# Detailed Program Scheme

## Bachelor of Science (Hons.)

## Agriculture

## (2020- 2021)

DOC202002250014

**RNB GLOBAL UNIVERSITY**
RNB Global City, Ganganagar Road,
Bikaner, Rajasthan 334601

| Document Release Notice | |
|---|---|
| **Detailed Program Scheme for all Semesters**<br><br>**Release: Version 1.0** | |
| **Name of Program** | Bachelor of Science (Hons.) Agriculture |
| **Abbreviated Program Name** | B.Sc. (Hons.) Agri. |
| **Updated on** | March'2020 |
| **Approved By** | BOS |

## OVERVIEW

RNB Global University follows Semester System along with Choice Based Credit System as per latest guidelines of University Grants Commission (UGC). Accordingly, each academic year is divided into two semesters, **Odd (July-December) and Even (January-June).** Also, the university follows a system of continuous evaluation along with regular updating in course curricula and teaching pedagogy. Kindly be noted that Lab Includes: Laboratory work / Field Work/Industry Visits/Practical/Hands on Experience.

### Course Scheme

| | |
|---|---|
| **Name of Program** | Bachelor of Science (Hons.) Agriculture |
| **Duration of Program** | 4 years |
| **Number of Semester** | 8 |
| **Total Credit of Program** | 221 |

### DETAILED CREDIT STRUCTURE

| | | |
|---|---|---|
| **Year 1** | Semester I | 26 credits |
| | Semester II | 29 credits |
| **Year 2** | Semester III | 31 credits |
| | Semester IV | 29 credits |
| **Year 3** | Semester V | 34 credits |
| | Semester VI | 22 credits |
| **Year 4** | Semester-VII | 28 credits |
| | Semester-VIII | 22 credits |
| **Total Credits** | | 221 Credits |

## SEMESTER WISE COURSE DETAILS

### *Semester –I*

| S.No. | Course Code | Course Name | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1. | 20000100 | Principles of Agronomy and Meteorology | 2 | 1 | 0 | 3 |
| 2. | 20000200 | Principles of Agronomy and Meteorology Lab | 0 | 0 | 2 | 1 |
| 3. | 20000300 | Introduction to Soil Science | 2 | 0 | 0 | 2 |
| 4. | 20000400 | Introduction to Soil Science Lab | 0 | 0 | 2 | 1 |
| 5. | 20000500 | Elementary Genetics | 2 | 0 | 0 | 2 |
| 6. | 20000600 | Elementary Genetics Lab | 0 | 0 | 2 | 1 |
| 7. | 20000700 | Statistical Methods | 2 | 1 | 0 | 3 |
| 8. | 20000800 | Introduction to Horticulture | 2 | 0 | 0 | 2 |
| 9. | 20000900 | Introduction to Horticulture Lab | 0 | 0 | 2 | 1 |
| 10. | 20001000 | Principles of Agricultural Economics | 2 | 0 | 0 | 2 |
| 11. | 99002200 | Business Communication | 3 | 1 | 0 | 4 |
| 12. | 20001100 | Ability and Skill Enhancement - I | 2 | 0 | 0 | 2 |
| 13. | 99002800 | Workshops & Seminars | - | - | - | 1 |
| 14. | 99002700 | Human Values & Social Service/NCC/NSS | - | - | - | 1 |
| | **Total** | | **17** | **3** | **8** | **26** |

### *Semester -II*

| S. No. | Course Code | Course Name | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1. | 20001200 | Plant Biochemistry | 2 | 0 | 0 | 2 |
| 2. | 20001300 | Plant Biochemistry Lab | 0 | 0 | 2 | 1 |
| 3. | 20001400 | Microbiology | 2 | 0 | 0 | 2 |
| 4. | 20001500 | Microbiology Lab | 0 | 0 | 2 | 1 |
| 5. | 20001600 | Introduction to Entomology and Nematology | 2 | 1 | 0 | 3 |
| 6. | 20001700 | Introduction to Entomology and Nematology Lab | 0 | 0 | 2 | 1 |
| 7. | 20001800 | Irrigation & Water Management | 2 | 1 | 0 | 3 |
| 8. | 20001900 | Rural Sociology and Educational Psychology | 2 | 1 | 0 | 3 |
| 9. | 20002000 | Natural Resources and Farm | 2 | 0 | 0 | 2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Management | | | | |
| 10. | 20002100 | Fundamentals of Plant Breeding | 2 | 0 | 0 | 2 |
| 11. | 20002200 | Fundamentals of Plant Breeding Lab | 0 | 0 | 2 | 1 |
| 12. | 99001900 | Environmental Studies | 3 | 1 | 0 | 4 |
| 13. | 20002300 | Ability and Skill Enhancement - II | 2 | 0 | 0 | 2 |
| 14. | 99002800 | Workshops & Seminars | - | - | - | 1 |
| 15. | 99002700 | Human Values & Social Service/NCC/NSS | - | - | - | 1 |
| | **Total** | | **19** | **4** | **8** | **29** |

***Semester – III***

| S.No. | Course Code | Course Name | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1. | 20012200 | Crop Production Technology – I (Kharif Crops) | 1 | 0 | 0 | 1 |
| 2. | 20012300 | Crop Production Technology – I Lab(Kharif Crops) | 0 | 0 | 2 | 1 |
| 3. | 20012400 | Soil & water Conservation Engineering | 2 | 0 | 0 | 2 |
| 4. | 20012500 | Soil & water Conservation Engineering Lab | 0 | 0 | 2 | 1 |
| 5. | 20012600 | Agricultural Finance and Cooperation | 2 | 0 | 0 | 2 |
| 6. | 20012700 | Agricultural Finance and Cooperation Lab | 0 | 0 | 2 | 1 |
| 7. | 20012800 | Agri- Informatics | 1 | 0 | 0 | 1 |
| 8. | 20012900 | Agri- Informatics Lab | 0 | 0 | 2 | 1 |
| 9. | 20013000 | Farm Machinery and Power | 1 | 0 | 0 | 1 |
| 10. | 20013100 | Farm Machinery and Power lab | 0 | 0 | 2 | 1 |
| 11. | 20013200 | Production Technology for Vegetables and Spices | 1 | 0 | 0 | 1 |
| 12. | 20013300 | Production Technology for Vegetables and Spices Lab | 0 | 0 | 2 | 1 |
| 13. | 20013400 | Fundamentals of Crop Physiology | 2 | 0 | 0 | 2 |
| 14. | 20013500 | Fundamentals of Crop Physiology Lab | 0 | 0 | 2 | 1 |
| 15. | 20013600 | Fundamentals of Plant Pathology | 3 | 0 | 0 | 3 |
| 16. | 20013700 | Fundamentals of Plant Pathology Lab | 0 | 0 | 2 | 1 |
| 17. | 20013800 | Livestock and Poultry Management | 3 | 0 | 0 | 3 |
| 18. | 20013900 | Livestock and Poultry Management Lab | 0 | 0 | 2 | 1 |
| 19. | 20014000 | Agriculture Heritage & Human Values & Ethics | 0 | 0 | 0 | 2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 20. | 20014100 | Ability and Skill Enhancement -III | 2 | 0 | 0 | 2 |
| 21. | 99002800 | Workshops & Seminars | - | - | - | 1 |
| 22. | 99002700 | Human Values & Social Service/NCC/NSS | - | - | - | 1 |
| | **Total** | | **18** | **0** | **18** | **31** |

***Semester - IV***

| S.No. | Course Code | Course Name | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1. | 20014200 | Crop Production Technology –II (Rabi Crops) | 1 | 0 | 0 | 1 |
| 2. | 20014300 | Crop Production Technology –II (Rabi Crops) Lab | 0 | 0 | 2 | 1 |
| 3. | 20014400 | Production Technology for Ornamental Crops, MAP and Landscaping | 1 | 0 | 0 | 1 |
| 4. | 20014500 | Production Technology for Ornamental Crops, MAP and Landscaping Lab | 0 | 0 | 2 | 1 |
| 5. | 20014600 | Renewable Energy and Green Technology | 1 | 0 | 0 | 1 |
| 6. | 20014700 | Renewable Energy and Green Technology Lab | 0 | 0 | 2 | 1 |
| 7. | 20014800 | Problematic Soils and their Management | 2 | 0 | 0 | 2 |
| 8. | 20014900 | Production Technology for Fruit and Plantation Crops | 2 | 0 | 0 | 1 |
| 9. | 20015000 | Production Technology for Fruit and Plantation Crops Lab | 0 | 0 | 2 | 1 |
| 10. | 20015100 | Principles of Seed Technology | 1 | 0 | 0 | 1 |
| 11. | 20015200 | Principles of Seed Technology lab | 0 | 0 | 4 | 2 |
| 12. | 20015300 | Plant Biotechnology | 2 | 0 | 0 | 2 |
| 13. | 20015400 | Plant Biotechnology Lab | 0 | 0 | 2 | 1 |
| 14. | 20015500 | Agricultural Marketing Trade & Prices | 2 | 0 | 0 | 2 |
| 15. | 20015600 | Agricultural Marketing Trade & Prices Lab | 0 | 0 | 2 | 1 |
| 16. | 20015700 | Fundamentals of Agriculture Extension Education | 2 | 0 | 0 | 2 |
| 17. | 20015800 | Fundamentals of Agriculture Extension Education Lab | 0 | 0 | 2 | 1 |
| 18. | - | Elective-I | 2 | 0 | 0 | 2 |
| 19. | - | Elective Lab-I | 0 | 0 | 2 | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 20. | 20015900 | Ability and Skill Enhancement IV | 2 | 0 | 0 | 2 |
| 21. | 99002800 | Workshops & Seminars | - | - | - | 1 |
| 22. | 99002700 | Human Values & Social Service/NCC/NSS | - | - | - | 1 |
| | **Total** | | **19** | **0** | **18** | **29** |

