study the physiological aspects of crops, contribute a major role in growth and development in plants

Unit-I

Introduction to crop physiology and its importance in Agriculture; Plant cell: An Overview; Diffusion and osmosis; Absorption of water, transpiration and Stomatal Physiology.

Unit-II

Mineral nutrition of Plants: Functions and deficiency symptoms of nutrients, nutrient uptake mechanisms; Photosynthesis: Light and Dark reactions, C3, C4 and CAM plants.

Unit-III

Respiration: Glycolysis, TCA cycle and electron transport chain; Fat Metabolism: Fatty acid synthesis and Breakdown

Unit-IV

Plant growth regulators: Physiological roles and agricultural uses, Physiological aspects of growth and development of major crops.

Unit-V

Growth analysis, Role of Physiological growth parameters in crop productivity.

Course Outcomes:

Students completing this course will be able to:

- Define plant cell and its physiological functions.
- Understand different physiological functions in a cell such as photosynthesis, respiration, osmosis, diffusion, fatty acid synthesis and breakdown.
- Understand the physiological roles and commercial use of Plant Growth Regulators in agriculture.
- Understand the methods and formulas used for growth analysis in crops.
- Apply the knowledge of plant physiology to have better understanding science behind agronomic practices in different crops.

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3. Taiz, L. & Ziger, E. 2010. Plant Physiology. (5th Ed.). Sinauer Associates.
4. Gupta, N.K. and Sunita Gupta. 2002. Plant Physiology. Oxford & IBH Publishing Co.Pvt.Ltd. NewDelhi.
5. Malick, C.P. and Srivastava, A.K. 2000. Text book of Plant Physiology. Kalyani publishers, New Delhi.

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BAG261

Crop Physiology Lab

L:T: P 0:0:1

List of Experiments. Minimum 08 of the following-

1. Study of plant cell.
2. Study of imbibition, osmosis and plasmolysis.
3. Study of structure and distribution of stomata.
4. Measurement of root pressure.
5. Measurement of rate of transpiration.
6. Separation of photosynthetic pigments through paper chromatography.
7. Rate of transpiration, photosynthesis, respiration, tissue test for mineral nutrients.
8. Estimation of relative water content.
9. Measurement of photosynthetic CO₂ assimilation by Infra-Red Gas Analyzer (IRGA).

BAG212 Fundamentals of Agricultural Economics, Farm and Natural Resources Management **L: T: P 3:0:0**

Objective: Students will able to get basic knowledge industrial market research and economic analysis of competing companies.

Unit-I

Agricultural economics: meaning, definition, characteristics of agriculture, importance and its role in economic development. Agricultural planning and development in the country. *Demand*: meaning, law of demand, schedule and demand curve, determinants, utility theory; law of diminishing marginal utility, equi-marginal utility principle. Consumer's equilibrium and derivation of demand curve, concept of consumer surplus. Elasticity of demand: concept and measurement of price elasticity, income elasticity and cross elasticity.

Unit-II

Meaning and concept of cost, types of costs and their interrelationship, importance of cost in managing farm business and estimation of gross farm income, net farm income, family labour income and farm business income. Concept of risk and uncertainty occurs in agriculture production, nature and sources of risks and its management strategies, Crop/livestock/machinery insurance weather-based crop insurance, features, and determinants of compensation.

Unit-III

Meaning and concept of farm management, objectives and relationship with other sciences. Meaning and definition of farms, its types and characteristics, factor determining types and size of farms. Principles of farm management: concept of production function and its type, use of production function in decision-making on a farm, factor-product, factor-factor and product- product relationship, law of equi-marginal/or principles of opportunity cost and law of comparative advantage. Production: process, creation of utility, factors of production, input output relationship. Laws of returns: Law of variable proportions and law of returns to scale

Unit-IV

Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises. Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain on farm, farm inventory, balance sheet, profit and loss accounts. Meaning and importance of farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting-linear programming, appraisal of farm resources, selection of crops and livestock's enterprises.

Unit-V

Concepts of resource economics, differences between NRE and agricultural economics, unique properties of natural resources. Positive and negative externalities in agriculture, Inefficiency and welfare loss, solutions, Important issues in economics and management of common property resources of land, water, pasture and forest resources etc. *National income*: Meaning and importance, circular flow, concepts of national income

Course Outcome: At the end of the course, a student will be able to understand –

- The course contains a comprehensive treatment of the traditional agricultural production economics topics employing both detailed graphics and differential calculus.
- Focus on the neoclassical factor-product, factor-factor and product- product models, and is suitable for an advanced undergraduate or a beginning graduate –level course in static production economics.
- Understand limited resources available in the economy. Realize the need to exploit and utilize through development and improvement of production techniques.
- Make them aware of the availability of rich natural endowments to achieve sustainable agricultural development with this knowledge they can challenge the problems of unemployment inequality shortage of food productions, poverty and be useful to compete advanced agricultural economies.
- Gain knowledge of the causes of regional variations in productivity and production, social and economic inequality, size of land holdings and lack of quality inputs etc. And suggest appropriate measures for the whole economy.

References:

1. Barlowe, R. 1972. Land Resource Economics. Prentice Hall Inc., London.
2. Johl, S. S.andKapoor, T. R. 1991. Fundamentals of Farm Business Management.Kalyani Publishers, Ludhiana.

3. Kerr, J. M., Marothia, D. K., Singh, Katar, Ramaswamy, C. and Bently, Willam, R. (Ed.) 1997. Natural Resource Economics – Theory and Application in India. Oxford and I.B.H., Pub. Co.Pvt. Ltd., New Delhi.
4. McConnell, D. J. and Dillo, J. L. 1997, Farm Management for Asia: a system approach. Food and Agriculture Organization of the United Nations, Rome.
5. Seneca Joseph, J. and TaussingMicheal, K. 1974. Environmental Economics. Prentice Hall Inc., London.
6. Sharma, A. N. and Sharma, V. K. 1981. Elements of Farm Management. VaigyanikEvamTaknikiShabdawaliAyog, New Delhi.
7. Singh, I. J. 1977. Elements of Farm Management Economics. Affiliated East West Press Pvt. Ltd., New Delhi.
8. Bishop, C.E. and W. D. Tousaint. (1958). Introduction to Agricultural Economic Analysis. John Wiley and Sons, London.
9. Heady, Earl O. 1964. Economics of Agricultural Production and Resource Use. Prentice Hall of India, Private Limited, New Delhi
10. Kahlon, A.S. and Karam Singh. 1965. Principles of Farm Business Management. Kalyani Publishers, New Delhi.
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BAG213 Renewable Energy and Green Technology L: T:P 3:0:0

Objective: To train graduates with adequate knowledge of renewable energy sources and its utilization for human benefits.

Unit I

Energy sources, Introduction, Classification, Energy from Biomass, Types of biogas plants, constructional details, Biogas production and its utilization,

Unit II

Agricultural wastes, Principles of combustion, pyrolysis and gasification, Types of gasifiers, Producer gas and its utilization; Briquettes, Types of Briquetting machines, uses of Briquettes.

Unit III

Solar energy, Solar flat plate collectors, Solar air heaters, Solar space heating and cooling, Solar energy applications / Solar energy gadgets, Solar cookers, Solar water heating systems, solar grain dryers, Solar Refrigeration system, solar lantern, Solar street lights, solar fencing, Solar pumping systems.

Unit IV

Wind energy, Type of wind mills, Constructional details & application of wind mills.

Unit V

Liquid Bio fuels, Bio diesel and Ethanol from agricultural produce, its production & uses.

Course Outcomes:

Students completing this course will be able to:

- Understand different sources of energy available naturally.
- Understand the concept of production of biogas and its utilization in agricultural farms.
- Understand the alternate and constructive use of agricultural waste.
- Understand the utilization of solar and wind energy for various agricultural operations.
- Understand the production of different fuels such as biofuel, biodiesel, bio diesel etc. from agricultural products.

References:

1. Bansal, N. K., Kleemann, M and Meliss, M 1990. Renewable Energy sources and Conversion Technology. Tata McGraw Hill Pub., New Delhi.

2. Pateriya, R.N. 2007. Agri Industries and Appropriate Technology (Ist Ed.). MadhukarPrakashan, Agra.
3. Rai, G. D. 2010. Non-conventional Energy Sources (4th Ed.). Khanna Publishers, New Delhi.
4. Ojha, T.P. and A.M.Michael. Principles of Agricultural Engineering, Vol.I. Jain Brothers New Delhi.3rd Edition 2001.
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BAG307

Crop Production Technology -I (Kharif)

L:T:P 3:0:0

Objective:

- To study about the origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Kharif* crops.
- To study about package and practices of Rabi crops.
- Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of following *Kharif* crops-

Unit-I

Cereals – Rice, maize, sorghum, pearl millet and finger millet,

Unit-II

Pulses-Pigeon pea, moonbeam and urdbean;

Unit-III

Oilseeds- Groundnut, and soybean;

Unit-IV

Fiber crops- Cotton, jute and sunhemp;

Unit-V

Forage crops-Sorghum, cowpea, cluster bean and Napier grass.

Course Outcomes:

- In the course study the students will be able to know about Soil and climatic requirements, varieties, cultural practices and yield of Kharif crops.
- Student will able to understand the preparation field for rising crop.
- Student will able to understand the package and practices of Rabi crops.
- Constraints in production of oilseeds and pulses maybe identified through course content.
- Students will able to understand the marketing of agricultural produces.
- Analysis of comparative benefits of the different kharif crops.

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1. Chatterjee, B.N. and Das, P.K. 1989. Forage Crop Production. Principles and Practices. Oxford and IBH Pub. Co. Pvt. Ltd., New Delhi.
2. De Datta, S.K. 1981. Principles and Practices of Rice Production. Inter Science Publication. John Wiley and Sons, New York.
3. Singh, C., Singh, P. and Singh, R. 2005. Modern Techniques of Raising Field Crops (II, Ed.). Oxford and IBH Pub. Co. Pvt. Ltd., New Delhi.
4. Maiti, S., Hedge, M.R. and Chattopadhyay, S.B. (1988). Hand Book of Annual Oilseed Crops. Oxford and IBH Pub. Co. Pvt. Ltd., New Delhi.

5. Prasad, R. Ed. (2005). Textbook of Field Crops Production. ICAR, New Delhi.
6. Yadav, R.L. (1993). Agronomy of Sugarcane- Principles and Practices. International Book Distributing Co. Lucknow.

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BAG357 Crop Production Technology of Kharif Crops Lab L:T: P 0:0:1

List of Experiments. Minimum 08 of the following-

1. Nursery preparation and transplanting of rice.
2. Sowing methods of soybean, pigeon pea and mung bean, maize, groundnut and cotton.
3. Effect of seed size on germination and seedling vigor of *kharif* season crops.
4. Effect of sowing depth on germination of *kharif* crops.
5. Identification of weeds in *kharif* season crops.
6. Top dressing and foliar feeding of nutrients.
7. Study of yield contributing characters and yield calculation of *kharif* season crops.
8. Study of crop varieties and important agronomic experiments at experimental farm.
9. Study of morphological description from experiments on forage crops.
10. Visit to research centers of related crops.

BAG308

Fundamentals of Plant Breeding

L:T:P 3:0:0

Objective: To impart theoretical knowledge and practical skills about plant breeding objectives, modes of reproduction and genetic consequences, breeding methods for crop improvement.

Unit-I

Historical development, concept, nature and role of plant breeding, major achievements and future prospects, modes of reproduction and apomixes, self-incompatibility and male sterility

Unit-II

Domestication, Acclimatization and Introduction, Centres of origin/ diversity, components of Genetic variation; Heritability and genetic advance; Genetic basis and breeding methods in self- pollinated crops - mass and pure line selection, hybridization techniques and handling of segregating population; Multiline concept. Concepts of population genetics and Hardy-Weinberg Law

Unit-III

Genetic basis and methods of breeding cross pollinated crops, modes of selection; Population improvement Schemes Ear to row method, Modified Ear to Row, recurrent selection schemes;

Unit-IV

Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties; Breeding methods in asexually propagated crops, clonal selection and hybridization; Wide hybridization; Polyploidy in relation to plant breeding, mutation breeding-methods and uses;

Unit-V

Breeding for important biotic and abiotic stresses; Molecular markers and marker assisted selection. Participatory plant breeding; Intellectual Property Rights, Patenting, Plant Breeders and Farmer's Rights.

Course Outcomes:

- Students will able to understand the historiological development, achievements and future prospects of Plant breeding
- Students will understand about the different plant breeding methods uses in crop improvement

References:

1. Chopra, V.L. 1990 Plant Breeding: Theory and Practices. Oxford and IBH pub. Co. Pvt. Ltd, New Delhi.
2. Choudhari, T.C. 1982. Introduction to Plant Breeding. Oxford A& IBH Publishing Co., New Delhi.
3. Harihar Ram and Singh, H.G. 1994. Crop Breeding and Genetics. Kalyani Pub., New Delhi.
4. Singh, B.D. 2001. Fundamentals of Genetics. Kalyani Publishers. New Delhi. Ludhiana.

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BAG358

Plant Breeding Lab

L:T: P 0:0:1

List of Experiments. Minimum 08 of the following-

1. Study of Plant Breeder's kit.
2. Study of germplasm of various crops.
3. Study of floral structure of self-pollinated crops.
4. Study of floral structure of cross-pollinated crops
5. Emasculation and hybridization techniques in self-pollinated crops.
6. Emasculation and hybridization techniques in cross pollinated crops.
7. Study of male sterility and self-incompatibility system.
8. Handling of segregating populations.
9. To work out the mode of pollination in a given crop and extent of natural out-crossing.
10. Prediction of performance of double cross hybrids.
11. Maintenance of breeding records and data collection.

BAG309

Fundamentals of Entomology

L:T:P 3:0:0

Objective: To impart the basic knowledge on insects/pest of agricultural importance

Unit-I

History of Entomology in India. Major points related to dominance of Insecta in Animal kingdom. Taxonomy –importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order. Classification of class Insecta upto Orders, basic groups of present-day insects with special emphasis to orders and families of Agricultural importance

Unit-II

Morphology: Structure and functions of insect cuticle and molting. Body segmentation. Structure of Head, thorax and abdomen. Structure and modifications of insect antennae, mouthparts, legs, Wing venation, modifications and wing coupling apparatus. Structure of male and female genital organ.