**Electives**

| Elective | Course Code | Course Name |
|---|---|---|
| **Elective I** | 20016000 | **Agribusiness Management** |
| | 20016100 | **Agribusiness Management Lab** |
| | 20016200 | Agrochemicals |
| | 20016300 | Agrochemicals Lab |
| | 20016400 | Commercial Plant Breeding |
| | 20016500 | Commercial Plant Breeding Lab |
| | 20016600 | Landscaping |
| | 20016700 | Landscaping Lab |

***Semester - V***

| S. No. | Course Code | Course Name | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1. | 20016800 | Principles of Integrated Pest and Disease Management | 2 | 0 | 0 | 2 |
| 2. | 20016900 | Principles of Integrated Pest and Disease Management Lab | 0 | 0 | 2 | 1 |
| 3. | 20017000 | Manures, Fertilizers and Soil Fertility Management | 2 | 0 | 0 | 2 |
| 4. | 20017100 | Manures, Fertilizers and Soil Fertility Management lab | 0 | 0 | 2 | 1 |
| 5. | 20017200 | Pests of Crops and Stored Grain and their Management | 2 | 0 | 0 | 2 |
| 6. | 20017300 | Pests of Crops and Stored Grain and their Management Lab | 0 | 0 | 2 | 1 |
| 7. | 20017400 | Diseases of Field and Horticultural Crops and their Management -I | 2 | 0 | 0 | 2 |
| 8. | 20017500 | Diseases of Field and Horticultural Crops and their Management -I Lab | 0 | 0 | 2 | 1 |
| 9. | 20017600 | Crop Improvement-I *(Kharif Crops)* | 1 | 0 | 0 | 1 |
| 10. | 20017700 | Crop Improvement-I Lab *(Kharif Crops)* | 0 | 0 | 2 | 1 |
| 11. | 20017800 | Food Safety & standards | 2 | 0 | 0 | 2 |
| 12. | 20017900 | Food Safety & standards Lab | 0 | 0 | 2 | 1 |
| 13. | 20018000 | Bio pesticides & Bio fertilizers | 2 | 0 | 0 | 2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 14. | 20018100 | Bio pesticides & Bio fertilizers | 0 | 0 | 2 | 1 |
| 15. | 20018200 | Practical Crop Production – I (*Kharif* crops) | 0 | 0 | 4 | 2 |
| 16. | 20018300 | Intellectual Property Rights | 1 | 0 | 0 | 1 |
| 17. | - | Elective -II | 2 | 0 | 0 | 2 |
| 18. | - | Elective - II Lab | 0 | 0 | 2 | 1 |
| 19. | 20018400 | Ability and Skill Enhancement -V | 2 | 0 | 0 | 2 |
| 20. | 20018500 | Summer Internship and Report | 0 | 0 | 8 | 4 |
| 21. | 99002800 | Workshops & Seminars | - | - | - | 1 |
| 22. | 99002700 | Human Values & Social Service/NCC/NSS | - | - | - | 1 |
| | **Total** | | **18** | **0** | **28** | **34** |

| Elective | Course Code | Course Name |
|---|---|---|
| **Elective II** | 20018600 | Geoinformatics and Nano-technology and Precision Farming |
| | 20018700 | Geoinformatics and Nano-technology and Precision Farming Lab |
| | 20018800 | Farming System & Sustainable Agriculture |
| | 20018900 | **Weed Management** |
| | 20019000 | **Weed Management Lab** |
| | 20019100 | Micro propagation Technologies |
| | 20019200 | Micro propagation Technologies Lab |

***Semester- VI***

| S. No. | Course Code | Course Name | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1. | 20019300 | Rainfed Agriculture & Watershed Management | 1 | 0 | 0 | 1 |
| 2. | 20019400 | Rainfed Agriculture & Watershed Management lab | 0 | 0 | 2 | 1 |
| 3. | 20019500 | Protected Cultivation and Secondary Agriculture | 1 | 0 | 0 | 1 |
| 4. | 20019600 | Protected Cultivation and Secondary Agriculture lab | 0 | 0 | 2 | 1 |
| 5. | 20019700 | Diseases of Field and Horticultural Crops and their Management-II | 2 | 0 | 0 | 2 |
| 6. | 20019800 | Diseases of Field and Horticultural Crops and their Management-II Lab | 0 | 0 | 2 | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7. | 20019900 | Post-harvest Management and Value Addition of Fruits and Vegetables | 1 | 0 | 0 | 1 |
| 8. | 20020000 | Post-harvest Management and Value Addition of Fruits and Vegetables lab | 0 | 0 | 2 | 1 |
| 9. | 20020100 | Management of Beneficial Insects | 1 | 0 | 0 | 1 |
| 10. | 20020200 | Management of Beneficial Insects lab | 0 | 0 | 2 | 1 |
| 11. | 20020300 | Crop Improvement-II (Rabi crops) | 1 | 0 | 0 | 1 |
| 12. | 20020400 | Crop Improvement-II (Rabi crops) Lab | 0 | 0 | 2 | 1 |
| 13. | 20020500 | Practical Crop Production –II (Rabi crops) | 0 | 0 | 4 | 2 |
| 14. | 20020600 | Principles of Organic Farming | 1 | 0 | 0 | 1 |
| 15. | 20020700 | Principles of Organic Farming lab | 0 | 0 | 2 | 1 |
| 16. | 20020800 | Farm Management, Production & Resource Economics | 1 | 0 | 0 | 1 |
| 17. | 20020900 | Farm Management, Production & Resource Economics Lab | 0 | 0 | 2 | 1 |
| 18. | 20021000 | Principles of Food Science and Nutrition | 2 | 0 | 0 | 2 |
| 19. | - | Elective III | 2 | 0 | 0 | 2 |
| 20. | - | Elective III Lab | 0 | 0 | 2 | 1 |
| 21. | 20021100 | Ability and Skill Enhancement VI | 2 | 0 | 0 | 2 |
| 22. | 99002800 | Workshops & Seminars | - | - | - | 1 |
| 23. | 99002700 | Human Values & Social Service/NCC/NSS | - | - | - | 1 |
| | **Total** | | **15** | **0** | **22** | **28** |

| Elective | Course Code | Course Name |
|---|---|---|
| **Elective III** | 20021200 | Hi-tech. Horticulture |
| | 20021300 | Hi-tech. Horticulture Lab |
| | 20021400 | Protected Cultivation |
| | 20021500 | Protected Cultivation Lab |
| | 20021600 | System Simulation and Agro-advisory |
| | 20021700 | System Simulation and Agro-advisory Lab |
| | 20021800 | **Agricultural Journalism** |
| | 20021900 | **Agricultural Journalism Lab** |

***Semester – VII***

**Rural Agricultural Work Experience and Agro-industrial Attachment (RAWE & AIA)**

**Rural Agricultural Work Experience (RAWE)**

Rural Agricultural Work Experience (RAWE) is included in the programme, where students will be exposed to rural (Village) environment for strengthening practical training 4-5 students in a group will be associated to farmers, Agro-industrial units and Agricultural Research Centre for this purpose for a period of 3-4 months. They will be constantly supervised and evaluated by the faculty and a detailed report of the survey and works of the students for the same period has to be submitted by him/her. For RAWE student can choose any one area as mentioned below:

**Total Credits = 28**

| Activities | No. of weeks | Credit Hours |
|---|---|---|
| **Rural Agricultural Work Experience and Agro-industrial Attachment (RAWE & AIA)**<br><br>**READY-Component-I** | | 14 |
| **RAWE- 411 (Rural Agricultural Work Experience)** | | |
| 1. General orientation & On campus training by different faculties | 1 | |
| 2. (a) Village attachment training programme | 8 | |
| i. Orientation and Survey of Village | | |
| ii. Agronomical Interventions | | |
| iii. Plant Protection Interventions | | |
| iv. Soil Improvement Interventions (Soil sampling and testing) | | |
| v. Fruit and Vegetable production interventions | | |
| vi. Food Processing and Storage interventions | | |
| vii. Animal Production Interventions | | |
| viii. Extension and Transfer of Technology activities | | |
| (b) Attachment in University/College/KVK/research Station | 5 | |
| **READY- Component –II** | | |

| | | |
|---|---|---|
| **AIA- 412 (Agro Industrial Attachment)** | | |
| • Students shall be placed in Agro-and Cottage industries and Commodities Boards for 03 weeks.<br>• Industries include Seed/Sapling production, Pesticides-insecticides, Post-harvest-processing-value addition, Agri-finance institutions, etc. | 3 | 4 |
| **Plant Clinic**<br>• Seed/Sampling production, Pesticide/insecticide, post-harvest industries, processing- value addition, Agri –finance institutions etc. | 2 | 2 |
| **Activities and Tasks during Agro-Industrial Attachment Programme** | | |
| i. Acquaintance with industry and staff | | |
| ii. Study of structure, functioning, objective and mandates of the industry | | |
| iii. Study of various processing units and hands-on trainings under supervision of industry staff | | |
| iv. Ethics of industry | | |
| v. Employment generated by the industry | | |
| vi. Contribution of the industry promoting environment | | |
| vii. Learning business network including outlets of the industry | | |
| viii. Skill development in all crucial tasks of the industry | | |
| ix. Documentation of the activities and task performed by the students | | |
| x. Performance evaluation, appraisal and ranking of students | | |
| **Summer Internship /Agro Industry/Rural Development Program & Report** | | **6** |
| Workshops & Seminars | | 1 |
| Human Values & Social Service/NCC/NSS | | 1 |
| **Total** | | **28** |

**READY- Component –II**

**Case Study of Agro Industry Attachment**

1. Topic/ title of case study.
2. Student name/ ID No.
3. Name of Instructor/Supervisor/Designation.
4. Department/Section
5. Detail of Agro Industry Promoter/Place/Address of Industry
6. Relevance of case study
7. Objective of case study
8. Functioning of Agro Industry/Structure of Industry/type of technology used/type of machinery used
9. Case study out put
10. Future prospects of case study & suggestions
11. Recommendations for beneficiaries/farmers about case study
12. References/Appendices.

***Semester VIII***

**READY- Component III (Experiential Learning Programme)**

**Modules for Skill Development and Entrepreneurship**

A student has to register 22 credits opting for two modules of (0+10) credits each (total 22 credits) from the package of modules.

| Course Code | Title of the module | Department | Credits |
|---|---|---|---|
| 20022000 | Production Technology for Bioagents & Biofertilizer | Soil Science & Agricultural Chemistry & Plant pathology | 0+10 |
| 20022100 | Seed Production, Processing and Technology | Seed Science & Technology | 0+10 |
| 20022200 | Mushroom Cultivation Technology | Plant Pathology | 0+10 |
| 20022300 | Commercial Beekeeping | Entomology | 0+10 |
| 20022400 | Commercial Horticulture | Horticulture | 0+10 |
| 20022500 | Agriculture Waste Management | Agronomy | 0+10 |
| 20022600 | Organic Crop Production Technology | Agronomy | 0+10 |
| 20022700 | Value addition in Milk | Animal Husbandry | 0+10 |
| 20022800 | Micro Propagation | Horticulture | 0+10 |
| 20022900 | Poultry Production Technology | Animal Husbandry | 0+10 |

| | | | |
|---|---|---|---|
| 99002800 | Workshops & Seminars | | 1 |
| 99002700 | Human Values & Social Service/NCC/NSS | | 1 |

**Project Preparation Modules for Experiential Learning/Hands of Training**

1. Project Title.
2. Student name/ ID No.
3. Department/Section
4. Name of Guide/Instructor/Supervisor/Designation/Department
5. Justification/Relevance of Project
6. Project Activities/Methodologies
7. Project of Output/results
8. Summary & Conclusion
9. Future prospects of case study & suggestions
10. References
11. Appendices.

## EVALUATION SCHEME- THEORY

The evaluation of the theory paper of B.Sc. (Agriculture) would be based on Internal and External Assessments. Internal Assessment would consist of 50% of the marks (50 marks) and external assessment (in form of End Term Exam) would consist of remaining 50% marks (50 marks). Detailed scheme of Internal and External Assessments as follows:

### Internal Assessment

| Type | Details | Marks |
|---|---|---|
| Mid Term | Two Mid-term Sessional of 15 marks each (15+15) | 30 |
| Marks obtained in various Tests, Assignments, Presentations, Quiz, Tutorials, etc. | Average of marks obtained | 15 |
| Attendance | 75%+ : 5 marks | 5 |
| **TOTAL** | **50** | |

**External Assessment**

| Type | Marks |
|---|---|
| Theory | 50 |

## EVALUATION SCHEME -PRACTICAL

The evaluation of the practical paper of B.Sc. (Agriculture) would be based on Internal and External Assessments. Internal Assessment would consist of 50% of the marks (50 marks) and external assessment (in form of End Term Exam) would consist of remaining 50% marks (50 marks). Detailed scheme of Internal and External Assessment is as follows:

**Internal Assessment**

| Type | Details | Marks |
|---|---|---|
| Marks obtained in various manuals, practical file, participation, any model prepared, output of practical | Average of marks obtained | 45 |
| Attendance | 75%+ : 5 marks | 5 |
| **TOTAL** | **50** | |

**External Assessment**

| Type | Marks |
|---|---|
| Practical | 50 |

## CURRICULUM

***Semester –I***

| S.No. | Course Code | Course Name | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1. | 20000100 | Principles of Agronomy and Meteorology | 2 | 1 | 0 | 3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2. | 20000200 | Principles of Agronomy and Meteorology Lab | 0 | 0 | 2 | 1 |
| 3. | 20000300 | Introduction to Soil Science | 2 | 0 | 0 | 2 |
| 4. | 20000400 | Introduction to Soil Science Lab | 0 | 0 | 2 | 1 |
| 5. | 20000500 | Elementary Genetics | 2 | 0 | 0 | 2 |
| 6. | 20000600 | Elementary Genetics Lab | 0 | 0 | 2 | 1 |
| 7. | 20000700 | Statistical Methods | 2 | 1 | 0 | 3 |
| 8. | 20000800 | Introduction to Horticulture | 2 | 0 | 0 | 2 |
| 9. | 20000900 | Introduction to Horticulture Lab | 0 | 0 | 2 | 1 |
| 10. | 20001000 | Principles of Agricultural Economics | 2 | 0 | 0 | 2 |
| 11. | 99002200 | Business Communication | 3 | 1 | 0 | 4 |
| 12. | 20001100 | Ability and Skill Enhancement - I | 2 | 0 | 0 | 2 |
| 13. | 99002800 | Workshops & Seminars | - | - | - | 1 |
| 14. | 99002700 | Human Values & Social Service/NCC/NSS | - | - | - | 1 |
| | **Total** | | **17** | **3** | **8** | **26** |

## Course Name: Principles of Agronomy and Meteorology

## Course Code: 20000100

**Course Outline**

**Unit I**

Agronomy and its scope, seeds and sowing, tillage and tillage, crop density and geometry, Crop nutrition, manures and fertilizers, nutrient use efficiency, water resources, soil-plant-water relationship, crop water requirement, water use efficiency, irrigation- scheduling criteria and methods, quality of irrigation water, logging.

**Unit II**

Weeds- importance, classification, crop weed competition, concepts of weed management principles and methods, herbicides- classification, selectivity and resistance, allelopathy. Growth and development of crops, factors affecting growth and development, plant ideotypes, crop rotation and its principles, adaptation and distribution of crops, crop management technologies in problematic areas, harvesting and threshing of crops.

**Unit III**

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; Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, longwave and thermal radiation, net radiation,

albedo; Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature,

**Unit IV**

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, 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 normal for crop and livestock production. 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.

**Suggested Readings:**


1. De, Gopal Chandra 1989, Fundamentals of Agronomy. Oxford & IBH Publishing Co., New-Delhi
2. ICAR 1989 Handbook of Agriculture, Indian Council of Agricultural Research, New-Delhi
3. Michael, A.M. and Ojha, T.P. 1986. Principles of Agricultural Engineering, Vol.II Jain Brothers, New Delhi.
4. Morachan, Y.B. 1986, Crop production and management, Oxford & IBH Publishing Co., New-Delhi.
5. Porwal, B.L. and Sharma, D.D. 1991. SashyaVigyanKeAdhunicSiddhant (Hindi) Alka Publishers, Ajmer.
6. Darashikoh – Nuskha Dar Fanni – Falahat (The Art of Agriculture). Translated from Persian to English by Razia Akbar (2000) with commentaries by K.L. Mehra, K.L. Chadhan, J.S. Kanwar and Y.L. Nene. Asian Agri- History Foundation, Secunderabad, Bull No. 3, pp : 136.
7. Murithy, K, and Radha, V. 1995. Practical Manual on Agricultural Meteorology ,Kalyani Publishers, New-Delhi.


## Course Name: Principles of Agronomy and Meteorology Lab

## Course Code: 20000200

**Course Outline**

1. Identification of crops, seeds, fertilizers, pesticides and tillage implements.
2. Study of agro climatic zones of India.
3. Identification of weeds in crops.
4. Methods of herbicide and fertilizer application.
5. Study of yield contributing characters and yield estimation.
6. Seed germination and viability test.
7. Numerical exercises on fertilizer requirement, plant population, herbicides and water requirement,
8. Use of tillage implements-reversible plough.
9. One way plough, harrow, leveler, seed drill.
10. Study of soil moisture measuring devices.
11. Measurement of field capacity, bulk density and infiltration rate, Measurement of irrigation water.
12. Visit of Agro meteorological Observatory, site selection of observatory, exposure of instruments and weather data recording.
13. Measurement of total, shortwave and longwave radiation, and its estimation using Planck's intensity law.
14. Measurement of albedo and sunshine duration, computation of Radiation Intensity using BSS.
15. Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis.
16. Measurement of soil temperature and computation of soil heat flux. Determination of vapor pressure and relative humidity.
17. Determination of dew point temperature. Measurement of atmospheric pressure and analysis of atmospheric conditions.
18. Measurement of wind speed and wind direction, preparation of wind rose. Measurement, tabulation and analysis of rain.
19. Measurement of open pan evaporation and evapotranspiration

## Course Name: Introduction to Soil Science

## Course Code: 20000300

**Course Outline**

**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; Soil Profile, components of soil; Soil physical properties: soil-texture, structure, density and porosity, soil colour, consistence and plasticity.

**Unit II**

Elementary knowledge of soil taxonomy classification and soils of India; 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, 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 III**

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

**Suggested Readings**


1. Sharma, N.L. & Singh, T.B. (1996) Soil Science ( Hindi ed.) Rama pub. House, BarotMerrut( U.P ).
2. Baver, L.D. Gardener, W.H. and gardener W.R.(1976) Soil Physics Wiley Eastern Ltd, New Delhi.
3. Biswas, T.D. and Mukherjee, S.K. (2006) Text book of soil science. Tata McGraw Hill publishing Co. Ltd, New Delhi.
4. Brady, N.C. and Weil, R.R. (2002) The nature and properties of soils, prentice hall of India Pvt. Ltd, M-97, Connaught Circus, New Delhi.
5. Das, D.K. (2002) Introductory Soil Science, Kalyani publisher, New Delhi.
6. Rai, M.M. (2002) Principal of Soil Science Mac Millan India Ltd, New Delhi
7. Mehra R.K. (2004) Text book of Soil Science, ICAR, New Delhi
8. ISSS (2002) Fundamentals of Soil Science, Div. of Soil Science, IARI, New Delhi
9. Chopra S.L. and Kanwar, J.S. ( 1991) Analytical Agricultural Chemistry, Kalyani publisher, Ludhiana.
10. Jackson, M.L. (1973 ) Soil chemical analysis, Prentice Hall of India, Pvt. Ltd New Delhi.