Unit-III

Metamorphosis and diapause in insects. Types of larvae and pupae. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretary(Endocrine) and reproductive system, in insects. Types of reproduction in insects; Major sensory organs like simple and compound eyes, chemoreceptor.

Unit-IV

Categories of pests. Concept of IPM, Practices, scope and limitations of IPM. Classification of insecticides, toxicity of insecticides and formulations of insecticides. Chemical control-importance, hazards and limitations. Recent methods of pest control, repellents, anti-feed ants, hormones, attractants, gamma radiation. Insecticides Act 1968- Important provisions. Application techniques of spray fluids. Symptoms of poisoning, first aid and antidotes.

Unit-V

Importance of beneficial Insects, Beekeeping and pollinators, beebiology. Types of silkworm, voltinism and biology of silkworm, Rearing, mounting and harvesting of cocoons. Species of lac insect, morphology, biology, host plant, lac production, Insect orders bearing predators and parasitoids used in pest control and their mass

multiplication techniques; Important species of pollinator, weed killers and scavengers with their importance.

Course outcomes:

- Students will know history, Identification, classification, external and internal morphology, types of reproduction in insect and Importance of beneficial Insects.

References:

1. Chapman, R. F. 1981. The Insects Structure and Functions. Elsevier, New York.
2. Davies, R. C. 1988. Outline of Entomology (7thEd.) Chapman and Hall, London.
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BAG359

Entomology Lab

L:T: P 0:0:1

List of Experiments. Minimum 08 of the following-

1. Methods of collection and preservation of insects including immature stages.
2. External features of Grasshopper.
3. Types of insect antennae, mouthparts and legs.
4. Study of wing venation, types of wings and wing coupling apparatus.
5. Types of insect larvae and pupae.
6. Study of digestive system in insects (Grasshopper).
7. Study of male and female reproductive systems in insects (Grasshopper).
8. Study of characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance.
9. Visit to research and training institutions devoted to bee keeping sericulture, lac culture and natural enemies.
10. Identification and techniques for mass multiplication of natural enemies.

BAG310 Geoinformatics, Nano-Technology and Precision Farming L:T:P 3:0:0

Objective: To acquaint and equip the students with the concepts and techniques of precision farming, geo-informatics, remote sensing and its application in agriculture, simulation models use for optimization of agricultural inputs, use of nanotechnology and its application in agriculture to increase the agricultural productivity.

Unit-I

Precision farming: concepts and techniques; their issues and concerns for Indian agriculture; Geo-informatics- definition, concepts, tool and techniques; their use in precision farming.

Unit-II

Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendations in geospatial technologies; Spatial data and their management in GIS.

Unit-III

Remote sensing concepts and application in agriculture; Image processing and interpretation; Global positioning system (GPS), components and its functions;

Unit-IV

Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs; STCR approach for precision agriculture;

Unit-V

Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors, Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.

Course outcomes

- Knowledge about geo-informatics system and precision farming.
- Importance of remote sensing in agriculture.
- Role of GPS in agriculture.
- Knowledge about crop simulation models.
- Benefits of nanotechnology in nutrient management.

References

1. SR Reddy (2018). Geoinformatics and Nano-Technology for Precision Farming. Kalyani Publication, New Delhi.
2. AK Singh (2014). Precision Farming.
3. SK Mandal and A. Maity (2013). Precision farming for small agriculture farm: Indian Scenario. Ame. J. Expti. Agri 3(1): 200-217.
4. R. Smith (1999). Fundamentals principles of modeling and simulation.

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BAG360 **Geoinformatics, Nano-technology and Precision Farming Lab**

L:T: P 0:0:1

List of Experiments. Minimum 08 of the following-

1. Introduction to GIS software, spatial data creation and editing.
2. Introduction to image processing software.
3. Visual and digital interpretation of remote sensing images.
4. Generation of spectral profiles of different objects.
5. Supervised, unsupervised classification and acreage estimation.
6. Multi spectral remote sensing for soil mapping.
7. Creation of the matic layers of soil fertility based on GIS.
8. Creation of productivity and management zones.
9. Fertilizers recommendations based of VRT and STCR techniques.
10. Crop stress (biotic/abiotic) monitoring using geospatial technology.
11. Application of GPS for agricultural survey.
12. Formulation, characterization and applications of nano particles in agriculture.
13. Projects formulation and execution related to precision farming.

BAG311

Agricultural Microbiology

L:T:P 3:0:0

Objective: To impart knowledge of microbiology in special reference to soil and agriculture.

Unit-I

Introduction Microbial world: Prokaryotic and eukaryotic microbes.

Unit-II

Bacteria: cell structure, chemoautotrophy, photo autotrophy, growth. Bacterial genetics: Genetic recombination transformation, conjugation and transduction, plasmids, transposon.

Unit-III

Role of microbes in soil fertility and crop production: Carbon, Nitrogen, Phosphorus and Sulphur cycles.

Unit-IV

Biological nitrogen fixation- symbiotic, associative and asymbiotic. Azolla, bluegreen algae and mycorrhiza. Rhizosphere and phyllosphere.

Unit-V

Microbes in human welfare: silage production, biofertilizers, biopesticides, biofuel production and biodegradation of agro-waste.

Course Outcomes:

The student will be able to understand:

- Concept of microorganisms, Prokaryotic and eukaryotic microbes.
- Role of microbes in soil fertility and crop production
- Biological nitrogen fixation- symbiotic, associative and aysmbiotic.
- Azolla, blue green algae and mycorrhiza. Rhizosphere and phyllosphere.
- Microbes in human welfare.

References:

1. Collins, C.H. Lyrie, P.M. and Crang, J.M. 1989. Microbiological methods. Academic press, New York.
2. Pelczar, M.J. Chan, E.C.S. and Krieg, N.R. 1993. Microbiology (5th Ed.). McGraw hill pub. Co., New Delhi.
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BAG361

Agricultural Microbiology Lab

L:T: P 0:0:1

List of Experiments. Minimum 08 of the following-

1. Introduction to microbiology laboratory and its equipment's.
2. Microscope- parts, principles of microscopy, resolving power and numerical aperture.
3. Methods of sterilization.
4. Nutritional media and their preparations.
5. Enumeration of microbial population in soil- bacteria, fungi, actinomycetes.
6. Methods of isolation and purification of microbial cultures.
7. Isolation of *Rhizobium* from legume root nodule.
8. Isolation of *Azotobacter* from soil.
9. Isolation of *Azospirillum* from roots.
10. Isolation of BGA.
11. Staining and microscopic examination of microbes.

BAG312 Agriculture Cooperation and Business Management L: T:P 3:0:0

Objective: To acquaint with the concept of business operation, economic analysis of competing industries and trade and public relations.

Unit I

Agricultural Cooperation – Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significance of cooperatives in Indian agriculture.

Unit II

Agricultural Cooperation in India- credit, marketing, consumer and multi-purpose cooperatives, farmers' service cooperative societies, processing cooperatives, farming cooperatives, cooperative warehousing; role of ICA, NCUI, NCDC, NAFED.

Unit III

Business Management: Meaning of management, functions of management, role of managers and scope of management in agricultural business. Role and objectives in management references. Decision making by individuals as also by groups. Functional areas of management and their relationship with agriculture production, finance, marketing and human resources as coordination thereof.

Unit IV

Importance and nature of planning, useful generalization of planning forecasting technique with the help of a planning model, components of strategic management. Budgeting in A basic planning technique

Unit V

Time management, a technique for planning use of manager's own time. Leadership in Management, Types and Leadership for production, planning and control activities (inventory control quality control, cost control) and financial management, financial forecasting and planning acquisition of funds. Acquaintance of book-keeping and cash accounts(s). Knowledge of business environment for operation of bank account cheques, bank draft etc.

Course Outcome: At the end of the course the student should be able to

- Explain on agricultural finance and credit.
- Comprehend the role of sources involved in farm financing.
- Assess financial statements and project reports
- Describe the functionalities of co-operatives involved in farmers' service

- Clarify the role of national level cooperatives
- Analyze the functions of a financial institute

References:

1. Kahlon, A.S., Singh, Karam. Managing Agricultural Finance. Allied Publishers, New Delhi.
2. Reddy, S., Raghuram, P., Neelakantan, T.V and Bhavani D.I. 2004. Agricultural Economics. Oxford and IBH Publishers, New Delhi
3. Subba Reddy, S and P. Raghu Ram. 2017. Agricultural Finance and Management. Oxford & IBH Publishing Company Private Ltd., New Delhi, India.
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BAG313

Environmental Science

L:T:P 3:0:0

Objective: To aware and educate students regarding environmental issues and problems at local, national and international levels.

Unit I

Environment: Introduction, definition and components; relationship between different components; Man environment relationship; Impact of technology on the environment; Environmental degradation;

Unit II

Ecology and ecosystems: Introduction, Objectives and classification, concepts of an ecosystem structure and function of ecosystem; Components of ecosystem: Producers, consumers, decomposers;

Unit III

Bio-geo-chemical cycles: Hydrological cycle, carbon cycle, oxygen cycle, nitrogen cycle, sulfur cycle;

Unit IV

Energy flow in eco-system; Food chains: Grazing, detritus, food webs; Ecological pyramids; Major ecosystems: Forest ecosystem, Grassland ecosystem, desert ecosystem, aquatic ecosystem, estuarine ecosystem;

Unit V

Environmental pollution -Water pollution, Air pollution, Land and noise pollution Global warming and greenhouses effects, acid rain, depletion of ozone layer.

Course Outcomes:

- Students will be able to recognize the all components of the earth's system and understand how they function.
- Helpful to understand how technology effect environment.
- Knowledge about both living and nonliving things are important to our survival.
- Understand how energy transfer from one trophic level to another trophic level.
- Awareness about environmental pollution and its effect on living beings.

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1. Bharucha, E. 2005. Text book of Environmental Studies. University Grant Commission, University Press, New Delhi.
2. Chauhan, B.C. 2008 Environmental Studies. University Press, New Delhi.
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BAG407 **Crop Production Technology – II (Rabi)** **L:T:P 3:0:0**

Objective: To study about the origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of rabi crops. To study about package and practices of Rabi crops.

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops;

Unit-I

Cereals –Wheat and barley.

Unit-II

Pulses-Chickpea, lentil and field pea,

Unit-III

Oilseeds-Rapeseed, mustard and sunflower;

Unit-IV

Sugar crops- Sugarcane, sugar beet;

Unit-V

Forage crops- Berseem, Lucerne and oat.

Course Outcomes:

- In the course study the students will be able to know about Soil and climatic requirements, varieties, cultural practices and yield of Rabi crops.
- Student will able to understand the preparation field for rising crop.
- Student will able to understand the package and practices of Rabi crops.
- Constraints in production of oilseeds and pulses maybe identified through course content.
- Students will able to understand the marketing of agricultural produces.
- Analysis of comparative benefits of the different Rabi crops.

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- <http://www.agriglance.com>

BAG457

Crop Production Technology of Rabi Crops Lab

L:T: P 0:0:1

List of Experiments. Minimum 08 of the following-

1. Sowing methods of wheat and sugarcane.
2. Identification of weeds in *rabi* season Crops.
3. Study of morphological characteristics of *rabi* crops.
4. Study of yield contributing characters of *rabi* season crops.
5. Juice quality analysis of sugarcane.
6. Study of important *rabi* crops at experimental farms.
7. Study of *rabi* forage crop's experiments.
8. Methods of oil extraction of medicinal crops.
9. Visit to research stations of related crops.

BAG408

Crop Improvement

L:T:P 3:0:0

Objective: To impart theoretical knowledge and practical skills about plant breeding objectives, modes of reproduction and genetic consequences, breeding methods for crop improvement.

Unit-I

Centers of origin, distribution of species, wild relatives in different cereals; Rice, Maize, Sorghum, Pearl millet, pulses; Pigeonpea, Urdbean, Mungbean oilseeds; Mustard, Sunflower fibers and fodder crop.

Unit-II

Centers of origin, distribution of species, wild relatives in different and cash crops; vegetable and horticultural crops.

Unit-III

Plant genetic resources; its utilization and conservation, study of genetics of qualitative and quantitative characters; Important concepts of breeding self-pollinated, cross pollinated and vegetatively propagated crops;

Unit-IV

Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance.

Unit-V

Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeonpea, etc. Ideotype concept and climate resilient crop varieties for future.

Course Outcomes

- In this course students learn importance of wild relative to produce new varieties of crop, and Gene preservation method for further use to improve kharif and Rabi crops. Students learn to apply breeding method to improve kharif and Rabi crops
- It becomes necessary to increase the crop variety to produce disease-resistance offspring's of the crops. It also helps in providing better and superior varieties based on the quality and quantity of the yield

- The most important outcomes of in this course identification of resistance gene relate to *kharif* and *rabi* crops with high yield potential against Pest and pathogen and utilization genes.
- Breeding for high yielding varieties/hybrids: Tolerant/resistant to wide range of biotic/a biotic stresses through pyramiding of genes using conventional and molecular tools

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2. Kalloo, G. 1994. Vegetable Breeding. Panima Educational Book Agency, New Delhi.
3. Kumar, N. 2006. Breeding of Horticultural Crops – Principles and Practices. New India Publishing Agency, New Delhi.
4. Phundan Singh 2006. Essentials of Plant Breeding. Kalyani Publishers, Ludhiana.