## Course Name: Introduction to Soil Science Lab

## Course Code: 20000400

**Course Outline**

1. Study of soil profile in field.
2. Study of soil sampling tools,

3. Collection of representative soil sample, its processing and storage.
4. Study of soil forming rocks and minerals.
5. Determination of soil density, moisture content and porosity.
6. Determination of soil texture by feel and Bouyoucos Methods.
7. Studies of capillary rise phenomenon of water in soil column and water movement in soil.
8. Determination of soil pH and electrical conductivity.
9. Determination of cation exchange capacity of soil. Study of soil map.
10. Determination of soil colour.
11. Demonstration of heat transfer in soil.
12. Estimation of organic matter content of soil.

## Course Name: Elementary Genetics

## Course Code: 20000500

**Course Outline:**

**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 Probability and Chi-square Dominance relationships, Epistatic interactions with example.

**Unit II**

Multiple alleles, pleiotropism and pseudoalleles, Sex determination and sex linkage, sex limited and sex influenced traits, Blood group genetics, Linkage and its estimation, crossing over mechanisms, chromosome mapping. Structural and numerical variations in chromosome andtheir implications Use of haploids, dihaploids and doubled haploids in Genetics.

**Unit III**

Mutation, classification, Methods of inducing mutations & CIB technique, mutagenic agents and induction of mutation Qualitative & Quantitative traits, Polygenes and continuous variations, multiple factor hypothesis, Cytoplasmic inheritance. Genetic disorders.

**Unit IV**

Nature, structure & replication of genetic material Protein synthesis, Transcription and translational mechanism of genetic material, Gene concept: Gene structure, function and regulation, Lac and Trp operons.

**Suggested Readings**


1. Gupta P.K.2004. Cytology, Genetics and evolution. Rastogi Publications, Meerut. (Hindi Edition)
2. Kaushik, M.P.2003. A text Book of Modern Botany. Prakash publications, Muzaffarnagar(UP)
3. Klug, W.W.And Cummings, M.R.2005.Concepts of genetics Pearson Education (Singapore) pvt.Ltd., Indian Branch, Pratapganj, New Delhi.
4. Singh, B.D. 2001.Kalyani Publishing House, New Delhi.
5. Strickberger, M.W.2001.Genetics. Prentice Hall of India. Pvt. Ltd., New Delhi.
6. Shekhawat, A.S.and Tripathi, B.K., 2009. A practical manual on Element of Genetics. Publish by College of Agriculture, Bikaner.


## Course Name: Elementary Genetics lab

## Course Code: 20000600

**Course Outline**

1. Study of microscope.
2. Study of cell structure.
3. Mitosis and Meiosis cell division.
4. Experiments on monohybrid, dihybrid, trihybrid, test cross and back cross,
5. Experiments on epistatic interactions including test cross and back cross,
6. Practice on mitotic and meiotic cell division,
7. Experiments on probability and Chi-square test.
8. Determination of linkage and cross-over analysis (through two point test cross and three point test cross data).
9. Study on sex linked inheritance in Drosophila.
10. Study of models on DNA and RNA structures.

## Course Name: Statistical Methods

## Course Code: 20000700

**Course Outline:**

**Unit I**

Introduction to Statistics and its Applications in Agriculture, Graphical Representation of Data, Measures of Central Tendency & Dispersion, Definition of Probability, Addition and Multiplication Theorem (without proof) Simple Problems Based on Probability. Binomial & Poisson Distributions,

**Unit II**

Definition of Correlation, Scatter Diagram Karl Pearson's Coefficient of Correlation Linear Regression Equations.

Introduction to Test of Significance, One sample & two sample test t for Means, Chi-Square Test of Independence of Attributes in 2 ×2 Contingency Table.

**Unit III**

Introduction to Analysis of Variance Analysis of One Way Classification 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

**Suggested Readings**


1. Chandel, S.R.S. 1998. Handbook of Agril. Statistics. Achal Prakashan Mandir, Kanpur.
2. Gupta S.P. 2002. Statistical Methods.Sultan Chand & Sons, New Delhi.
3. Agarwal B.L. 1991. Basic Statistics Wiley Eastern, New Delhi.


## Course Name: Introduction to Horticulture

## Course Code: 20000800

**Course Outline:**

**Unit I**

Horticulture - Its definition and branches, importance and scope; horticultural and botanical classification; climate and soil for horticultural crops; Plant propagation-methods and propagating structures; Seed dormancy, Seed germination, principles of orchard establishment.

**Unit II**

Principles and methods of training and pruning, juvenility and flower bud differentiation; unfruitfulness; pollination, pollinizers and pollinators; fertilization and parthenocarpy; medicinal and aromatic plants; importance of plant bio-regulators in horticulture Irrigation – methods, Fertilizer application in horticultural crops.

**Suggested Readings**


1. Bose. T.K., Kabir.J.,Das.P. and Joy.P.P.(2000)Tropical Horticulture. Naya Prokash. Calcutta.
2. Singh, Amar (1986) Fruit Physiology and Production. Kalyani Publishers, New Delhi.
3. Singh. S.P. (1997) Commercial Fruits. Kalyani Publishers, New Delhi.
4. Mitra. S.K., Bose. T.K. and RathoreD.S. (1991) Temperate Fruits. Horticulture & Allied Publishers, Calcutta.
5. Parthasvathy. V. A. Chattopadhyay. P.K. and Bose.T.K. (2006).Plantation Crpos.Naya Prokash, Kolkatta.
6. Bal. J.S. (1997) Fruit Growing. Kalyani Publisher, New Delhi.
7. Chandra, Atul and Chandra, Anju. Production and Post harvest technology of Fruits. NBS Publisher & Distributers, Bikaner.


## Course Name: Introduction to Horticulture Lab

## Course Code: 20000900

**Course Outline**

1. Identification of garden tools. Identification of horticultural crops.
2. Preparation of seed bed/nursery bed.
3. Practice of sexual and asexual methods of propagation including micro-propagation. Layout and planting of orchard.
4. Training and pruning of fruit trees.
5. Preparation of potting mixture.
6. Fertilizer application in different crops.
7. Visits to commercial nurseries/orchard.

## Course Name: Principles of Agriculture Economics

## Course Code: 20001000

**Course Outline:**

**Unit I**

**Economics:** Meaning, scope and subject matter, definitions, activities, approaches to economic analysis; micro and macroeconomics, positive and normative analysis. Nature of economic theory; rationality assumption, concept of equilibrium, economic laws as generalization of human behavior. Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare.

**Agricultural economics**: meaning, definition, characteristics of agriculture, importance and its role in economic development. Agricultural planning and development in the country.

**Unit II**

**Demand:** meaning, law of demand, 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.

**Production**: process, creation of utility, factors of production, input output relationship. Laws of returns: Law of variable proportions and law of returns to scale. *Cost:* Cost concepts, short run and long run cost curves. Supply: Stock v/s supply, law of supply, supply schedule, supply curve, determinants of supply, elasticity of supply.

**Unit III**

**Market structure:** meaning and types of market, basic features of perfectly competitive and imperfect markets. Price determination under perfect competition; short run and long run equilibrium of firm and industry, shut down and break even points.

**Distribution theory:** meaning, factor market and pricing of factors of production. Concepts of rent, wage, interest and profit.

**Unit IV**

**National income:** Meaning and importance, circular flow, concepts of national income accounting and approaches to measurement, difficulties in measurement. Good and services tax (GST) - meaning, definition, advantage and disadvantages and its implication on Indian economy.

**Tax***:* meaning, direct and indirect taxes, agricultural taxation.

**Suggested Readings**


1. K.K. Dewett and J.D. Verma (1986) Elementary Economic Theory, S.Chand& Company, New Delhi.
2. P.A. Samuelson & W.D. Nordhaus (1987) Economics, McGraw-Hill, Singapore.

3. S.K. Mishra and V.K. Puri (1996) Indian Economy, Himalaya Publishing House, New Delhi.
4. G.B. Jathar and S.G. Beri (1996) Elementary Principles of Economics, Oxford University Press (10th Edition), Delhi.
5. Berkeley Hill (1980) An Introduction to Economics for students of agriculture, Pergaman Press, Oxford.

## Course Name: Business Communication

## Course Code: 99002200

**Course Outline:**

**Unit I**

Introduction: Theory of Communication, Types and modes of Communication Fundamentals of Communication: Communication defined, Models of Communication, barriers in communication, perception and communication, essentials of good communication.

**Unit II**

Language of Communication: Verbal and Non-verbal (Spoken and Written) Personal, Social and Business Barriers and Strategies Intra-personal, Inter-personal and Group communication Modes of human communication: Basic differences in the principal modes of human communication – reading, writing, listening, speaking and non-verbal communication. Spoken communication: Importance of spoken communication, designing receiver-oriented messages, comprehending cultural dimension. Speaking Skills Monologue Dialogue Group Discussion Effective Communication/ Mis- communication Interview Public Speech

**Unit III**

Making Oral presentations: Functions of presentations, defining objective, audience analysis, collection of materials, organization of materials, body language, effective delivery techniques.Written communication: Fundamentals of sentence structure, writing as a process. Reading and Understanding Close Reading Comprehension Summary Paraphrasing Analysis and Interpretation Translation (from Indian language to English and vice-versa) Literary/Knowledge Texts Writing Skills Documenting Report Writing Making notes Letter writing.

**Unit IV**

Fundamental of technical writing: Special features of technical writing, the word choice, developing clarity and conciseness, Report writing, Business letters, Applications and

resumes. Transactional Analysis: Three human ego states, 4 life positions, different types of transactions.

**Unit V**

The significance of communication in a business organization: Channels of communication – Downwards, Upwards, Horizontal, Consensus, and Grapevine .Literary discussions: Analysis and discussion of the novel The Funda of Mix-ology and short stories from the books under the banyan tree and other stories and popular short stories.

**Laboratory work:**

Audio-visual aids for effective communication: The role of technology in communication, the role of audio-visuals, designing transparencies, computer-aided presentation software, Software-aided activities in developing communication skills: Proper pronunciation, learning to use the correct tense, Business writing, Report writing, connected speech, Building up vocabulary, Awareness about the common errors in the usage of English, etc.Case studies, group discussions, presentations.

**Suggested Readings:**


1. Sen, L., Communication Skills. Prentice Hall of India (2004).
2. Dhar, M., The Funda of Mixology: What bartending teaches that IIM does not, Srishti Publications (2008).
3. Narayan, R. K., Under the banyan tree and other stories. Penguin Classics. (2007).


## Course Name: Ability & Skill Enhancement I

## Course Code: 20001100

**Course Outline - Final Assessment – Written Paper**

**Unit I: Ice Breaking Session & Recap of Language Skills**

Ice Breaking Session, Phrase, Clause, Sentence, Word Classes (Parts of Speech).

**Unit II: Recap of Language Skills**

Tenses (Present, Past Future), Modals, Articles (a, an, the).

**Unit III: Reading Skills & Fluency Building**

Reading Process, Importance & Types of Reading, Techniques of Reading, and Strategies to Improve Reading Abilities, Comprehension, Reading Aloud, Reading News.

**Unit IV: Writing Skills**

Generating ideas/gathering data, organizing ideas, Note taking, Outlining, drafting, Editing, and Proof Reading, Story Writing (through pictures/videos), Dialogue Writing, Email Writing.

**Unit V: Listening & Speaking Skills**
Types and Essentials of good listening, Listening Process, Barriers to Listening and Strategies to improve Listening, Listening to Inspirational Movies/Clips, Listening News Techniques of Effective Speaking, Introducing Oneself and others, Extempore, Situational Conversations (Practicing Short Dialogues).

***Semester -II***

| S. No. | Course Code | Course Name | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1. | 20001200 | Plant Biochemistry | 2 | 0 | 0 | 2 |
| 2. | 20001300 | Plant Biochemistry Lab | 0 | 0 | 2 | 1 |
| 3. | 20001400 | Microbiology | 2 | 0 | 0 | 2 |
| 4. | 20001500 | Microbiology Lab | 0 | 0 | 2 | 1 |
| 5. | 20001600 | Introduction to Entomology and Nematology | 2 | 1 | 0 | 3 |
| 6. | 20001700 | Introduction to Entomology and Nematology Lab | 0 | 0 | 2 | 1 |
| 7. | 20001800 | Irrigation & Water Management | 2 | 1 | 0 | 3 |
| 8. | 20001900 | Rural Sociology and Educational Psychology | 2 | 1 | 0 | 3 |
| 9. | 20002000 | Natural Resources and Farm Management | 2 | 0 | 0 | 2 |
| 10. | 20002100 | Fundamentals of Plant Breeding | 2 | 0 | 0 | 2 |
| 11. | 20002200 | Fundamentals of Plant Breeding Lab | 0 | 0 | 2 | 1 |
| 12. | 99001900 | Environmental Studies | 3 | 1 | 0 | 4 |
| 13. | 20002300 | Ability and Skill Enhancement - II | 2 | 0 | 0 | 2 |
| 14. | 99002800 | Workshops & Seminars | - | - | - | 1 |
| 15. | 99002700 | Human Values & Social Service/NCC/NSS | - | - | - | 1 |
| | **Total** | | **19** | **4** | **8** | **29** |

## Course Name: Plant Biochemistry

## Course Code: 20001200

**Course Outline**

**Unit I**

Biochemistry –Introduction and importance. Plant cell-Structure & organellar functions. Bio-molecules – Structure, Properties & reactions: amino acids, peptides and proteins, lipids, carbohydrates, nucleotides and nucleic acids.

**Unit II**

Enzymes – Factors affecting the activity, classification, immobilization and other industrial applications.

**Unit III**

Metabolism – Basic concepts, glycolysis, citric acid cycle, pentose phosphate pathway, b-oxidation of fatty acid, electron transport and oxidativephosphorylation. General reactions of amino acid degradation.
Metabolic regulation. Secondary metabolites-terpenoids alkaloids, phenolic

**Suggested Readings**


1. Plant Biochemistry- V. Arun Kumar, N. Senthil Kumar and K. Siva Kumar, 2010, APH Publishing Corporation, New Delhi.
2. Biotechnolgy-Expanding Horizons, B.D. Singh, 2014, Kalyani Publishers, Ludhiana
3. Principles and Techniqes of Biochemistry and Molecular Biology, Eds. Keith Wilson and John Walker, 7th Edition, 2010, Cambridge University Press
4. A Textbook of Biotechnology, Revised Edtion, 2014, R.C. Dubey, S. Chand Publishing Company, New Delhi
5. Lehninger Principles of Biochemistry by Albert Lehninger, David Nelson and Michael Cox, Seventh Edition, 2017 Macmillan Publishers.


## Course Name: Plant Biochemistry Lab

## Course Code: 20001300

**Practical**

1. Protein denaturation- heat, pH, precipitation of proteins with heavy metals,
2. Estimation of crude protein,
3. Estimation of protein by Lowry method;
4. Enzyme assay; Extraction of nucleic acids;
5. Extraction of oil from oilseeds;
6. Estimation of crude fat;
7. Estimation of iodine number and saponification value of an oil;
8. Quantitative determination of sugars;
9. Paper chromatography for the separation of sugars;
10. Determination of phenols, chlorophyll, phosphorus and ascorbic acid

## Course Name: Microbiology

## Course Code: 20001400

**Course Outline**

**Unit-I**

Introduction. Microbial world: Prokaryotic and eukaryotic microbes. Bacteria: cell structure, chemoautotrophy, photo autotrophy, growth. Bacterial genetics: Genetic recombination transformation, conjugation and transduction, plasmids, transposon.

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

**Unit-II**

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

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

**Suggested Readings**


1. Biswas, T.D. and Mukherjee, S.K. 1990. Text Book of Soil Sciences, Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. Mukherjee, N. and Ghosh T. 1998. Agricultural Microbiology, Kalyani Publishers, New Delhi.
3. Pelczar, Jr. Michel J. Chan, E.C.S. and Krieg, Noel R. 1997. Microbiology. Tata McGraw -Hill Edition, 1993. India.
4. Rangaswami, G. and Bagyaraj, D.J. 2010. IInd ed. Agricultural Microbiology. Prentice Hall of India Pvt. Limited, New Delhi.
5. Rao, N.S. 2000. Soil Microbiology, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
6. Vishunavat, K. and Kolte, S.J. 2005. Essentials of Phytopathological Techniques.Kalyani Publishers, New Delhi
7. Prescott , 2014. Microbiology. McGraw Hill & Co.
8. R.P. Singh , 2013. Plant Pathology.Kalyani Publishers


## Course Name: Microbiology Lab

## Course Code : 20001500

**Practical**

1. Introduction to microbiology laboratory and its equipments;
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. Isolation of Azospirillum from roots.
9. Isolation of BGA. Staining
10. Microscopic examination of microbes.
11. Mehrotra, R.S. and Aggarawal, A. 2012. I2th ed. Plant Pathology. Tata McGraw Hill Publishing Co. Ltd., New Delhi

## Course Name: Introduction to Entomology and Nematology

## Course Code: 20001600

**Course Outline:**

**Unit-I**

Introduction to phylum arthropoda Importance of class Insect dominance History of entomology in India Importance of entomology in different fields. Definition, division and scopet of entomology Comparative account of external morphonology-types of mouth parts, antennae, legs, wings and genetalia. Structure, function of cuticle & moulting and body segmentation,

**Unit II**

Anatomy of digestive, Circulatory, Sensory, respiratory, glandular, excretory, nervous and reproductive systems Types of reproduction. Postembryonic development-eclosion. Matamorphosis. Types of egg larvae and pupa Classification of insectsupto orders, sub-order and families of economic importanceand their distinguished characters.
Plant mites – morphological features, important families with examples

**Unit III**

History and economic importance of plant parasitic nematodes; Characters of Phylum Nematoda and systematic position of plant parasitic nematodes (outline classification up to Generic level); General morphology, ecology and biology; Plant nematode relationship; Kinds of parasitism and symptomology; Nematode interaction with other micro-organisms; Nematode diseases of crop plants of economic importance in State with special reference to Meloidogyne sp.Heteroderaavenae, Anguinatritici and Rotylenchulus reniformis Tylenchulussemipenetrans; Principles of nematode management

**Suggested Readings**


1. Nayar. K.K, Ananthakrishnan .T.N. and David.B.V. 1976.General and Applied Entomology.Mcgraw Hill publishing Co. Ltd. New Delhi.
2. Richards O.W. and Davies R.G. 1977. Imm's General Text Book of Entomology, Vol.I & II. Chapman and Hall, London.
3. Pant. N.C. and Ghai, S. 1981. Insect Physiology and Anatomy, ICAR, New Delhi.
4. Chapman .R.F.1974. Insect Structure and Function, ELBS Publishers New Delhi.
5. Snodgrass.R.E .2001. Principles of Insect Morphology.
6. Mathur and Upadhyay, 2000. A Text Book of Entomology, Aman Publishing House, Meerut.
7. Reddy, P.P. (1993). A treatise on phyto nematology, Agricol.Publ. Academy, N. Delhi.
8. Walia, R.K. and Bajaj, H.K. (2003). Introduction plant Nematology, ICAR Publication, KrishiBhawan, New Delhi.
9. Laboratory Manual of Elementary Nematology (Correspondence to course No. NEMAT-411) by Dr. R.L. Midha and Dr. G.L. Sharma (2007).