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- www.ecourses.icar.gov.in
- www.agriglance.com
- www.agrimoon.com

BAG458

Crop Improvement Lab

L:T: P 0:0:1

List of Experiments: Minimum 08 of the followings-

1. Floral biology, emasculation and hybridization techniques in different crop species; viz., Rice, Maize, Sorghum, Pearl millet.
2. Floral biology, emasculation and hybridization techniques in different crop species; viz., Pigeonpea, Urdbean, Mungbean, Cowpea.
3. Floral biology, emasculation and hybridization techniques in different crop species; viz., Brinjal, Okra.
4. Floral biology, emasculation and hybridization techniques in different crop species; viz., Cucurbitaceous crops.
5. Maintenance breeding of different kharif crops.
6. Handling of segregating populations by different methods like pedigree, bulk methods.
Study of field techniques for seed production in Kharif crops.
7. Study of hybrid seeds production in Kharif crops.
8. Estimation of heterosis, inbreeding depression and heritability.
9. Layout of field experiments.
10. Study of quality characters, donor parents for different characters.
11. Visit to seed production plots.
12. Visit to AICRP plots of different field crops.

BAG409 Manures, Fertilizers and Soil Fertility Management L:T:P 3:0:0

Objective: To make students able to understand the status and management of soil fertility by knowing the principles, applications of manures and fertilizers.

Unit-I

Introduction and importance of organic manures, properties and methods of preparation of bulky and concentrated manures. Green/leaf manuring. Fertilizer recommendation approaches. Integrated nutrient management.

Unit-II

Chemical fertilizers: classification, composition and properties of major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, Complex fertilizers, nano fertilizers, Soil amendments, Fertilizer Storage, Fertilizer Control Order.

Unit-III

History of soil fertility and plant nutrition, criteria of essentiality, role, deficiency and toxicity symptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants.

Unit-IV

Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients. Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil. Forms of nutrients in soil, plant analysis, rapid plant tissue tests.

Unit-V

Indicator plants. Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions.

Course Outcomes:

- Understand the role of manures and integrated nutrient management approach in soil fertility.
- Gained knowledge about chemical fertilizers and their classification.
- Imparts knowledge on essential nutrients and their deficiency symptom on plant parts.
- Knowledge about the techniques of soil fertility evaluation

References:

1. Foth, H.D. and Ellis, B.C. 1997. Soil fertility (2nd Ed.) CRC press, New Delhi.
2. Havlin, J.L., Beaton, J.D., Tisdale, S.L. and Nelson, W.L. 2005 soil fertility and fertilizer- An introduction to nutrient management, (7th Ed.). Prince Hall of India Pvt. Ltd., New Delhi.
3. Kanwar, J.S. 1976. Soil Fertility- Principles and Practices, ICAR, New Delhi.
4. Mengel, K.J. and Kirkby, A. 1978. Principles of Plant Nutrition. International Potash Institute, Switzerland.
5. Fundamentals of Soil Science. Published by Indian Society of Soil Science, IARI New Delhi, 2002.
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BAG459 Manures, Fertilizers and Soil Fertility Management Lab L:T: P 0:0:1

List of Experiments: Minimum 08 of the followings-

1. Determination of Soil pH.
2. Estimation of organic carbon in soil.
3. Estimation of available Nitrogen in soil by alkaline permanganates method.
4. Estimation of available Phosphorous in soil
5. Estimation of available Potassium in soil
6. Estimation of available Zinc, Iron and Boron in soil.
7. Identification of manures and fertilizers.
8. Study of fertilizer adulteration.
9. Preparation of vermicompost and vermi - wash.
10. Methods of compost preparation.
11. Visit to fertilizer industry.

BAG410 Production Technology of Vegetables and Spices L:T:P 3:0:0

Objective:

- To acquaint the students about importance of vegetables and spices in human nutrition.
- To make the students able to classify the various vegetables and spices for their use.
- To familiarize the students about production technology of various vegetables and spices.

UNIT-I

Importance of vegetables & spices in human nutrition and national economy; Classification of vegetables and spices; types of vegetable gardening including hydroponics.

UNIT-II

Production technologies of Solanaceous vegetables (Tomato, Brinjal, Chilli) and Cucurbit vegetables (Cucumber, Melons, Gourds, Pumpkin).

UNIT-III

Production technologies of garden pea and Beans; Cole crops such as Cabbage, Cauliflower, Broccoli, Brussels sprouts, Knol-khol. Production technologies of Carrot, Radish, Beetroot; Potato, Sweet potato, Okra and Colocasia.

UNIT-IV

Production technologies for the cultivation of Amaranth, Palak; Asparagus, Drumstick, and Pointed gourd.

UNIT-V

Production technologies for the cultivation of spices such as Onion, Garlic, Ginger, Turmeric, Fenugreek, Cumin, Coriander.

Course Outcomes:

- Students' outcome with the scope of growing vegetables in India.
- Students learn the role of vegetables and spice in human nutrition.
- Students learn to develop suitability of growing vegetables in different types of garden and soil less cultivation of vegetables.
- Students can be able to manage the production of vegetables and spices with knowledge of scientific cultivation.

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- Bose, T.K. and Som, M.G 1986. Vegetables crops in India (Ist Ed.) Nayaprakash, Calcutta.
- Chadha, K.L. 2001. Hand Book of Horticulture (Ist Ed.).ICAR, KrishiAnusandhanBhavan, Pusa. New Delhi.
- Swarup, Vishnu. 2006. Vegetable sciences and Technology in India (Ist Ed.). Kalayani Pub. Ludhiana, Punjab.
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BAG460

Vegetables and Spices Lab

L:T: P 0:0:1

List of Experiments: Minimum 08 of the followings-

1. Identification of vegetables & spice crops and their seeds.
2. Techniques of direct seed sowing, nursery raising and transplanting.
3. Study of morphological characters of different vegetables & spices.
4. Fertilizers applications in vegetable & spice crops.
5. Extraction of seeds in vegetable crops like tomato & brinjal.
6. Propagation of black pepper and cardamom.
7. Planting technique of ginger/turmeric.
8. Processing and curing technique of turmeric and ginger.
9. Procedure for extraction of oleoresin from spices.
10. Harvesting & preparation of vegetables for market.
11. Economics of vegetables and spices cultivation.

BAG411 Fundamentals of Plant Biochemistry and Biotechnology L:T:P 3:0:0

Objective: To impart knowledge and practical skills to use biotechnological in crop improvement.

Unit I

Importance of Biochemistry. Properties of Water, pH and Buffer. Carbohydrate: Importance and classification. Structures of Monosaccharides, Reducing and oxidizing properties of Monosaccharides, Mutarotation; Structure of Disaccharides and Polysaccharides.

Unit II

Lipids: Importance and classification; Structures and properties of fatty acids; storage lipids and membrane lipids. Proteins: Importance of proteins and classification; Structures, titration. nature of amino acids; Structural organization of proteins.

Unit III

Enzymes: General properties; Classification; Mechanism of action; Nucleic acids: Importance and classification; Structure of Nucleotides, A, B & ZDNA; RNA.

Unit IV

Concepts and applications of plant biotechnology: Scope, organ culture, embryo culture, cell suspension culture, callus culture, anther culture, pollen culture and ovule culture and their applications; Micro-propagation methods; organogenesis and embryogenesis, Synthetic seeds and their significance; Embryo rescue and its significance; somatic hybridization and cybrids

Unit V

Soma clonal variation and its use in crop improvement; cryo-preservation; Introduction to recombinant DNA methods: physical (Gene gun method), chemical (PEG mediated) and *Agrobacterium* mediated gene transfer methods; Transgenics and its importance in crop improvement; PCR techniques and its applications; RFLP, RAPD, SSR; Marker Assisted breeding in crop improvement.

Course outcome:

After completing this course, the students will be able to:

- Understand the basic knowledge of biochemistry, its importance and uses in agriculture.

References:

1. Subba Rao, N.S. 1999. *Biofertilizers in Agricultural and Agroforestry*. Oxford & IBH, New Delhi.
2. Subba Rao, N.S. 1995. *Soil Microorganisms and Plant Growth*. Oxford & IBH, New Delhi.
3. Bhojwani, S.S. and M.K. Razdan. 1993. *Plant Tissue Culture: Theory and Practice*. Elsevier Science Publications, Netherlands.
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- www.bckv.edu.in

BAG461

Plant Biochemistry and Biotechnology Lab

L:T: P 0:0:1

List of Experiments: Minimum 08 of the followings-

1. Preparation of solution, pH & buffers
2. Qualitative tests of carbohydrates and amino acids.
3. Quantitative estimation of glucose/ proteins.
4. Titration methods for estimation of amino acids/lipids
5. Effect of pH, temperature and substrate concentration on enzyme action
6. Paper chromatography/ TLC demonstration for separation of amino acids/ Monosaccharides.
7. Study of sterilization techniques.
8. Composition of various tissue culture media and preparation of stock solutions for MS nutrient medium. Callus induction from various explants.
9. Micro-propagation, hardening and acclimatization.
10. Demonstration on isolation of DNA. Demonstration of gel electrophoresis techniques and DNA fingerprinting.

BAG412 Rural Sociology and Educational Psychology L:T:P 3:0:0

Objective: To inculcate the principles, elements of rural sociology and educational psychology in order to extend science and technology among farmers.

UNIT-I

Sociology and Rural sociology: Definition and scope, its significance in agriculture extension,

UNIT-II

Social Ecology, Rural society, Social Groups, Social Stratification, Culture concept, Social Institutions, Social Change & Development.

UNIT-III

Educational psychology: Meaning & its importance in agriculture extension.

UNIT-IV

Behavior: Cognitive, affective, psychomotor domain, Personality, Learning,

UNIT-V

Motivation, Theories of Motivation, Intelligence.

Course Outcomes:

- Students gain the knowledge of rural sociology and its importance in agricultural extension
- Understand the knowledge of rural society and their functions
- Know about the educational psychology and its importance in extension education

References:

1. Ray, G.L. (2003), Extension Communication and Management. Kalyani Publishers. Fifth revised and enlarged edition.
2. Dahama, O.P. and Bhatnagar, O.P. (2003). Education and Communication for Development. Oxford and IBH Publishing Co. Pvt. Ltd.
3. Sandhu, A.S. (1993) Textbook on Agricultural Communication: Process and Methods. Oxford and IBH Publishing Co. Pvt. Ltd.
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BAG413

Statistical Methods

L: T: P 3:0:0

Objective: The main aims of this course Statistical Methods are to defining the type and quantity of data need to be collected, analyzing the data and drawing conclusions from it. Statistics is to equip students with consequently requisite quantitative skills that they can employ and build on in flexible ways in agriculture.

Unit I

Introduction to Statistics and its Applications in Agriculture, Graphical Representation of data, Measures of Central Tendency & Dispersion.

Unit II

Definition of Probability, Addition and Multiplication Theorem (without proof). Simple Problems Based on Probability. Binomial & Poisson Distributions.

Unit III

Definition of Correlation, Scatter Diagram. Karl Pearson's Coefficient of Correlation. Linear Regressions, Method of least square, fitting of a straight line, parabola.

Unit IV

Introduction to Test of Significance, one sample & two sample T-test for Means, Chi-Square Test of Independence of Attributes in 2×2 Contingency Table. Introduction to Analysis of Variance, Analysis of One-Way Classification.

Unit V

Introduction to Sampling Methods, Sampling versus Complete Enumeration, Simple Random Sampling with and without replacement, Use of Random Number Tables for selection of Simple Random Sample.

Course Outcomes:

The student is able to

- Understand basic theoretical and applied principles of statistics needed to enter in agriculture.
- Demonstrate an understanding of the basic concepts of probability and random variables.
- Understand and interpret the concepts of descriptive statistics from the obtained data.
- Communicate key statistical concepts to non- statisticians.
- Gain proficiency in using statistical software for data analysis.

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1. J, Medhi: Statistical Methods, New age International (P) Ltd.
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3. J.K.Ghosh, Mathematical Statistics, John Wiley & Sons, New York.
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BAG507 Diseases of Field & Horticultural Crops and their Management-I L:T:P 3:0:0

Objective: To facilitate the students for diagnosing and controlling the important diseases of crops.

Symptoms, etiology, disease cycle and management of major diseases of following crops:

UNIT-I

Field Crops: Rice: blast, brown spot, bacterial blight, sheath blight, false smut, khaira and tungro; Maize: stalk rots, downy mildew, leaf spots; Sorghum: smuts, grain mold and anthracnose, Bajra: downy mildew and ergot

UNIT-II

Groundnut: early and late leaf spots, wilt Soybean: Rhizoctonia blight, bacterial spot and mosaic; Pigeonpea: Phytophthora blight, wilt and sterility mosaic; Finger millet: leaf spot; black & green gram: Cercospora leaf spot and anthracnose, web blight and yellow mosaic, Tobacco: black root rot and TMV.

UNIT-III

Horticultural Crops:

Guava: wilt and anthracnose; Banana: Panama wilt, bacterial wilt, Sigatoka and bunchy top; Papaya: foot rot, leaf curl and mosaic, Pomegranate: bacterial blight;

UNIT-IV

Cruciferous vegetables: Alternaria leaf spot and black rot; Brinjal: Phomopsis blight and fruit rot and Sclerotinia blight; Tomato: damping off, wilt, early and late blight, buck eye rot and leaf curl and mosaic; Okra: Yellow Vein Mosaic; Beans: anthracnose and bacterial blight;

UNIT-V

Ginger: soft rot; Colocasia: Phytophthora blight; Coconut: wilt and bud rot; Tea: blister blight; Coffee: rust

Course outcome:

- Students will know the diagnosing symptoms, etiology, disease cycle and management of major diseases of Field crops, horticultural crops and vegetable crops.

References:

1. Singh. R.S 2001. *Plant Disease management*, Oxford and IBH N. Delhi.
2. Mehrotra. R. S. *Plant Pathology*. TATA Mechgrow Hill Pub. Co. N. Delhi.
3. Nair, M.C. and Menon. M. R. 1985. *Diseases of Crop plants in KAU*.

4. Prakasam. V Valluvaparidasan. V., Raguchander, T., Prabhakar, K and Thiruvudainambi. S 1997. Field Crop Diseases, A.E publication, Coimbatore.
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6. Reghunath, P., Gokulapalan, CandUmamaheswaran, K. 2001. Integrated pest and disease management of crop plant. State Institute of Languages Kerala, Thiruvananthapuram.
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BAG557 Diseases of Field & Horticultural Crops and their Manag.-I Lab L:T: P 0:0:1

List of Experiments: Minimum 08 of the followings-

1. Identification and histopathological studies of Paddy diseases.
2. Identification and histopathological studies of bajra diseases.
3. Identification and histopathological studies of okra diseases.
4. Identification and histopathological studies of tomato diseases.
5. Identification and histopathological studies of beans disease.
6. Identification and histopathological studies of brinjal disease.
7. Identification and histopathological studies of mango disease.
8. Collection and preservation of diseased plant specimens for Herbarium.
9. Field visit for the diagnosis of diseases.

Note: Students should submit 50 pressed and well mounted specimens

BAG508 Production Technology for Ornamental Crops, MAP and Landscaping L:T:P 3:0:0

Objective: To impart comprehensive knowledge about the cultivation of commercial flowering, medicinal crops and landscape gardening.

UNIT-I

Importance and scope of ornamental crops, medicinal and aromatic plants and landscaping. Principles of landscaping. Landscape uses of trees, shrubs and climbers.

UNIT-II

Production technology of important cut flowers like rose, gerbera, carnation, liliun and orchids under protected conditions and gladiolus, tuberose, chrysanthemum under open conditions.

UNIT-III

Package of practices for loose flowers like marigold and jasmine under open conditions.

UNIT-IV

Production technology of important medicinal plants like ashwagandha, asparagus, aloe, costus, Cinnamomum, periwinkle, isabgol and aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, rose, geranium, vetiver.

UNIT-V

Processing and value addition in ornamental crops and MAPs produce.

Course outcomes

After completion of this course students will be able to

- Understand the importance of floriculture, landscaping and medicinal and aromatic plants
- Understand the scientific production of technology of commercial flowers under protected and open condition
- Get knowledge about the scientific production of medicinal and aromatic crops at commercial level
- Understand the post-harvest management of flowers and medicinal plants

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1. Singh, A.K. & Sisodia A. 2017. Textbook of floriculture & Landscaping. NIPA.
2. Arora JS. 2006. *Introductory Ornamental horticulture*. Kalyani. Bhattacharjee SK. 2006. *Advances in Ornamental Horticulture*. Vols. I-VI.
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BAG558

Ornamental Crops, MAP and Landscaping Lab

L:T: P 0:0:1

List of Experiments: Minimum 08 of the followings-

1. Identification of ornamental and medicinal plants.
2. Nursery bed preparation and seed sowing.
3. Training and pruning of Ornamental plants.
4. Preparation of herbaceous border.
5. Preparation of shrubbery border.
6. Planning and layout of garden.
7. Protected structures – care and maintenance.
8. Intercultural operations in flowers.
9. Harvesting and post-harvest handling of cut and loose flowers.
10. Distillation process in important aromatic plants.
11. Visit to commercial production unit of flower/medicinal plants

BAG509

Principles of Seed Technology

L:T:P 3:0:0

Objective: To provide insight into recent advances technology of seed production, testing, packing and storage.

Unit-I

Seed and seed technology: introduction, definition and importance. Deterioration causes of crop varieties and their control; Maintenance of genetic purity during seed production, seed quality; Definition, Characters of good quality seed, different classes of seed.

Unit-II

Foundation and certified seed production of important cereals, pulses, oilseeds, fodder and vegetables. Seed certification, phases of certification, procedure for seed certification, field inspection. Seed Act and Seed Act enforcement. Duty and powers of seed inspector, offences and penalties. Seeds Control Order 1983.

Unit-III

Varietal Identification through Grow Out Test and Electrophoresis, Molecular and Biochemical test. Detection of genetically modified crops, Transgene contamination in non-GM crops, GM crops and organic seed production.

Unit-IV

Seed drying, processing and their steps, seed testing for quality assessment, seed treatment, its importance, method of application and seed packing. Seed storage; general principles, stages and factors affecting seed longevity during storage. Measures for pest and disease control during storage.

Unit-V

Seed marketing: structure and organization, sales generation activities, promotional media. Factors affecting seed marketing, Role of WTO and OECD in seed marketing. Private and public sectors and their production and marketing strategies.

Course outcomes:

- The students will able to understand the classes of seed and its production technology.
- Understand the improved seed, supply of good quality seeds of improved varieties.

- How to increase the farm income by producing high yielding disease free quality seed, production of hybrid seed of different crop and decrease the cost of cultivation also.
- Student learns practical knowledge to estimates of genetic purity, physical purity, viability test and germination percentage of different crop.

References

1. Agrawal, P.K. 1994. Principles of Seed Technology Kalyani Publishers, Ludhiana.
2. Agrawal, R.L. 1990. Seed Technology Kalyani Publishers, Ludhiana.
3. Agrawal, P.K. and N. Dadlani 1995. Techniques in Seed Science and Technology.
4. Neal C. Stoskopf, Dwight T. Tomes and B.R. Christie. 2006. Plant Breeding Theory and Practice. Scientific Publishers (India), Jodhpur.
5. Dahiya, B.S.; Rai, K.N. 1995 Seed Technology Kalyani Publishers, Ludhiana.
6. Nema, N.P. 1999 Principles of Seed Certification and Testing Allied Publishers Pvt. Ltd., New Delhi.

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- <http://eagri.org>
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BAG559

Seed Technology Lab

L:T: P 0:0:1

List of Experiments: Minimum 08 of the followings-

1. Seed production in major cereals: Wheat, Rice, Maize and Bajra.
2. Seed production in major pulses: Urd, Mung, Pigeonpea, Gram and lentil.
3. Seed production in major oilseeds: Soybean, Sesame, Groundnut, and Mustard.
4. Seed production in important vegetable crops.
5. Seed sampling and testing: Physical purity, germination, viability.
6. Seed and seedling vigour test.
7. Genetic purity test.
8. Grow - out test and electrophoresis.
9. Seed certification: Procedure, Field inspection, Preparation of field inspection report.
10. Visit to seed production farms, seed testing laboratories and seed processing plant.

BAG510

Livestock and Poultry Management

L:T:P 3:0:0

Objective: To make the students able to identify important breeds of cattle, feeding management and controlling of diseases of livestock and poultry.

Unit-I

Role of livestock in the national economy. Housing principles, space requirements for different species of livestock and poultry

Unit-II

Management of calves, growing heifers and milch animals. Management of sheep, goat and swine. Incubation, hatching and brooding. Management of growers and layers.

Unit-III

Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry. Improvement of farm animals and poultry. Reproduction in farm animals and poultry.

Unit-IV

Digestion in livestock and poultry. Classification of feed stuffs. Proximate principles of feed. Nutrients and their functions. Feed ingredients for ration for livestock and poultry. Feed supplements and feed additives. Feeding of livestock and poultry.

Unit-V

Introduction of livestock and poultry diseases. Prevention (including vaccination schedule) and control of important diseases of livestock and poultry.

Course outcome:

- Through this course the students will be exposed to the importance of biological macromolecules and understanding of the role of bio-molecules and their functions.
- This course teaches the students approaches to manipulate and improve plant yield, and throws light on transgenic plants.
- They are introduced to the concepts and applications of plant biotechnology.
- These students will be able to understand the relationship between science and society and will be able to give justification for biotechnological manipulation of plants for human use.

References:

14. Subba Rao, N.S. 1999. Biofertilizers in Agricultural and Agroforestry. Oxford & IBH, New Delhi.
15. Subba Rao, N.S. 1995. Soil Microorganisms and Plant Growth. Oxford & IBH, New Delhi.

16. Bhojwani, S.S. and M.K. Razdan. 1993. *Plant Tissue Culture: Theory and Practice*. Elsevier Science Publications, Netherlands.
17. Chawla, H.S. 2006. *Introduction to Plant Biotechnology*. Lab Manuals Pantnagar University.
18. Chawla, H.S. 2009. *Introduction to Plant Biotechnology*. Oxford & IBH Pub. Co.
19. Gupta, P.K. 2010. *Plant Biotechnology*. Rastogi publ. Meerut.
20. Lewin, B. 2007. *Genes IX*. Oxford University Press, Inc., New York.
21. Singh, B.D. 2006. *Plant Biotechnology*, Kalyani publ., Ludhiana.
22. Conn, E.E and Stumpf, P.K. 1989. *Outline of Biochemistry*. Wiley Eastern Ltd. New Delhi.
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25. Mazur, A and Harrows, B. 1971. *Textbook of Biochemistry*. W.B. Sanders Publications, New Delhi
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- <http://www.agrilance.com>

BAG560

Livestock and Poultry Management Lab

L:T: P 0:0:1

List of Experiments: Minimum 08 of the followings-

1. Study and identification of external body parts of cattle, buffalo, goat, swine and poultry.
2. Study of different breeds of cows and buffaloes.
3. Visit to IDF and IPF to study breeds of livestock and poultry and daily routine farm operations and farm records.
4. Judging of cattle, buffalo and poultry.
5. Handling and restraining of livestock.
6. Culling of livestock and poultry.
7. Planning and layout of housing for different types of livestock.
8. Computation of rations for livestock.
9. Formulation of concentrate mixtures.
10. Clean milk production, milking methods.
11. Hatchery operations, incubation and hatching equipments.
12. Debeaking, dusting and vaccination.
13. Economics of cattle, buffalo, sheep, goat, swine and poultry production.

BAG562

Practical Crop Production - I (*Kharif*)

L:T: P 0:0:1

List of Experiments: Minimum 08 of the followings-

Crop planning, raising field crops in multiple cropping systems:

1. Field preparation.
2. Seed treatment.
3. Nursery rising.
4. Sowing time.
5. Nutrient, INM.
6. Water management.
7. Weed management, IWM.
8. Management of insect-pests diseases of crops and IPM.
9. Harvesting, threshing, drying and winnowing.
10. Storage and marketing of produce.
11. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.

EHU501 Human values and professional ethics L: T: P 3:1:0

Objectives:

- To create awareness on Engineering Ethics and Human Values.
- To understand social responsibility of an engineer.
- To appreciate ethical dilemma while discharging duties in professional life.

UNIT I

HUMAN VALUES: Morals, Values and Ethics – Integrity – Work Ethic – Service – Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing - Honesty – Courage – Valuing Time – Co-operation – Commitment - Empathy – Self-Confidence – Character - Spirituality.

UNIT II

ENGINEERING ETHICS: Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - Moral dilemmas - Moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - custom and religion - uses of ethical theories. Valuing Time – Co-operation – Commitment.

UNIT III

ENGINEERING AS SOCIAL EXPERIMENTATION: Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study.

UNIT IV

SAFETY, RESPONSIBILITIES AND RIGHTS: Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the Three Mile Island and Chernobyl case studies. Collegiality and loyalty – Respect for authority – Collective bargaining – Confidentiality – Conflicts of interest – Occupational crime – Professional rights – Employee rights – Intellectual Property rights (IPR) – Discrimination.

UNIT V

GLOBAL ISSUES: Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers and engineers as expert witness and advisors -moral leadership – Sample code of Ethics like ASME, ASCE, IEEE, IETE etc.

References:

1. Mike Martin and Roland Schinzinger, “Ethics in Engineering”, McGraw-Hill, New York 1996.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.
3. Jayshree Suresh and B.S.Raghavan, “Human values and Professional Ethics”, S.Chand & Company Ltd., New Delhi.

Course Outcomes:

- After completing this course student will be able to understand human values.
- Inculcate ethics in professional life.

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BAG607 Rainfed Agriculture and Watershed Management L:T:P 3:0:0

Objective:

- Students learn basic knowledge of rain fed agriculture and water shed management.
- Study the crop adaptation and mitigation strategies, crop planning and crop management techniques.
- Main objective is to increase / stabilize production of crops, forage, fruits, fuel and timber in rainfed areas by introduction of improved soil and moisture conservation measures, better crop and range land management practices.

Unit-I

Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India; Problems and prospects of rainfed agriculture in India;

Unit-II

Soil and climatic conditions prevalent in rainfed areas; Soil and water conservation techniques,

Unit-III

Drought: types, effect of water deflection physio-morphological characteristics of the plants, Crop adaptation and mitigation to drought;

Unit-IV

Water harvesting: importance, its techniques, Efficient utilization of water through soil and crop management practices, Management of crops in rainfed areas,

Unit-V

Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management, factors affecting watershed management.

Course Outcomes:

Students completing this course will be able to:

- Problems and prospects of rainfed agriculture in India characteristics of the plants, Mechanism of crop adaptation under moisture deficit condition.
- History of rainfed agriculture & watershed in India.
- Rain fed agriculture is used to describe farming practices that rely on rainfall for water.
- Student will be able to understand objective, principles and component of watershed management.
- Conservation of soil by adopting new techniques of soil conservation will help in obtaining higher production of rainfed crops.

References:

1. Arnon, 1972: Crop Production in Dry Regions (Vol. I), Leonard Hill Pub. Co, London.
2. DhruvaNarayana, V.V., Sastry, G.S. and Patnaiak, V.S. 1999: Watershed Management in India. ICAR, New Delhi.
3. Gupta, U.S. 1975: Physiological Aspects of Dryland Farming. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Khan, M.A. 2011: Watershed Management for Sustainable Agriculture (1st Ed.). AgrobiosInida.
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- <http://agrimoon.com>

BAG657 Rainfed Agriculture and Watershed Management Lab L:T: P 0:0:1

List of Experiments: Minimum 08 of the followings-

1. Studies on climate classification.
2. Studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons.
3. Studies on cropping pattern of different rainfed areas in the country and demarcation of rainfed area on map of India.
4. Interpretation of meteorological data and scheduling of supplemental irrigation on the basis of evapo-transpiration demand of crops.
5. Critical analysis of rainfall and possible drought period in the country, effective rainfall and its calculation.
6. Studies on cultural practices for mitigating moisture stress.
7. Characterization and delineation of model watershed.
8. Field demonstration on soil & moisture conservation measures.
9. Field demonstration on construction of water harvesting structures.
10. Visit to rainfed research station/watershed.

BAG608 Insect Ecology and Integrated Pest Management L:T:P 3:0:0

Objective: To disseminate the knowledge on insect/pest behavior and controlling them by integrated manner.