## Course Name: Introduction to Entomology and Nematology Lab

## Course Code: 20001700

**Course Outline**

1. Insect collection and preservation. Identification of important insects.
2. General body organization of insects. Study on morphology of grasshopper or cockroach. Preparation of permanent mounts of mouth parts, antennae, legs and wings.
3. Dissection of grasshopper and caterpillar for study of internal morphology.
4. Observations on metamorphosis of larvae and pupae.
5. Dissection of cockroaches.
6. Study of compound microscope along with other laboratory necessaries,
7. Survey and Collection of soil and plant samples,
8. Extraction of nematodes from soil and roots, killing and fixing of nematodes, staining and separation of nematodes in plants tissue,
9. Preparation of temporary and semi-permanent mounts of nematodes,
10. Identification of important plant parasitic nematodes,
11. Collection and preservation of nematode diseased plant samples;
12. Nematicides and their uses.

## Course Name: Irrigation and Water Management

## Course Code: 20001800

**Course Outline**

**Unit I**
Irrigation: definition and objectives; Water resources and irrigation development in India and Rajasthan; Soil moisture constants and theories of soil water availability; Methods of soil moisture estimation; Evapo transpiration and crop water requirement; Scheduling of irrigation;

**Unit-II**
Methods of irrigation: surface, sprinkler and drip irrigation; Irrigation efficiency and water use efficiency, Irrigation water quality and its management including conjunctive use of water; Water management of different crops (rice, wheat, maize, groundnut, sugarcane, pearl millet, chickpea, mustard); Agricultural drainage.

**Unit-III**
Importance of water in crop production Soil Moisture constant Estimation of potential evapo-transpiration and consumptive useWater requirement of crops and factors affecting it Approaches of irrigation scheduling , . Systems and methods of irrigation – drip, sprinkler and mist Irrigation, Quantity and quality of irrigation, Measurement of irrigation water, Elementary idea of drainage on farms.

**Suggested Readings:**


1. Land and Water Management Engineering. 1982. Murthy V.V.N. Kalyani Pubhliers, New Delhi.
2. Irrigation: Theory and Practices.2012. Michael A.M. Vikas Publishing House Pvt. Ltd., New Delhi.
3. Principles of Agricultural. Engineering. Vol. II. 2012. Michael A.M. and T.P. Ojha. Jain Brothers, New Delhi.
4. Soil and Water Conservation Water Management. 2010. Mahnot, S.C., Singh P.K. and Chaplot, P.C.,. Apex Publication House, Udaipur.


## Course Name: Rural Sociology and Educational Psychology

## Course Code: 20001900

**Course Outline**

**Unit-I**
Sociology and Rural Sociology- Meaning, Definition, Scope, Importance of rural sociology in Agricultural Extension and Interrelationship between Rural Sociology and Agricultural Extension. Indian Rural Society, Important characteristics, differences & Relationship between Rural and Urban societies.

Social Groups: Meaning, Definition, Classification, Factors considered in formation and organization of groups. Social Stratification – Meaning, Definition, Functions, Forms of Social stratification.

**Unit-II**

Cultural concepts - Culture, Customs, Folkways, Mores, Taboos, Rituals and Traditions - Meaning, Definition and their role in Agricultural Extension. Social Values and Attitude - Meaning, Definition, Types and Role of social values and Attitudes in Agricultural Extension. Social Institutions - Meaning, Definition, Major institutions in Rural society, Functions. Social Control - Meaning, Definition, Need and Means of Social control. Social change - Meaning, Definition, Nature of Social change and factors of social change. Leadership- Meaning, Definition, Classification, Roles of Leader, Methods of selection of leaders.

**Unit-III**

Psychology and Educational psychology- Meaning, Definition, Scope and Importance of Educational Psychology in Agricultural Extension. Intelligence - Meaning, Definition, Types, Factors affecting intelligence. Personality- Meaning, Definition, Types, Factors influencing the Personality and Role of Personality in Agricultural Extension.

Teaching- Learning process- Meaning and Definition of Teaching, Learning, Learning experience and Learning situation, Elements of learning situation and its characteristics

**Suggested Readings**


1. Chitambar, J.B. 1973. Introductory rural sociology.New York, John Wilex and Sons.
2. Desai, A.R. 1978. Rural sociology in India. Bombay, Popular Prakashan, 5th Rev. ed.
3. Doshi, S.L. 2007. Rural sociology.Rawat Publishers, Delhi.
4. Jayapalan, N. 2002. Rural sociology.Altanic Publishers, New Delhi.
5. Sharma, K.L. 1997. Rural society in India.Rawat Publishers, Delhi.
6. Bhatia, H.R. 1965. A Text Book of Educational Psychology, Asia Publishing House, New Delhi.
7. Pujari, D. 2002. Educational Psychology in Agriculture, Agrotech Publishing Academy, Udaipur (Raj.)
8. Bhushan, V. and Sachdeva, D.R. 2010. An introduction to Sociology, KitabMahal , New Delhi.
9. Rao, C.N.S. 2015. Sociology, S.Chand & Company, New Delhi.
10. Maslow, A.H. 1970. Motivation and personality. Harper and Row publishers , New York.
11. Mondal, S. 2014. Text Book of Rural Sociology and Educational Psychology.Kalyani Publishers, New Delhi.
12. Sharma O. P. and Somani L. L. 2012. Fundamentals of Rural Sociology and Educational Psychology.Agrotech Pub. Co., Udaipur.

## Course Name: Natural Resources and Farm Management

## Course Code: 20002000

**Course Outline:**

**Unit-I**
Concept, Subject matter and importance of natural resource economics, Classifications of natural resources and basic terms and concepts of natural resource economics: ecology-ecosystem, biomass, biosphere, reserves, environment, pollution, etc.

**Unit-II**
Natural resources management and conservation, issues in natural resources and management. Approaches to natural resource problems. Important issues in economics and management of land, water and forest resource and the environment. Factors mitigating natural resources scarcity.
Natural resources administration and policy formulations. International environmental issues, climate change.

**Suggested Readings**


1. Environmental and natural resource economics: Theory, policy and the sustainable society: M.E. Sharpe, Armonk NY
2. The economics of natural resource use :Hartiwick JM and Olewiler ND
3. Natural resource economics : Theory and applications in India- Korr JM, Marothia D.K., Katar Singh, Ramaswamy C. and Bentley WR.
4. Environmental and natural resource economics :Tietonberg T. S


## Course Name : Fundamentals of Plant Breeding

## Course Code: 20002100

**Course Outline**

**Unit 1**
Historical development, concept, nature and role of plant breeding, objectives of plant breeding, major achievements and future prospects; Genetics in relation to plant breeding, modes of reproduction, pollination and apomixes, self – incompatibility and male sterility-genetic consequences, cultivar options. Domestication, Acclimatization, introduction; Centre of origin/diversity.

**Unit II**

Component of Genetic variation; Heritability and genetic advance; Genetic basis and breeding methods in self- pollinated crops- mass and pure line selection, pedigree, bullk, SSD and backcross methods, hybridization techniques and handling of segregating population; Multiline concept.

Concepts of population genetics and Hardy-Weinberg Law, Genetic basis and methods of breeding cross pollinated crops, modes of selection; Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties;

**Unit III**

Breeding methods in asexually propagated crops, clonal selection and hybridization; Wide hybridization and pre-breeding; Polyploidy in relation to plant breeding, mutation breeding-methods and uses;

Breeding for important biotic and abiotic stresses; Biotechnological tools-DNA markers and marker assisted selection. Participatory plant breeding; Development and release of varieties

**Suggested Readings:**


1. Alard, R.W. 2000.Principles of Plant Breeding. John Willey & Sons, New York.
2. Chahel, G.S. and S.S. Ghosal.2002.Principles and Procedures of Plant Breeding, Biotechnological and Conventional Approaches. Narosa Publishing House, New Delhi.
3. Singh, B.D. 2005. Plant Breeding.Kalyani Publishing House, New Delhi.
4. Singh, P. 2001.Essentials of Plant Breeding-Principles and Methods. Kalyani Publishing House, New Delhi.
5. Jain,H.K. and M.C. Kharkwal.2004. Plant Breeding- Mendelian to Molecular Approach.Narosa Publishing House, New Delhi.
6. Sharma, A.K. 2005. Breeding Technology of Crop Plants (Edt.).Yash Publishing House, Bikaner.
7. Shekhawat, S. S. (ed) (2016). Advances and Current Issues in Agriculture, VoI.III. Shiksha Prakashan, S. M. S. Highway, Jaipur.


## Course Name: Fundamentals of Plant Breeding Lab

## Course Code: 20002200

**Practical:**

1. Plant Breeder's kit, Study of germplasm of various crops.
2. Study of floral structure of self-pollinated and cross pollinated crops.
3. Emasculation and hybridization techniques in self & cross pollinated crops.
4. Consequences of inbreeding on genetic structure of resulting populations.
5. Study of male sterility system.

6. Handling of segregating populations.
7. Methods of calculating mean, range, variance, standard deviation, heritability.
8. Designs used in plant breeding experiment, analysis of Randomized Block Design and components of genetic variance.
9. To work out the mode of pollination in a given crop and extent of natural out crossing. Prediction of performance of double cross hybrids.

**Suggested Readings:**


1. Alard, R.W. 2000.Principles of Plant Breeding. John Willey & Sons, New York.
2. Chahel, G.S. and S.S. Ghosal.2002.Principles and Procedures of Plant Breeding, Biotechnological and Conventional Approaches. Narosa Publishing House, New Delhi.
3. Singh, B.D. 2005. Plant Breeding.Kalyani Publishing House, New Delhi.
4. Singh, P. 2001.Essentials of Plant Breeding-Principles and Methods. Kalyani Publishing House, New Delhi.
5. Jain,H.K. and M.C. Kharkwal.2004. Plant Breeding- Mendelian to Molecular Approach.Narosa Publishing House, New Delhi.
6. Sharma, A.K. 2005. Breeding Technology of Crop Plants (Edt.).Yash Publishing House, Bikaner.
7. Shekhawat, S. S. (ed) (2016). Advances and Current Issues in Agriculture, VoI. III. ShikshaPrakashan, S. M. S. Highway, Jaipur.