Unit I

Insect ecology: introduction, environment and its components; effect of abiotic factors: temperature, moisture, humidity, rainfall, light, atmospheric pressure and air currents; effect of biotic factors: food, competition, natural and environmental resistance. Concepts of balance of life in nature, biotic potential and environmental resistance and causes for outbreak of pests in agro-ecosystem; pest surveillance and pest forecasting; categories of pests

Unit II

Integrated Pest Management (IPM): introduction, importance, concepts and tools of IPM - host plant resistance, cultural, mechanical, physical, legislative, biological (parasites, predators and pathogens such as bacteria, fungi and viruses) methods of control; chemical control

Unit III

Importance, hazards and limitations; classification of insecticides, toxicity of insecticides and formulations of insecticides; study of important insecticides; recent methods of pest control: repellents, anti feedants, hormones, attractants, gamma radiation and genetic control

Unit IV

Insecticide Act 1968: important provisions; application techniques of spray fluids; phytotoxicity of insecticides; symptoms of poisoning, first aid and antidotes; non-insect pests: mites, nematodes, rodents and birds; beneficial insect: silk worms, honey bees and lac insects

Unit V

Stored grain pests: Coleopteran and Lepidopteran pests, their biology and damage, preventive and curative methods. Distribution, biology, nature and symptoms of damage, and management strategies of insect and non insect pests. of rice, sorghum, maize, ragi (*Eleusine coracana*), wheat, sugarcane, cotton, mesta, sunhemp, pulses, groundnut, castor, safflower, sunflower, mustard, brinjal, bhendi, tomato, cruciferous and cucurbitaceous vegetables, potato, colacasia, amaranthus, chillies, mango, citrus, grapevine, banana, pomegranate, guava, ber, aonla, tobacco, turmeric, betelvine, onion, coriander, garlic, ginger and ornamental plants.

Course outcomes:

On successful completion of this course a student will be able to:

- Understand the basics of insect ecology and integrated pest management practices
- Reflect on the importance of agriculture sector in Indian economy, agricultural intensification and the development of the need for integrated approaches to crop protection.
- Characterize the major components of pest management strategies and compare their relative merits for different pests and crops.
- Critically reflect on use of newer technology, emerging trends and advances in insects/ pest management.
- Adoption of apiculture, sericulture and lac culture techniques for the entrepreneurship development.

References:

1. Dhaliwal, G.S and Ramesh Arora. 2001. Integrated Pest Management– Concepts and Approaches. Kalyani Publishers, Ludhiana.
2. Gautam, R.D. 2008. Biological Pest Suppression. Westville Publishing House, New Delhi.
3. Metcalf, R.L. and Luckman, W. H. 1982. Introduction to Insect Pest Management. Wiley Inter Science Publishing, New York.
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5. Larry, P. Pedigo and Marlin, E. Rice. 1991. Entomology and Pest Management. Prentice Hall of India Private Ltd., New Delhi.
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BAG658 Insect Ecology and Integrated Pest Management Lab L:T: P 0:0:1

List of Experiments. Minimum 08 of the followings-

1. Identification of different types of insect damages on crop plants.
2. Sampling techniques for the estimation of insect population in selected crops.
3. Estimation of insect damage in selected crops.
4. Pest monitoring through light traps, pheromone traps and field incidence.
5. Familiarization with mechanical methods of pest control.
6. Familiarization with cultural methods of pest control.
7. Familiarization with plant protection equipment.
8. Familiarization with different formulations of insecticides.
9. Familiarization with different insecticides.
10. Calculation of doses/concentrations of insecticides.
11. Preparation of spray fluid for field application.
12. Familiarization with plant protection equipment.
13. Study of identification of store grain pests.

BAG609 Diseases of Field & Horticultural Crops & Their Management-II L:T:P 3:0:0

Objective: To facilitate the students for diagnosing and controlling the important diseases of crops

Symptoms, etiology, disease cycle and management of following diseases:

Unit I

Field Crops:

Wheat: rusts, loose smut, karnal bunt and ear cockle; Sugarcane: red rot, smut, grassy shoot and ratoon stunting; Sunflower: Sclerotinia stem rot and Alternaria blight; Mustard: Alternaria blight, white rust, downy mildew and Sclerotinia stem rot;

Unit II

Gram: wilt, grey mould and Ascochyta blight; Lentil: rust and wilt; Cotton: anthracnose, and black arm; Pea: downy mildew, powdery mildew and rust.

Unit III

Horticultural Crops:

Mango: anthracnose, malformation, black tip and powdery mildew; Citrus: canker and gummosis; Grape vine: downy mildew and Powdery mildew; Apple: scab, powdery mildew and fire blight; Peach: leaf curl. Strawberry: leaf spot, Potato: early and late blight, black scurf, leaf roll, and mosaic;

Unit IV

Cucurbits: downy mildew, powdery mildew, wilt; Onion and garlic: purple blotch, and Stemphylium blight; Chillies: anthracnose, wilt and leaf curl;

Unit V

Turmeric: leaf spot Coriander: stem gall, Marigold: Botrytis blight; Rose: dieback, and black leafspot.

Course outcomes

- Students will know diagnosing symptoms, etiology, disease cycle and management of major diseases of Field crops, horticultural crops and vegetable crops.

References:

1. Singh. R.S 2001. *Plant Disease management*, Oxford and IBH N. Delhi.
2. Mehrotra. R. S. *Plant Pathology*. TATA Mechgrow Hill Pub. Co. N. Delhi.
3. Nair, M.C. and Menon. M. R. 1985. *Diseases of Crop plants in KAU*.

4. Prakasam. V Valluvaparidasan. V., Raguchander, T., Prabhakar, K and Thiruvudainambi. S 1997. Field Crop Diseases, A.E publication, Coimbatore.
5. Ramakrishnan, T. S. 1971. Diseases of Millets. ICAR.
6. Reghunath, P., Gokulapalan, CandUmamaheswaran, K. 2001. Integrated pest and disease management of crop plant. State Institute of Languages Kerala, Thiruvananthapuram.
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13. Varma, L.R. and Sharma, R.C. 1999. Diseases of Horticultural Crops. Indus Publishing Co., New Delhi.

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BAG 659 Diseases of Field & Horticultural Crops & their Management-II Lab

L:T: P 0:0:1

List of Experiments: Minimum 08 of the followings-

1. Identification and histopathological studies of Wheat and barley diseases.
2. Identification and histopathological studies of Mustard diseases.
3. Identification and histopathological studies of cucurbitaceous diseases.
4. Identification and histopathological studies of potato disease.
5. Identification and histopathological studies of chilli disease.
6. Identification and histopathological studies of guava disease.
7. Identification and histopathological studies of citrus disease
8. Field visit for the diagnosis of field problems.
9. Collection and preservation of plant diseased specimens for Herbarium;

Note: Students should submit 50 pressed and well mounted specimens

BAG 610 Protected Cultivation and Secondary Agriculture L:T:P 3:0:0

Objective: To impart the scientific technology on off season production of horticultural crops especially flowers and vegetables is an emerging industry.

Unit- I

Protected cultivation- importance and scope, Status of protected cultivation in India and World, types of protected structure based on site and climate. Cladding material involved in greenhouse/ poly house. Greenhouse design, environment control, artificial lights, Automation.

Unit- II

Soil preparation and management, Substrate management. Types of benches and containers. Irrigation and fertigation management.

Unit- III

Propagation and production of quality planting material of horticultural crops.

Unit- IV

Greenhouse cultivation of important horticultural crops – rose, carnation, chrysanthemum, gerbera, orchid, anthurium, liliun, tulip, tomato, bell pepper, cucumber, strawberry, pot plants, etc.

Unit- V

Cultivation of economically important medicinal and aromatic plants. Off-season production of flowers and vegetables. Insect pest and disease management.

Course outcome

After completion of this course students will be able to

- Understand the importance and various dimensions of protected cultivation in order to establishment of protected structure.
- To know about the preparation of media for cultivation
- Understand the propagation techniques and development of quality planting material of commercially important horticultural crops
- Understand different aspects of scientific production techniques of important horticultural crops

References:

1. Anonymous 2003. *Proc. All India Seminar on Potential and Prospects for Protective Cultivation*. Organized by Institute of Engineers, Ahmednagar. Dec.12-13, 2003.
2. Chandra S & Som V. 2000. *Cultivating Vegetables in Green House*. *Indian Horticulture* 45: 17-18.

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BAG660 Protected Cultivation and Secondary Agriculture Lab L:T: P 0:0:1

List of Experiments: Minimum 08 of the followings-

1. Raising of seedlings and saplings under protected conditions.
2. Use of pro-trays in quality planting material production.
3. Study of different growing media.
4. Study of bed preparation and planting for crop production,
5. Study of Inter cultural operations in protected cultivation.
6. Measurement of Soil pH in protected structures.
7. Measurement of Soil EC in protected structures.
8. Regulation of irrigation and fertilizers through drip.
9. Preparation of plastic tunnels and hydroponic structure.
10. Regulation of fogging and misting in protected structures.
11. Visit to protected cultivation unit.

BAG611A

Mushroom Cultivation

L:T:P 3:0:0

Objective: To know nutritional value, Medicinal value, Consumption of mushrooms, income generation and employment creation.

Unit-I

Importance of mushroom cultivation – definition of mushroom - its importance – present scenario of mushroom cultivation

Unit II

General morphological features, taxonomy and identification of different mushrooms- poisonous, hallucinogenic and medicinal mushrooms. Pure culture of mushrooms and their nutritional requirements

Unit III

Definition of spawn, substrate for spawn, types of spawn, methods of spawn production, characteristic of a good spawn, storage of spawn

Unit IV

Cultivation of Agaricus species – composting – its formulation, casing, preparation of casing mixture, sterilization, cultivation of pleurotus, Volvariella, Lentinus, Calocybe and Auricularia. Different types of substrates, substrate preparation and sterilization, Spawning, methods of spawning, spawn run phase, cropping

Unit V

Identification and management of different pests and diseases of mushrooms. Methods of harvesting mushrooms, post-harvest treatments and preservation of mushrooms. Packing and processing – Different methods of processing, canning and dehydration. Nutritive value of mushrooms and preparation of different recipes.

Course outcomes

- Students will know history, nutritional value, Medicinal value, cultivation methods, insect pest and their management, Consumption of mushrooms, income generation and employment creation.

References:

1. Chadha, C. L and Sharma, S. R 1995. Advances in Horticulture, Mushroom– Vol. 13 (ed) Malhotra Publishing House, New Delhi.
2. Chang, S. T. Miles, P. G. and Hays, W. A. 1978. The Biology and Cultivation of Edible Mushrooms. Academic Press, London.
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5. Lulu Das. 2002. Mushroom Recipes. (Released in the VIII Biennial meeting of AICMIP)
6. Nair, M. C. 1991. Mushrooms– Technical bulletin No. 14. Director of Extension, KAU.
7. Nair, M. C. 1994. Advances in Mushroom Biotechnology. Scientific Publishers, New Pali Road, Jodhpur.

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BAG611B

Agri – Informatics and IPR

L:T:P 3:0:0

Objectives: To disseminate the information technology among the agricultural graduates and be aware about IPRs

Unit-I

Introduction to Computers, Operating Systems, definition and types, Applications of MS Office for document creation & Editing, Data presentation, interpretation and graph creation, statistical analysis, mathematical expressions, Database, concepts and types, uses of DBMS in Agriculture, World Wide Web (www): Concepts and components.

Unit-II

e-Agriculture, concepts and applications, Use of ICT in Agriculture. Computer Models for understanding plant processes. IT application for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management, Smartphone Apps in Agriculture for farm advisory, e-banking markets market price, post harvest management etc;

Unit-III

Geospatial technology for generating valuable agri-information. Decision support systems, concepts, components and applications in Agriculture, Agriculture Expert System.

Unit-IV

Introduction and meaning of intellectual property, brief introduction to GATT, WTO, TRIPs and WIPO, Types of Intellectual Property and legislations covering IPR in India:-Patents, Copyrights, Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets.

Unit-V

Patents Act 1970 and Patent system in India, patentability, process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement, Plant breeders rights, researcher and farmers rights. Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing.

Course outcome: Upon completion of the course students will be able to understand:

- Explain importance of ICT in agriculture.
- Use of agriculture related database to develop analytics.
- Develop interactive apps. to provide services.
- Develop decision making process to support agricultural activities.

- Develop database of all aspects of agriculture.
- Explain the importance of IPR in agriculture.
- Categorize types of IPR and licensing procedure.
- Gained expertise on process of application for IPR for an agricultural produce.
- Explain the importance of biodiversity and obtaining the IPR.

References:

1. Franz Müller 1999. Agrochemicals: Composition, Production, Toxicology, Applications. Wiley-VCH: Weinheim
2. John Walkenbach, Herb Tyson, Michael R. Groh, Faithe Wempen, Microsoft Office 2010 Bible
3. Prof. Satish Jain and M. Geetha, MS-Office 2010 Training Guide
4. Kate Shoup, Microsoft Office 2010
5. Melanie Gass, It's All about You! Office 2010
6. Nancy Conner and Matthew MacDonald, Office 2010: The Missing Manual
7. Acharya, N.K. 2014. Text book of Intellectual Property Rights. Asia Law House, Hyderabad. Loganathan, E.T. 2012. Intellectual Property Rights. New Century Publications, New Delhi.
8. Rosedar, S.R.A. 2016. Intellectual Property Rights. Lexis Nexis (2nd Ed.), Nagpur

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- <https://lecturenotes.in/>
- <http://www.ignouhelp.in/>
- 8. <https://hau.ac.in/>
- <https://www.bits-pilani.ac.in/>
- <http://www.rvskvv.net/>
- <https://www.wipo.int/>
- <http://www.caaa.in/>
- <http://www.gpcet.ac.in/>
- <https://www.iare.ac.in/>
- <https://shodhganga.inflibnet.ac.in/>

BAG611C

Food Safety and Standards

L:T:P 3:0:0

Objective: To acquaint with food quality parameters and control systems, food standards, regulations, specifications.

UNIT-I

Basics of Food Science and Food Analysis, Concept, objectives and need of food quality. Measurement of colour, flavour, consistency, viscosity, texture and their relationship with food quality and composition.

UNIT-II

Sampling; purpose, sampling techniques, sampling procedures for liquid, powdered and granular materials. Food adulteration and food safety.

UNIT-III

Quality control, Quality control tools, Statistical quality control, Sensory evaluation methods, panel selection methods, Interpretation of sensory results. Instrumental method for testing quality.

UNIT-IV

TQM and TQC, consumer preferences and acceptance, Food Safety Management Systems GAP, GHP, GMP, Hazards and HACCP (Hazard analysis and critical control point), Sanitation in food industry (SSOP),

UNIT-V

Food Laws and Regulations in India, FSSAI, Food grades and standards BIS, AGMARK, PFA, FPO, ISO 9000, 22000 Series. CAC (Codex Alimentarius Commission), Traceability and Quality Assurance system in a process plant, Bio safety and Bioterrorism.

Course Outcomes:

The student will be able to:

- impart the knowledge of food safety issues, surveillance and monitoring techniques, Food Labeling as well as sanitation and food allergy
- know the principles of Food Safety and Quality
- apply preventive measures and control methods to minimize the hazards
- know the requirements of FSSAI
- learn the principles of HACCP and to develop procedures and approaches to identify food safety hazards in food processing
- gain the knowledge about the Food Labeling and sanitation of food industries.

References:

1. Ranganna S. Hand book of Analysis and Quality Control for Fruit and Vegetable Products.
2. Srilakshmi B, A text book of Food Science and Technology.
3. MudambiSumati R, Rao Shalini M and Rajagopal M.V. Food Science.

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- https://onlinecourses.swayam2.ac.in/cec20_ag06/preview
- <http://ecoursesonline.iasri.res.in/course/view.php?id=185>
- <http://coursera.org/lecture/valuechains/food-quality-vTDYx>
- <https://www.openlearning.com/courses/food-quality-assurance-and-control/>

BAG662

Practical Crop Production - II (*Rabi*)

L:T: P 0:0:1

List of Experiments: Minimum 08 of the followings-

Crop planning, raising field crops in multiple cropping systems:

1. Field preparation.
2. Seed, treatment.
3. Nursery raising.
4. Sowing time.
5. Nutrient, INM.
6. Water management.
7. Weed management, IWM.
8. Management of insect-pests diseases of crops and IPM.
9. Harvesting, threshing, drying and winnowing.
10. Storage and marketing of produce.
11. Preparation of balance sheet.

BAG-611 I (D)

Micro Propagation Technologies

L:T:P 3:0:0

Objectives: To study the micro propagation techniques, types of culture, stages of micro propagation shoot tip and meristem culture, bud culture and somatic embryogenesis.

UNIT I

Introduction, history, advantages and limitations of micro propagation

UNIT II

Types of cultures (seed, embryo, organ, callus, cell).

UNIT III

Stages of micro propagation, axillary bud proliferation (Shoot tip and meristem culture. budculture).

UNIT IV

Organogenesis (callus and direct organ formation), somatic embryogenesis, cell suspension cultures

UNIT V

Production of secondary metabolites, somaclonal variation, Cryopreservation.

Course outcomes:

- Students able to understand the concept of micro propagation technologies
- Students will be familiarized with different steps of micro propagation

References:

1. Bhojwani, S.S. and M.K. Razdan. 1993. Plant Tissue Culture: Theory and Practice. Elsevier Science Publications, Netherlands.
2. Chawla. IIS. 2006. Introduction to Plant Biotechnology. Lab Manuals Pantnagar University
3. Chawla, H.S. 2009. Introduction to Plant Biotechnology. Oxford & IBH Pub. Co.
4. Gupta, P.K. 2010. plant Biotechnology. Rastogi publ. Meerut
5. Lewin, B. 2007. Genes IX. Oxford University Press, Inc., New York
6. Singh, B.D. 2006. Plant Biotechnology, Kalyani publ., Ludhiana.

Website sources:

- www.omicsonline.org
- www.biogeny.net
- www.beky.edu.in

EHU601

Disaster Management

L: T: P 3:0:0

Objectives:

- To provide students an understanding to the concepts and aspects of disaster and its relationship with development.
- To ensure awareness of Disaster Risk Reduction (DRR) approaches among students.
- To assist students develop ability to respond to their environment with potential response to disaster.

UNIT I: Introduction to Disasters

(12 Sessions)

- Definition: Disaster, Hazard, Vulnerability, Resilience, Risks
- Types of disasters – Earthquake, Landslide, Flood, Drought, Fire, campus shooting, bomb threat, terrorist incidence and financial emergency etc.
- Causes and Impacts including social, economic, political, environmental, health, psychosocial, etc. Differential impacts- in terms of caste, class, gender, age, location, disability.
- Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT II: Approaches To Disaster Risk Reduction

(10 Sessions)

- Disaster life cycle – its analysis, phases, culture of safety, prevention, mitigation and preparedness
- Community based DRR (Disaster Risk Reduction), Structural-nonstructural measures,
- Roles and responsibilities of community: Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders

UNIT III: Inter-Relationship Between Disasters And Development

(08 Sessions)

- Factors affecting Vulnerabilities, impact of Development projects such as dams, embankments, changes in Land-use etc.
- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India – Relevance of indigenous knowledge, appropriate technology and local resources.
- Role of international cooperations in Disaster Management

UNIT IV: Disaster Risk Management In India

(08 Sessions)

- Hazard and Vulnerability profile of India. Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management
- Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy – Other related policies, plans, programmes and legislation
- Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V: Disaster Management: Applications, Case Studies and Field Works (07 Sessions)

The project /fieldwork is meant for students to understand vulnerabilities and to work on reducing disaster risks and to build a culture of safety. Projects must be conceived creatively based on the geographic location and hazard profile of the region where the college is located. A few ideas or suggestions are discussed below.

Several governmental initiatives require Urban Local Bodies (ULBs) and Panchayati Raj Institutions (PRIs) to be proactive in preparing DM plans and community based disaster preparedness plans. Information on these would be available with the district collector or Municipal corporations.

Teachers could ask students to explore and map disaster prone areas, vulnerable sites, vulnerability of people (specific groups) and resources. The students along with teacher could work on ways of addressing these vulnerabilities, preparing plans and consultation with local administration or NGOs.

Students could conduct mock drills in schools, colleges or hospitals. They could also work on school safety, safety of college buildings, training in first aid.

Other examples could be- identifying how a large dam, road/ highway or an embankment or the location of an industry affects local environment and resources or how displacement of large sections of people creates severe vulnerabilities may be mapped by student project work.

The suggested topics for Project work for student could be as follows:

- Monitoring and evaluation plan for disaster response
- Low cost Home based water purification methods
- Planning Nutrition intervention programmes
- Safety tips before during and after earthquake, cyclone, floods and fire accidents.
- Mock Drills
- Major disasters in India
- Disaster Management in India
- Flood affected areas and damages in India
- Heat waves in India
- Earth quakes in India
- Historical Tsunamis in India
- Nuclear emergence
- Traffic accidents in India
- Train Accidents
- Major disease outbreak
- Disaster management structure in India
- Precaution, mitigation of disaster in India
- Warning system in India to prevent disaster
- Bhopal gas tragedy
- Kutch earth quake
- Tsunami (2004)
- Kosi Calamity 2008
- Mayapuri radiation exposure Delhi (2010)
- Mock exercises

Any field works related to disaster management.

Learning Outcomes: The students will be able to identify the nature and causes of disaster. Also the students will be able to apply the disaster risk reduction mechanism.

Teaching Resources

Emphasis will be on interactive teaching learning methods. Tools could be Range of Films- documentaries and feature films related to disasters and their impacts and on vulnerabilities of people are available which a teacher could choose with care and screen. This could form a basis for classroom discussion.

Suggested Readings:

- SatishModh, Introduction to Disaster Management, Macmillan Publisher India Ltd
- Alexander David, Introduction in 'Confronting Catastrophe', Oxford University Press
- Blaikie, P, Cannon T, Davis I, Wisner B 1997. At Risk Natural Hazards, Peoples' Vulnerability and Disasters, Routledge.
- Damon P. Coppola, Introduction to International Disaster Management, Butterworth-Heinemann,
- Singhal J.P. "Disaster Management", Laxmi Publications. ISBN-10: 9380386427 ISBN-13: 978-9380386423
- Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., . ISBN-10: 1259007367, ISBN-13: 978-1259007361]
- Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi
- KapurAnu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi.
- Carter, Nick. Disaster Management: A Disaster Manager's Handbook. Asian Development Bank, Manila Philippines.
- Cuny, F. Development and Disasters, Oxford University Press. Document on World Summit on Sustainable Development.
- Govt. of India: Disaster Management Act 2005, Government of India, New Delhi. Government of India, 2009.
- Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi Indian Journal of Social Work.
- Special Issue on Psychosocial Aspects of Disasters, Volume 63, Issue 2, April.

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- <https://nidm.gov.in/online.asp>
- <https://www.ifrc.org/en/get-involved/learning/opportunities/online-certificate-course-on-disaster-management/>
- <https://www.iirs.gov.in/disaster-management-studies>

BAG704 Farming Systems, Sustainable Agriculture and Organic Farming L:T:P 3:0:0

Objective: To acquaint the students about prevailing sustainable agriculture in the country and practices to improve productivity

Unit- I

Sustainable agriculture-problems and its impact on agriculture, indicators of sustainability, adaptation and mitigation, conservation agriculture strategies in agriculture, HEIA, LEIA and LEISA and its techniques for sustainability. Resource use Efficiency and optimization techniques, Resource cycling and flow of energy in different farming system, farming system and environment, field.

Unit-II

Farming System-scope, importance, and concept, Types and systems of farming system and factors affecting types of farming, Farming system components and their maintenance. Integrated farming system-historical background, objectives and characteristics, components of IFS and its advantages, Site specific development of IFS model for different agro-climatic zones. Visit to IFS model in different agro-climatic zones of nearby states University/institutes and farmers.

Unit-III

Cropping system and pattern, multiple cropping system, Efficient cropping system and their evaluation, Allied enterprises and their importance, Tools for determining production and efficiencies in cropping and farming system.

Unit-IV

Organic farming, principles and its scope in India; Initiatives taken by Government (central/state), NGOs and other organizations for promotion of organic agriculture; Organic ecosystem and their concepts; Organic nutrient resources and its fortification; Restrictions to nutrient use in organic farming; Choice of crops and varieties in organic farming.

Unit-V

Fundamentals of insect, pest, disease and weed management under organic mode of production. Operational structure of NPOP; Certification process and standards of

organic farming. Processing, leveling, economic considerations and viability, marketing and export potential of organic products.

Course outcomes:

The students will be able to understand that:

- Need of sustainable agriculture and problems in sustainability.
- Roll of IFS in Indian agriculture.
- Importance of cropping system and pattern in agriculture.
- Knowledge about organic crop cultivation.
- Controls of insect, pest, disease and weed management organically.

References:

1. Ananthakrishnan, T.N. (Ed.). 1992. Emerging Trends in Biological Control of Phytophagous Insects. Oxford & IBH.
2. Gaur, A.C. 1982. A Manual of Rural Composting, FAO/UNDP Regional Project Document, FAO.
3. Lampin, N. 1990. Organic Farming. Press Books, Ipswich, UK.
4. Palaniappan, S.P. & Anandurai, K. 1999. Organic Farming–Theory and Practice. Scientific Publ.
5. Reddy, M.V. (Ed.). 1995. Soil Organisms and Litter Decomposition in the Tropics. Oxford & IBH.
6. Sharma, A. 2002. Hand Book of Organic Farming. Agrobios.
7. Singh, S.P. (Ed.) 1994. Technology for Production of Natural Enemies. PDBC, Bangalore.
8. Subba Rao, N.S. 2002. Soil Microbiology. Oxford & IBH.
9. Veeresh, G.K., Shivashankar, K. & Suiglachar, M.A. 1997. Organic Farming and Sustainable Agriculture. Association for Promotion of Organic Farming, Bangalore.
10. WHO. 1990. Public Health Impact of Pesticides Used in Agriculture. WHO.

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- <https://ncof.dacnet.nic.in/>
- www.agrimoon.com
- <https://ecourses.icar.gov.in/>

BAG754 Farming Systems, Sustainable Agriculture and Organic Farming Lab

L:T: P 0:0:1

List of Experiments: Minimum 08 of the followings

1. Preparation of enrich compost & quality analysis.
2. Preparation of vermin-compost & quality analysis.
3. Preparation of bio-fertilizers/bio-inoculants & quality analysis.
4. Indigenous technology knowledge (ITK) for nutrient management.
5. Indigenous technology knowledge (ITK) for insect and pest management.
6. Indigenous technology knowledge (ITK) for disease management.
7. Indigenous technology knowledge (ITK) for weed management.
8. Cost of organic production system.
9. Post-harvest management.
10. Quality aspect, grading, packaging and handling.
11. Visit of organic farms to study the various components and their utilization.

BAG705 Post-Harvest Management and Value Addition of Fruits and Vegetable L:T:P 3:0:0

Objective: To acquaint with the proper handling technologies of fruits and vegetables to reduce post-harvest losses.

Unit- I

Importance of post-harvest processing of fruits and vegetables.

Unit- II

Possible causes of post-harvest losses; Pre-harvest factors affecting postharvest quality, maturity, ripening and changes occurring during ripening; Respiration and factors affecting respiration rate; Harvesting and field handling; Storage (ZECC, cold storage, CA, MA, and hypobaric);

Unit- III

Value addition concept; Principles and methods of preservation; Intermediate moisture food- Jam, jelly, marmalade, preserve, candy – Concepts and Standards; Fermented and non-fermented beverages. Tomato products- Concepts and Standards;

Unit- IV

Drying/ Dehydration of fruits and vegetables – Concept and methods, osmotic drying.

Unit- V

Canning – Concepts and Standards, packaging of products.

Course Outcomes:

The students will be able to:

- Understand the physical, chemical, and mechanical properties of food and their handling and storage.
- Determine the porosity and roundness of fruits and vegetables.
- Understand maturity indices of fruits and vegetables.
- Understand the concept of quality in relation to fruit and vegetable based products.
- Understand the processing and preservation of fruits and vegetables using various techniques.