## Course Name: Environmental Studies

## Course Code: 99001900

**Course Outline**

**Unit I**

The Multidisciplinary Nature of Environmental Studies Definition, scope and importance need for public awareness. Natural Resources Renewable and Non-renewable Resources: Natural resources and associated problems. (a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people. (b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. (c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. (d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, Case studies. (e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. (f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources.Equitable use of resources for sustainable lifestyles.

**Unit II**

Ecosystems. Concept of an ecosystem.Structure and function of an ecosystem.Producers, consumers and decomposers.Energy flow in the ecosystem.Ecological succession.Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

**Unit III**

Biodiversity and Its Conservation. Introduction, definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels.India as a mega-diversity nation.Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

**Unit IV**

Environmental Pollution. Definition.Causes, effects and control measures of (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards. Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.Pollution case studies. Disaster management: Foods, earthquake, cyclone and landslides.

**Unit V**

Social Issues and the Environment.From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns.Case studies. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. Waste land reclamation. Consumerism and waste products.Environment Protection Act.Air (Prevention and Control of Pollution) Act.Water (Prevention and Control of Pollution) Act.Wildlife Protection Act.Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.

**Unit VI**

Human Population and the Environment .Population growth, variation among nations. Population explosion—Family Welfare Programme. Environment and human health.Human rights.Value education.HIV/AIDS.Women and Child Welfare.Role of Information Technology in environment and human health.Case Studies.

Field Work. Visit to a local area to document environmental assets - river/forest/grassland/hill/mountain. Visit to a local polluted sites - Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds. Study of simple ecosystems—pond, river, hill slopes, etc .

**Suggested Readings**


1. Environmental Geography, H.M. Saxena, Rawat Pub.
2. A Textbook of Environment, K.M. Agrawal; P.K. Sikdar; S.C. Deb, McMillanPub.
3. A Textbook of Environmental Studies, D K Asthana & MeeraAsthana, S. Chand Pub.
4. Environmental Studies, V. K. Ahluwalia, The Energy and Resources Institute, Pub, (2012).
5. Environmental Chemistry, A.K. Dey, New Age Pub.
6. Environmental Biology, K.C. Agarwal, Nidi Pub. Ltd. Bikaner


## Course Name: Ability and Skill Enhancement - II

## Course Code: 20002300

**Course Outline - Final Assessment – Debate/Group Discussion**

**Unit I: Phonetics**

Phonetic symbols and the International Phonetic Alphabets (IPA), The Description and Classification of Vowels (Monophthongs& Diphthong) Consonants, Phonetic Transcription & Phonology, Syllable, Stress & Intonations, and Reading aloud, recording audio clips.

**Unit II: Vocabulary Building**

Idioms and Phrases, Words Often Confused, One word Substitution, Word Formation: Prefix & Suffix.

**Unit III: Ethics & Etiquettes**

What are ethics, what are values, difference between ethics and morals, Business ethics, workplace ethics, what are virtues for e.g. civic virtues, etc. Human ethics and values- 5 core human values are: right conduct, living in peace, speaking the truth, loving and care, and helping others. Etiquette awareness, Importance of First Impression, Personal Appearance & Professional presence, Personal Branding, Dressing Etiquette, Dining Etiquette.

**Unit IV: Reading & Writing Skills**

Reading Comprehension, News Reading, Picture Description, Paragraph Writing, News Writing.

**Unit V: Listening & Speaking Skills**

Public Speaking, Debate, Inspirational Movie Screening, Skit Performance.

***Semester - III***

| S.No. | Course Code | Course Name | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1. | 20012200 | Crop Production Technology – I (Kharif Crops) | 1 | 0 | 0 | 1 |
| 2. | 20012300 | Crop Production Technology – I Lab(Kharif Crops) | 0 | 0 | 2 | 1 |
| 3. | 20012400 | Soil & water Conservation Engineering | 2 | 0 | 0 | 2 |
| 4. | 20012500 | Soil & water Conservation Engineering Lab | 0 | 0 | 2 | 1 |
| 5. | 20012600 | Agricultural Finance and Cooperation | 2 | 0 | 0 | 2 |
| 6. | 20012700 | Agricultural Finance and Cooperation Lab | 0 | 0 | 2 | 1 |
| 7. | 20012800 | Agri- Informatics | 1 | 0 | 0 | 1 |
| 8. | 20012900 | Agri- Informatics Lab | 0 | 0 | 2 | 1 |
| 9. | 20013000 | Farm Machinery and Power | 1 | 0 | 0 | 1 |
| 10. | 20013100 | Farm Machinery and Power lab | 0 | 0 | 2 | 1 |
| 11. | 20013200 | Production Technology for Vegetables and Spices | 1 | 0 | 0 | 1 |
| 12. | 20013300 | Production Technology for Vegetables and Spices Lab | 0 | 0 | 2 | 1 |
| 13. | 20013400 | Fundamentals of Crop Physiology | 2 | 0 | 0 | 2 |
| 14. | 20013500 | Fundamentals of Crop Physiology Lab | 0 | 0 | 2 | 1 |
| 15. | 20013600 | Fundamentals of Plant Pathology | 3 | 0 | 0 | 3 |
| 16. | 20013700 | Fundamentals of Plant Pathology Lab | 0 | 0 | 2 | 1 |
| 17. | 20013800 | Livestock and Poultry Management | 3 | 0 | 0 | 3 |
| 18. | 20013900 | Livestock and Poultry Management Lab | 0 | 0 | 2 | 1 |
| 19. | 20014000 | Agriculture Heritage & Human Values & Ethics | 0 | 0 | 0 | 2 |
| 20. | 20014100 | Ability and Skill Enhancement Module-III | 2 | 0 | 0 | 2 |
| 21. | 99002800 | Workshops & Seminars | - | - | - | 1 |
| 22. | 99002700 | Human Values & Social Service/NCC/NSS | - | - | - | 1 |
| | **Total** | | **18** | **0** | **18** | **31** |

## Course Name: Crop Production Technology – I (Kharif Crops)

## Course Code: 20012200

**Course Outline**

**Theory**

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Kharif* crops. Cereals – rice, maize, sorghum, pearl millet and finger millet, pulses-pigeonpea, mungbean and urdbean; oilseeds- groundnut, and soybean; fibre crops- cotton & jute; forage crops-sorghum, cowpea, cluster bean and napier.

## Course Name: Crop Production Technology – I Lab (Kharif Crops)

## Course Code: 20012300

**Course Outline**

1. Rice nursery preparation, transplanting of rice, sowing of soybean, pigeonpea and mungbean. maize, groundnut and cotton, effect of seed size on germination and seedling vigour of kharif season crops, effect of sowing depth on germination of kharif crops.
2. Identification of weeds in kharif season crops, top dressing and foliar feeding of nutrients, study of yield contributing characters and yield calculation of kharif season crops, study of crop varieties and important agronomic experiments at experimental farm.
3. Study of forage experiments, morphological description of kharif season crops, visit to research centres of related crops.

## Course Name: Soil & Water Conservation Engineering

## Course Code: 20012400

**Course Outline**

**Unit I**

Introduction to Soil and Water Conservation, causes of soil erosion. Definition and agents of soil erosion, water erosion: Forms of water erosion. Gully classification and control measures. Soil loss estimation by universal Loss Soil Equation. Soil loss measurement techniques.

**Unit II**

Principles of erosion control: Introduction to contouring, strip cropping. Contour bund. Graded bund and bench terracing. Grassed water ways and their design. Water harvesting and its techniques. Wind erosion: mechanics of wind erosion, types of soil movement. Principles of wind erosion control and its control measures.

## Course Name: Soil & Water Conservation Engineering Lab

## Course Code: 20012500

**Course Outline**

1. Study of different types and forms of water erosion. Exercises on computation of rainfall erosivity index. Computation of soil erodibility index in soil loss estimation.
2. Determination of length of slope (LS) and cropping practice (CP) factors for soil loss estimation by USLE and MUSLE. Exercises on soil loss estimation/measuring techniques. Study of rainfall simulator for erosion assessment.
3. Estimation of sediment rate using Coshocton wheel sampler and multi slot devisor. Determination of sediment concentration through oven dry method.
4. Design and layout of contour bunds.
5. Design and layout of graded bunds.
6. Design and layout of broad base terraces.
7. Design and layout of bench terraces.
8. Design of vegetative waterways.
9. Exercises on rate of sedimentation and storage loss in tanks.
10. Computation of soil loss by wind erosion.
11. Design of shelterbelts and wind breaks for wind erosion control.
12. Visit to soil erosion sites and watershed project areas for studying erosion control and water conservation measures.

## Course Name: Agricultural Finance and Cooperation

## Course Code: 20012600

**Course Outline**

Agricultural Finance- meaning, scope and significance, credit needs and its role in Indian agriculture. Agricultural credit: meaning, definition, need, classification. Credit analysis: 4 R's, and 3C's of credits. Sources of agricultural finance: institutional and non-institutional sources, commercial banks, social control and nationalization of commercial banks, Micro financing including KCC. Lead bank scheme, RRBs, Scale of finance and unit cost. An introduction to higher financing institutions – RBI, NABARD, ADB, IMF, world bank, Insurance and Credit Guarantee Corporation of India. Cost of credit. Recent development in agricultural credit. Preparation and analysis of financial statements – Balance Sheet and

Income Statement. Basic guidelines for preparation of project reports- Bank norms – SWOT analysis.
Agricultural Cooperation – Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significance of cooperatives in Indian agriculture. 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.