References

1. Giridharilal, G.S., Siddappa and Tondon, G.L. 2007. *Preservation of Fruits and Vegetables*. ICAR, New Delhi.
2. Hard, N.F, and Salunkhe, D.K. 1980. *Post-harvest Biology and Handling*. AVI Publishing Co., Westport.

3. Lloyd Ryoll, A.M.S. and Pentzer W.T.M.S. 1982. *Handling, Transportation and Storage of Fruits and Vegetables (Vol. 2)*. AVI Publishing Tables Co. Inc., Connecticut.
4. Mitra, S.K. 2005. *Post-harvest Physiology and Storage of Tropical and Subtropical Fruits*. CABI Publishers, Kolkatta.
5. Salunkhe, D.K. and Kadam, S.S. 1995. *Hand Book of Fruit Science and Technology*. Marcel Dekker Incorporated, New York.
6. Srivastava, R.P. and Sanjeev Kumar. 2002. *Fruit and Vegetable Preservation: Principles and Practices*. International Book Distribution Company, Lucknow.

Website sources:

- <http://ecoursesonline.iasri.res.in/course/view.php?id=164>
- <https://www.youtube.com/watch?v=szC5qqB0CdI>

BAG755 Post-Harvest Management and Value Addition of Fruits and Vegetable Lab L:T:P 0:0:1

List of Experiments: Minimum 08 of the followings-

1. Applications of different types of packaging, containers for shelf life extension.
2. Effect of temperature on shelf life and quality of produce.
3. Demonstration of chilling and freezing injury in vegetables and fruits.
4. Extraction and preservation of pulps and juices.
5. Preparation of jam and jelly.
6. Preparation of squash.
7. Study of value added product of tomato.
8. Quality evaluation of products - physico-chemical and sensory.
9. Visit to processing unit/ industry.

BAG706A

Agricultural Journalism

L:T:P 3:0:0

Objective: To facilitate understanding on the importance, coverage, and broadcasting agriculture through print and electronic media.

UNIT I

Agricultural Journalism: The nature and scope of agricultural journalism characteristics and training of the agricultural journalist, how agricultural journalism is similar to and different from other types of journalism.

UNIT II

Newspapers and magazines as communication media: Characteristics; kinds and functions of newspapers and magazines, characteristics of newspaper and magazine readers. Form and content of newspapers and magazines: Style and language of newspapers and magazines, parts of newspapers and magazines.

UNIT III

The agricultural story: Types of agricultural stories, subject matter of the agricultural story, structure of the agricultural story. Gathering agricultural information: Sources of agricultural information, interviews, coverage of events, abstracting from research and scientific materials, wire services, other agricultural news sources.

UNIT IV

Writing the story: Organizing the material, treatment of the story, writing the news lead and the body, readability measures. Illustrating agricultural stories: Use of photographs, use of artwork (graphs, charts, maps, etc.), writing the captions. Editorial mechanics: Copy reading, headline and title writing, proofreading, lay outing. Practical Practice in interviewing. Covering agricultural events. Abstracting stories from research and scientific materials and from wire services. Writing different types of agricultural stories. Selecting pictures and artwork for the agricultural story.

UNIT V

Practice in editing, copy reading, headline and title writing, proofreading, layouting. Testing copy with a readability formula. Visit to a publishing office.

Course outcomes:

Upon completion of the course students will be able to understand:

- Able to understand and differentiate between newspaper journalism and agricultural journalism.
- Pragmatically approach reporting issues relevant agriculture in newspapers/magazine.
- Ability to write an issue-based article, edit, proofread and publish.
- Develop interest in agricultural journalism
- Acquire knowledge on agricultural journalism
- Analyze the various types of agricultural stories 4. Analyze the readability of different news stories published in newspapers and magazines
- Develop skills in Copy reading, headline and title writing, proofreading and lay outting.

References:

1. Mohan. K.S. Et Al. 2010.A Handbook on Farm Journalism. Pulari Publication.
2. Priest. S.H. 2016. Agricultural Journalism. Encyclopedia of Sciences and Technology Communication.
3. Jana, B.L. 2014.Agricultural Journalism. Agro-Tech Publishing Academy. India
4. Singh, A K. 2014. Agricultural Extension and Farm Journalism, Agrobios, India.
5. Bhaskaran C. 2008. Farm Journalism and Media Management, Agrotech Publishing Academy, India.
6. Shahzad Ahmad. 2006. Art of Modern Journalism. Anmol Publications Pvt. Ltd., India.

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- <http://ecoursesonline.iasri.res.in/>
- <http://keralamediaacademy.org/>
- <https://content.kopykitab.com/>
- <https://www.academia.edu/>

BAG706B Fundamentals of Soil and Water Conservation Techniques L:T:P 3:0:0

Objective: The aims of soil conservation strategies for cultivated land are too established and maintain a good ground cover for controlling the soil erosion.

Unit I

Surveying: survey equipment, chain survey, cross staff survey, plotting procedure, calculations of area of regular and irregular fields

Unit II

Levelling – levelling equipment, terminology, methods of calculation of reduced levels, types of levelling, contouring.

Unity III

Irrigation, classification of projects, flow irrigation and lift irrigation. Water source, Water lifting devices – pumps (shallow and deep well).

Unit IV

Irrigation water measurement – weirs, flumes and orifices and methods of water measurement and instruments. Water conveyance systems, open channel and underground pipeline. Irrigation methods – drip and sprinkle irrigation systems.

Unit V

Soil and water conservation – soil erosion, types and engineering control measures.

Course Outcomes:

The students should be able to-

- Demonstrate knowledge of various surveying methods.
- Conduct a chain survey and compass survey.
- Conduct levelling survey and be able to do RL calculations.
- Demonstrate knowledge of properties of various building materials.
- Design the field channels, Regime Channels, border irrigation, drip and sprinkler irrigation system and fundamentals of check basin and furrow irrigation.
- Understand the importance of soil & water conservation (SWC) measures for the control of soil erosion and thereby enhancing agricultural productivity
- Compute various design components of terraces, bunds etc.
- Select appropriate soil and water conservation measures at a location
- Apply the knowledge on engineering for design of SWC projects in watersheds

References:

1. Soil & Water Conservation Engineering by R. Suresh

2. Hydrology and Soil Conservation Engineering by Gahanshyam Das
3. Ojha, T.P. and A.M.Michael. Principles of Agricultural Engineering, Vol.II. Jain Brothers New Delhi.3rd edition 2001.

Website Source:

- www.onlinecourses.nptel.ac.in
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- <http://ecoursesonline.iasri.res>

BAG706C

Micro – Irrigation Techniques

L:T:P 3:0:0

Objectives: To introduce the concept and designing of micro – irrigation systems

UNIT 1

Irrigation projects in India– their comparative performance; development and utilization of water resources through different major/minor irrigation schemes. Basic concepts of command area – definition, need, scope, and development

UNIT II

Past, present and future need of micro-irrigation systems, Role of Govt. for the promotion of micro-irrigation in India, Merits and demerits of micro-irrigation system. Types and components of micro-irrigation system, Micro-irrigation system-design, installation, and irrigation water use efficiency and agricultural production.

UNIT III

Drip irrigation–potential, automation, crops suitability. Fertigation–Fertilizer application criteria, suitability of fertilizer compounds, merits and demerits of fertigation.

UNIT IV

Quality control in micro-irrigation components, water quality parameters for micro irrigation, design and maintenance of polyhouse, importance and application of micro irrigation in poly-houses.

UNIT V

Prospects of waste land development –hills, semi-arid, coastal areas, water scarce areas, Benefit and Cost analysis.

Course Outcomes:

At the end of the course the students will be able to

- Design the field channels, Regime Channels, border irrigation, drip and sprinkler irrigation system and fundamentals of check basin and furrow irrigation.
- To provide a sound theoretical knowledge applied to water resources and agricultural engineering.
- The students will be able to understand the requirements of crop water.

- The Students will understand the importance of water quality for beneficial uses, especially irrigation and its management.
- To develop innovative capacity of students for increasing agricultural production with scarce water resources available.

Reference:

1. Cuenca, H.R. (1989). Irrigation System Design-An Engineering Approach. Prentice Hall, Engle wood, Cliffs, New Jersey.
2. Israelson and Hassan. (1981). Irrigation Principles and Practices. John Wiley and sons, New York.
3. Jack, K. and Rend, B. Sprinkler and Trickle Irrigation. Van Nostra Reinhold, New York.
4. Lal, R. (1983). Irrigation Hydraulics. Saroj Prakashan Publishers, Allahabad.
5. Larry, G. J. (1982). Principles of Farm Irrigation System Design. John Wiley Sons, New York.
6. Michael, A.M. (1986). Irrigation Theory and Practice. Vikas Publishing House, New Delhi.
7. Sivanappan, R.K. (1987). Sprinkler irrigation. Oxford & IBH Publishing Company, New Delhi.

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BAG-706 II (D)

Commercial Plant Breeding

L:T:P 3:0:0

Objectives: To study the different aspect of maintenance breeding and development of two line system for hybrid seed production.

UNIT I

Types of crops and modes of plant reproduction Line development and maintenance breeding in self and cross pollinated crops (A/B/K and two line system) for development of hybrids and seed production. Genetic purity test of commercial hybrids.

UNIT II

Advances in hybrid seed production of maize, rice, sorghum, pearl millet, cadour, sunflower, cotton pigeon pea, Brassica etc. Quality seed production of vegetable crops under open and protected environment.

UNIT III

Alternative strategies for the development of the line and cultivars: haploid inducer, tissue culture techniques and biotechnological tools.

UNIT IV

IPR issues in commercial plant breeding DUS testing and registration of varieties under PPV & FR Act.

UNIT V

Variety testing, release and notification systems in India, Principles and techniques of seed production, types of seeds, quality testing in self and cross pollinated crops.

Course outcomes:

- To know the commercial plant breeding techniques for new superior crops
- Develop new insect and disease resistant varieties
- Serve the quality food in the market by developing high nutritive varieties.

References:

1. Chopra, VL 1990 Plant Breeding: Theory and Practices. Oxford and IBH pub. Co. Pvt. Ltd, New Delhi.
2. Choudhari, LC 1982. Introduction to Plant Breeding Oxford A& IBH Publishing Co., New Delhi
3. Harihar Ram and Singh, H.G. 1994. Crop Breeding and Genetics: Kalayani Pub., New Delhi

4. Phundan Singh, 1996, Essentials of plant breeding Kalyani Publishers, New Delhi/Ludhiana
5. Singh, B.D. 2001. Fundamentals of Genetics. Kalyani Publishers. New Delhi/Ludhiana

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- <http://www.iwmi.cgiar.org>
- <http://agricoop.nic.in>
- <https://www.researchgate.net>
- <https://www.wassan.org>
- <http://eagri.org>
- <https://ecourses.icar.gov.in>
- <http://www.agriglance.com>
- <http://agrimoon.com>

BAG 757 & BAG 758 Experiential Learning Programme L:T:P 0:0:4

Objective: To aware the students an opportunity to develop practical and entrepreneurial skills, and knowledge through hands on experience.

The students have to register for any two modules, which are as follows-

1. Production Technology for Bio-agents and Bio-fertilizer
2. Seed Production Technology
3. Mushroom Cultivation Technology
4. Soil, Plant, Water and Seed Testing
5. Commercial Beekeeping
6. Poultry Production Technology
7. Commercial Horticulture
8. Floriculture and Landscaping
9. Food Processing
10. Agriculture Waste Management
11. Organic Production Technology
12. Commercial Sericulture
13. Milk and Milk Product

Evaluation of Experiential Learning Programme

| Sl. No. | Aspects of Evaluation | Max. Marks |
|--------------|---|------------|
| 1. | Project Planning and Writing | 20 |
| 2. | Presentation | 10 |
| 3. | Regularity | 10 |
| 4. | Monthly Assessment | 10 |
| 6. | Technical Skill Development | 10 |
| 7. | Entrepreneurship and Business networking skills | 20 |
| 9. | Report Writing Skills | 10 |
| 10. | Final Presentation | 10 |
| Total | | 100 |

Course Outcomes:

- It develops practical and entrepreneurial skills, and knowledge through meaningful hands on experience, confidence in their ability to design and execute project work.

BAG805A

Agrochemicals

L:T:P 3:0:0

Objective: To impart comprehensive knowledge about the chemicals used for agricultural purposes.

Unit-I

An introduction to agrochemicals, their type and role in agriculture, effect on environment, soil, human and animal health, merits and demerits of their uses in agriculture, management of agrochemicals for sustainable agriculture.

Unit-II

Herbicides- Major classes, properties and important herbicides. Fate of herbicides.

Unit-III

Fungicides - Classification – Inorganic fungicides - characteristics, preparation and use of sulfur and copper, Mode of action-Bordeaux mixture and copper oxychloride.

Organic fungicides- Mode of action- Dithiocarbamates-characteristics, preparation and use of Zineb and maneb. Systemic fungicides- Benomyl, carboxin, oxycarboxin, Metalaxyl, Carbendazim, characteristics and use.

Unit-IV

Fertilizers and their importance. Nitrogenous fertilizers: Feed stocks and Manufacturing of ammonium sulphate, ammonium nitrate, ammonium chloride, urea. Slow release N-fertilizers. Phosphatic fertilizers: feedstock and manufacturing of single superphosphate. Preparation of bone meal and basic slag. Potassic fertilizers: Natural sources of potash, manufacturing of potassium chloride, potassium sulphate and potassium nitrate.

Mixed and complex fertilizers: Sources and compatibility–preparation of major, secondary and micronutrient mixtures. Complex fertilizers: Manufacturing of ammonium phosphates, nitrophosphates and NPK complexes. Fertilizer control order. Fertilizer logistics and marketing.

Unit-V

Plant bio-pesticides for ecological agriculture, Bio-insect repellent.

Course Outcomes:

- Understand the role of agrochemical in Agriculture.
- Acquire knowledge on herbicide and fungicide.
- Knowledge about importance of fertilizers.

- Explain the classification of fertilizers.
- Effect of agrochemicals and fertilizers on human health and animal health.

References:

1. T. V. Sathe 2009. Agrochemicals and Pest Management. Daya Publishing House
2. Franz Müller 1999. Agrochemicals: Composition, Production, Toxicology, Applications. Wiley-VCH: Weinheim

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- <http://www.iaritoppers.com/>
- <http://www.agriglance.com/>
- <http://www.agritech.tnau.ac.in/>

BAG805B

Biopesticides and Biofertilizers

L:T:P 3:0:0

Objective: To educate about the principles and application of biopesticides and biofertilizers in order to protect environment, soil fertility and human health.

Unit-I

History and concept of biopesticides. Importance, scope and potential of biopesticide. Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and biorationales.

Unit-II

Botanicals and their uses. Mass production technology of bio-pesticides. Methods of application of biopesticides. Methods of quality control and Techniques of biopesticides. Impediments and limitation in production and use of biopesticide.

Unit-III

Biofertilizers - Introduction, status and scope. Structure and characteristic features of bacterial biofertilizers- *Azospirillum*, *Azotobacter*, *Bacillus*, *Pseudomonas*, *Rhizobium* and *Frankia*; Cyanobacterial biofertilizers- *Anabaena*, *Nostoc*, *Hapalosiphon* and fungal biofertilizers- AMmycorrhiza and ectomycorrhiza. Nitrogen fixation -Free living and symbiotic nitrogen fixation.

Unit-IV

Mechanism of phosphate solubilization and phosphate mobilization, K solubilization. Production technology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertilizers.

Unit-V

FCO specifications and quality control of biofertilizers. Application technology for seeds, seedlings, tubers, sets etc. Biofertilizers -Storage, shelf life, quality control and marketing. Factors influencing the efficacy of biofertilizers.

Course Outcomes:

- Infer the importance of bio pesticide in sustainable Agriculture.
- Knowledge about methods of quality control and Techniques of bio pesticides.
- To educate about concept and classification of bio-concepts.
- Role of bio-fertilizers in quality parameters of various agricultural products and key role of bio-fertilizer in maintain soil health.

- Comprehend the types of bio fertilizers and their characteristics features.

References:

1. Hand book of Organic Farming and Bio fertilizers - A.C.Gaur
2. Anwar. A. 2017. Bio pesticides and Bio agents: Novel Tools for Pest Management. CRC Press.
3. Singh. 2014. Advances and Plant-pesticides. Springer India
4. EIRI. 2009. Hand Book Of Bio fertilizers & Vermiculture. Engineers India Research Institute.

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- <http://www.agriglance.com/>
- <http://www.agritech.tnau.ac.in/>

BAG805C

Agro Waste Management

L:T:P 3:0:0

Objective: To provide an understanding of the technology for waste and bi-product utilization of agriculture waste.

UNIT-I

Characterization and utilization of by-products from cereals, pulses, oilseeds, fruits, vegetables, plantation, dairy, eggs, meat, fish and poultry processing industries. Elements of importance in efficient management of wastes from aforesaid food industries.

UNIT-II

Waste utilization in various industries, furnaces and boilers run on agricultural wastes and byproducts, briquetting of biomass as fuel, production of charcoal briquette, generation of electricity using surplus biomass, producer gas generation and utilization.

UNIT-III

Concept, scope and maintenance of waste management and effluent treatment, Temperature, pH, Oxygen demands (BOD, COD), fat, oil and grease content, metal content, forms of phosphorous and sulphur in waste waters, microbiology of waste, other ingredients like insecticide, pesticides and fungicides residues.

UNIT-IV

Waste treatment and disposal, design, construction, operation and management of institutional community and family size biogas plants, concept of vermin-composting, Pretreatment of waste: sedimentation, coagulation, flocculation and floatation,

UNIT-V

Secondary treatments: Biological and chemical oxygen demand for different food plant waste– trickling filters, oxidation ditches, activated sludge process, rotating biological contractors, lagoons.

Tertiary treatments: Advanced waste water treatment process, Effluent treatment plants.

Course Outcomes:

The students will be able to:

- Understand the scientific principles of the use of biodegradable waste and agricultural by-products from agriculture
- Understand the basic information on waste management status in India.
- Apply acquired knowledge both theoretical and practically to generate market for agriculture by-product waste utilization.

References:

1. Water technology by N.F. Gray.
2. Environmental pollution by K.C. Agrawal.
3. Industrial microbiology by L.E. Casida Jr
4. Environmental pollution control engineering by C.S. Rao.
5. Food processing waste management by green and Kramer (AVI)

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BAG-805 III (D)

Agribusiness Management

L:T:P 3:0:0

Objectives: To expose the learners in agribusiness areas for evaluate, and understand the agribusiness management.

UNIT-I

Transformation of agriculture into agribusiness, various stakeholders and components of agribusiness systems. Importance of agribusiness in the Indian economy and New Agricultural Policy.

UNIT-II

Distinctive features of Agribusiness Management: Importance and needs of agro-based industries, Classification of and types of agro based industries, Institutional arrangement, procedures to set up agro based industries, Constraints in establishing agro based industries. Agri-value chain: Understanding primary and support activities and their linkages. Business environment: PEST & SWOT analysis.

UNIT-III

Management functions: Roles & activities, Organization culture. Planning, meaning, definition, types of plans. Purpose or mission, goals or objectives, Strategies, policies procedures, rules, programs and budget. Components of a business plan, Steps in planning and implementation. Organization staffing, directing and motivation. Ordering, leading, supervision, communications, control.

UNIT-IV

Capital Management and Financial management of Agribusiness. Financial statements and their importance. Marketing Management: Segmentation, targeting & positioning Marketing mix and marketing strategies. Consumer behaviour analysis, Product Life Cycle (PLC). Sales & Distribution Management. Pricing policy, various pricing methods.

UNIT-V

Project Management definition, project cycle, identification, formulation, appraisal, implementation, monitoring and evaluation. Project Appraisal and evaluation techniques.

Course Outcomes

- At the end of course a students will be able to:
- Understand about prepare a business plan or case study on an agribusiness topic.

- Understand, how to begin a project through working as a team. 3, Understand, how all aspects of agriculture combine and are used by scientists, marketers and producers.
- Learn the concepts and process of Planning and Organizing
- Acquaint with various functional areas of agribusiness
- Understand the fundamentals of management with reference to agribusiness,
- Understand to effectively evaluate the impact of trade policy, common markets, market instability and commodity problems.

References:

1. Gittinger, J. P. 1984, Economic Analysis of Agricultural Projects, John Hopkins University Press
2. Kotler, Philip, 1999, Marketing Management. Prentice Hall of India, New Delhi,
3. Mamoria, C. B., Joshi, R. L. and Mulla, N. 1. 2005. Principles and Practices of Marketing in India. Kitab Mahal, Allahabad,
4. Meena, G. L, Burark, S. S., l'ant, D. C. and Sharma, R. 2017. Fundamentals of Agribusiness Management Agrotech Publishing Academy, Udaipur.
5. Somani, L. L. and Meena, G. L 2017. Agribusiness & Farm Management at a Glance. Vol- 1&2, Agrotech Publishing Academy, Udaipur
6. Sudha, G. S. 2000, Business Management. RBSA Publishers, Jaipur.
7. Tripathi, P. C. and Reddy, P. N 2008. Principles of Management. Tata McGraw Hill Education Private Limited, New Delhi

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- <http://inujprdistance.com/>
- <https://zalamsyah.files.wordpress.com/>
- <https://agrimoon.com/>

BAG806

Dairy Technology

L:T:P 3:0:0

Objective: To provide in-depth knowledge in various unit operations and basic concepts in dairy processing.

Unit- I

Introduction: Status of Dairy Industry in India. Cooperative Dairying. Operation Floods. Chemical composition, microbiological quality, and nutritional importance of milk and milk product in PFA Act, Rules, 1955 as amended to date.

Unit- II

Receiving and quality assessing of liquid milk in dairy industry for detection of adulteration, decision for acceptance/rejection, and determination of price of the milk.

Unit- III

Standardization and/or processing (pasteurization, homogenization, sterilization and UHT processing), storage, packaging and distribution of liquid milks: whole, standardized, toned, double-toned, and skim milk. Bactofugation: Theory and microbiology. Recombined, reconstituted, and flavoured milks. Cleaning and sanitization of dairy equipments and plant as a whole.

Unit- IV

Thermal processing of milk: Principles of thermal processing: kinetics of microbial destruction, thermal death curve, Arrhenius equation, D value, Z value, F value, Q10 value. Factors affecting thermal destruction of microorganisms.

Unit- V

Milk Products: Definition, composition, methods of preparation/production, quality and/or grading parameters, packaging, storage characteristics, uses and shelf-life of cream, butter and ghee; evaporated and condensed milks, skimmed, whole and instants milk powders.

Course Outcomes:

- The students will gain knowledge about Dairy and Food process engineering
- Understand the process of manufacturing of dairy products and thermal processing of food.
- The Students will understand the importance of quality control and food preservation and packaging.
- The students gain a good knowledge on the various processes and equipments used in the processing of milk and milk products.
- The student will discover the biotechnological approaches in the field of dairy.

References:

1. Warner, James N.,(1953), Dairying in India, Calcutta: Mac Millan and Company Limited.
2. Sukumar De, (2006), Outlines of Dairy Technology, 23rd ed., New Delhi: Oxford University Press.
3. Mohan, C. Madan (1989.), Dairy Management in India, New Delhi, Mital Publications.

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BAG856

Dairy Technology Lab

L:T: P 0:0:1

List of Experiments: Minimum 08 of the followings-

1. Sampling of milk and milk products for different tests.
2. Determination of the composition of milk and its properties (fat content, total solids, specific gravity, acidity, pH, viscosity etc)
3. Study of milk plant.
4. To determine the stability of milk for heat processing.
5. Standardization of Milk
6. Detection of Adulteration of Milk, Khoa, Butter and Ice-cream
7. Study of plate heat exchanger and tubular heat exchanger.
8. HTST pasteurization of milk.
9. Centrifugal separation of milk.
10. Spray drying of milk
11. Study of soya milk process and related equipments
12. Visit to milk and milk products processing plant.

BAG807

Farm Machinery and Power

L:T:P 3:0:0

Objective: To develop skills in the students required developing and modification of indigenous farm machines as per the need of the area and farmers.

Unit- I

Status of Farm Power in India, Sources of Farm Power, I.C. engines, working principles of IC engines, comparison of two stroke and four stroke cycle engines.

Unit-II

Study of different components of I.C. engine, I.C. engine terminology and solved problems, Familiarization with different systems of I.C. engines: Air cleaning, cooling, lubrication, fuel supply and hydraulic control system of a tractor,

Unit-III

Familiarization with Power transmission system: clutch, gear box, differential and final drive of a tractor, Tractor types, Cost analysis of tractor power and attached implement,

Unit-IV

Familiarization with Primary and Secondary Tillage implement, implement for hill agriculture, implement for intercultural operations,

Unit-V

Familiarization with sowing and planting equipment, calibration of a seed drill and solved examples, Familiarization with Plant Protection equipment, Familiarization with harvesting and threshing equipment.

Course Outcomes:

Students completing this course will be able to:

- The students will be able to understand the different components of IC engine
- Familiar with different type of primary and Secondary tillage implement.
- The students will be able to understand the mechanization and various equipment used in the farm for different field operations
- Familiar with sowing and planting equipment. Calibration of seed drill.

References

1. Ojha, T.P. and A.M. Michael. *Principles of Agricultural Engineering*, Vol.I. Jain Brothers New Delhi.3rd edition 2001.
2. Sahay, Jagdiswar. *Elements of Agricultural Engineering*. Agro book Agencies1977

3. Singhal, O.P. *Agricultural Engineering*, 19

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BAG857

Farm Machinery and Power Lab

L:T:P 0:0:1

List of Experiments: Minimum 08 of the followings-

1. Study of different components of I.C. engine.
2. To study air cleaning and cooling system of engine.
3. Familiarization with clutch, transmission, differential and final drive of a tractor.
4. Familiarization with lubrication and fuel supply system of engine.
5. Familiarization with brake, steering, hydraulic control system of engine.
6. Learning of tractor driving.
7. Familiarization with operation of power tiller.
8. Implements for hill agriculture,
9. Familiarization with different types of primary and secondary tillage implements: mould plough, disc plough and disc harrow.
10. Familiarization with seed- cum-fertilizer drills, their seed metering mechanism.
11. Familiarization with different types of sprayers and dusters.
12. Familiarization with different inter- cultivation equipment.
13. Familiarization with harvesting and threshing machinery.

BAG858 Rural Agricultural Work Experience (RAWE): Under this programme, students' performance will be assessed based on model in Semester-VIII.

RAWE Model

| Sr. | RAWE Model | Duration (Week) | Credits |
|-----|--|-----------------|---------|
| 1 | Orientation | 1 | 0+1 |
| 2 | Training / Attachment Agro-industries, Agri-clinics, KVK | 4 | 0+4 |
| 3 | Village attachment | 12 | 0+12 |
| 4 | Project report preparation and examination | 3 | 0+3 |
| | Total | 20 | 20 |

Schedule of RAWE conduct:

Group formation: Maximum 15 students

Allocation of Group's mentor: Individual faculty will be assigned to guide each group

Working activity: Student in group will be allowed to visit rural (village) environment under supervision of their mentor for strengthening practical exposure.

Village attachment time and duration: Working day on Friday and Saturday for 6 weeks.

RAWE Training / Attachment-Agro-industries, Agri-clinics, KVK: During RAWE Programme the students will undergo internship in any one of the following industries / companies / institutes for a period of four weeks during summer months after sixth semester.

Evaluation criteria:

| Course Code | Course Name | Evaluation (Marks) | | |
|-------------|------------------------------------|-------------------------|--------------------------|---------------|
| | | Parameters | Mid Term (Internal exam) | External exam |
| BAG-858 | Rural Agricultural Work Experience | Regularity (Attendance) | 50 | - |
| | | Performance | 50 | - |
| | | Seminar | 50 | - |
| | | Summer Training | 100 | |
| | | Report | 50 | - |
| | | Viva-voce | - | 200 |
| | | Sub Total | 300 | 200 |
| | Total | | 500 | |