## Course Name: Agricultural Finance and Cooperation Lab

## Course Code: 20012700

**Course Outline**

**Practical**

1. Determination of most profitable level of capital use. Optimum allocation of limited amount of capital among different enterprise.
2. Analysis of progress and performance of cooperatives using published data. Analysis of progress and performance of commercial banks and RRBs using published data.
3. Visit to a commercial bank, cooperative bank and cooperative society to acquire firsthand knowledge of their management, schemes and procedures.
4. Estimation of credit requirement of farm business – A case study. Preparation and analysis of balance sheet – A case study. Preparation and analysis of income statement – A case study.
5. Appraisal of a loan proposal- A case study.
6. Techno-economic parameters for preparation of projects. Preparation of Bankable projects for various agricultural products and its value-added products. Seminar on selected topics.

## Course Name: Agri- Informatics

## Course Code: 20012800

**Course Outline**

**Unit I**
Introduction to Computers, Operating Systems, definition and types, Applications of MSOffice 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**
Introduction to computer programming languages, concepts and standard input/output operations 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 advises, market price, postharvest management etc.

**Unit III**

Geospatial technology for generating valuable agri-information Decision support systems, concepts, components and applications in Agriculture, Agriculture Expert System, Soil Information Systems etc for supporting Farm decisions. Preparation of contingent crop-planning using IT tools

**Suggested Readings**


1. Sinha, P.K. Computer Fundamentals (BPB Publications).
2. Niranjan Mansal and Jayshri Saraogi Computer Made Easy For Beginners (Hindi).
3. Satish Jain, Shashank Jain and Madhullika Jain. It Tools and Applications (BPB Publications).
4. MS Office 2000. Joe Habraken.
5. Rapidex Computer Course (Pustak Mahal)
6. Davinder Singh Minhas- Dynamic Memory Computer Course (Fusin Books), New Delhi.


## Course Name: Agri- Informatics Lab

## Course Code: 20012900

**Course Outline**

1. Study of Computer Components, accessories, practice of important DOS Commands.
2. Introduction of different operating systems such as windows, Unix/ Linux, Creating, Files & Folders, File Management. Use of MS-WORD and MS Power-point for creating, editing and presenting a scientific Document.
3. MS-EXCEL - Creating a spreadsheet, use of statistical tools, writing expressions, creating graphs, analysis of scientific data.
4. MS-ACCESS: Creating Database, preparing queries and reports, demonstration of Agri-information system.
5. Introduction to World Wide Web (WWW).
6. Introduction of programming languages.
7. Hands on Crop Simulation Models (CSM) such as DSSAT/Crop-Info/CropSyst/ Wofost;
8. Computation of water and nutrient requirements of crop using CSM and IT tools.
9. Introduction of Geospatial Technology for generating valuable information for Agriculture.
10. Hands on Decision Support System.
11. Preparation of contingent crop planning

## Course Name: Farm Machinery and Power

## Course Code: 20013000

**Course Outline**

**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 , 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, 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 II**

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

**Suggested Readings:**


1. Principles of Farm Machinery – Roy Bainer, R.A. Kepner, E.L. Barger
2. Farm Machinery and Equipment – C.P. Nakra
3. Elements of Farm Machinery – J. Sahay


## Course Name: Farm Machinery and Power Lab

## Course Code: 20013100

**Course Outline**

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, Familiarization with lubrication and fuel supply system of engine,
4. Familiarization with brake, steering, hydraulic control system of engine,
5. Learning of tractor driving, Familiarization with operation of power tiller, Implements for hill agriculture,
6. Familiarization with different types of primary and secondary tillage implements: mould plough, disc plough and disc harrow .
7. Familiarization with seedcum- fertilizer drills their seed metering mechanism and calibration, planters and transplanter
8. Familiarization with different types of sprayers and dusters Familiarization with different intercultivation equipment, Familiarization with harvesting and threshing machinery.

## Course Name: Production Technology for Vegetables and Spices

## Course Code: 20013200

**Course Outline**

Importance of vegetables & spices in human nutrition and national economy, kitchen gardening, brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders, of important vegetable and spices (Tomato, Brinjal, Chilli, Capsicum, Cucumber, Melons, Gourds, Pumpkin, French bean, Peas; Cole crops such as Cabbage, Cauliflower, Knol-khol; Bulb crops such as Onion, Garlic; Root crops such as Carrot, Raddish, Beetroot; Tuber crops such as Potato; Leafy vegetables such as Amaranth, Palak. Perennial vegetables).

## Course Name: Production Technology for Vegetables and Spices Lab

## Course Code: 20013300

**Course Outline**

1. Identification of vegetables & spice crops and their seeds. Nursery raising.
2. Direct seed sowing and transplanting.
3. Study of morphological characters of different vegetables & spices.
4. Fertilizers applications. Harvesting & preparation for market. Economics of vegetables and spices cultivation.

## Course Name: Fundamentals of Crop Physiology

## Course Code: 20013400

**Course Outline**

Introduction to crop physiology and its importance in Agriculture; Plant cell: an Overview; Diffusion and osmosis; Absorption of water, transpiration and Stomatal Physiology; Mineral nutrition of Plants: Functions and deficiency symptoms of nutrients, nutrient uptake mechanisms; Photosynthesis: Light and Dark reactions, C3, C4 and CAM plants; Respiration: Glycolysis, TCA cycle and electron transport chain; Fat Metabolism: Fatty acid synthesis and Breakdown; Plant growth regulators: Physiological roles and agricultural uses, Physiological aspects of growth and development of major crops: Growth analysis, Role of Physiological growth parameters in crop productivity.

## Course Name: Fundamentals of Crop Physiology Lab

## Course Code: 20013500

**Course Outline**

1. Study of plant cells, structure and distribution of stomata, imbibitions, osmosis, plasmolysis, measurement of root pressure, rate of transpiration, Separation of photosynthetic pigments through paper chromatography.
2. Rate of transpiration, photosynthesis, respiration, tissue test for mineral nutrients, estimation of relative water content, Measurement of photosynthetic CO2 assimilation by Infra-Red Gas Analyzer (IRGA).

## Course Name: Fundamentals of Plant Pathology

## Course Code: 20013600

**Course Outline**

Introduction to the science of phytopathology, its objectives, scope and historical background. Classification of plant diseases, symptoms, signs, and related terminology. Parasitic causes of plant diseases (fungi, bacteria, viruses, phytoplasma, protozoa, algae and flowering parasitic plants), their characteristics and classification. Non-parasitic causes of plant diseases. Infection process. Survival and dispersal of plant pathogens. Plant disease epidemiology, forecasting and disease assessment. Principles and methods of plant disease management. Integrated plant disease management. Fungicides classification based on chemical nature, Commonly used fungicides, bactericides and nematicides.

**Suggested Readings:**


1. N.G. Ravichandra, 2013.Fundamentals of Plant Pathology. PHI Hall of India, New Delhi
2. R.S. Mehrotra, Ashok Agarwal. Fundamental of Plant Pathology.
3. Sambamurthy A textbook of Plant Pathology.
4. R.S. Singh Introduction to principles of plant pathology
5. Alexopoulos, C.J. Mims, C.W. and Blackwell, M. 1996. Introduction to Mycology Wiley
6. Eastern Ltd., New York.
7. Mandahar,C.L. 1987. Introduction to Plant Viruses. Chand and Co. Pvt. Ltd., New Delhi
8. Mehrotra, R.S. and Aneja, K.R. 1990.An Introduction to Mycology. New Age International(P) Ltd., New Delhi.
9. Singh, R.S. 1982. Plant Pathogens - The Fungi. Oxford and IBH Publishing Co., New Delhi

10. Singh, R.S. 1989. Plant Pathogens - The Prokaryotes .Oxford and IBH Publishing Co., New Delhi.
11. Dhingra and Sinclair 1993. Basic Plant Pathology Methods. CBS, Publishers & Distributors, New Delhi.
12. Agrios, G.N. 2006. Plant Pathology. Elsevier Academic press, London

## Course Name: Fundamentals of Plant Pathology Lab

## Course Code: 20013700

**Course Outline**

1. Familiarity with general plant pathological laboratory and field equipments.
2. Study of disease symptoms and signs and host parasite relationship.
3. Identification and isolation of plant pathogens. Koch's postulates.
4. Preparation of fungicidal solutions, slurries, pastes and their applications.

## Course Name: Livestock and Poultry Management

## Course Code: 20013800

**Course Outline**

Role of livestock in the national economy. Reproduction in farm animals and poultry. Housing principles, space requirements for different species of livestock and poultry. Management of calves, growing heifers and milch animals. Management of sheep, goat and swine. Incubation, hatching and brooding. Management of growers and layers. Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry. Improvement of farm animals and poultry.Digestion in livestock and poultry. Classification of feedstuffs. 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. Introduction of livestock and poultry diseases. Prevention (including vaccination schedule) and control of important diseases of livestock and poultry.

## Course Name: Livestock and Poultry Management Lab

## Course Code: 20013900

**Course Outline**

1. External body parts of cattle, buffalo, sheep, goat, swine and poultry. Handling and restraining of livestock. Identification methods of farm animals and poultry.
2. Visit to IDF and IPF to study breeds of livestock and poultry and daily routine farm operations and farm records. Judging of cattle, buffalo and poultry.

3. Culling of livestock and poultry. Planning and layout of housing for different types of livestock.
4. Computation of rations for livestock. Formulation of concentrate mixtures.
5. Clean milk production, milking methods. Hatchery operations, incubation and hatching equipments.
6. Management of chicks, growers and layers. Debeaking, dusting and vaccination. Economics of cattle, buffalo, sheep, goat, swine and poultry production.

## Course Name: Agriculture Heritage & Human Values & Ethics

## Course Code: 20014000

**Course Outline**

**Unit I**

Introduction of Indian agricultural heritage; Ancient agricultural practices, Relevance of heritage to present day agriculture; Past and present status of agriculture and farmers in society; Journey of Indian agriculture and its development from past to modern era; Plant production and protection through indigenous traditional knowledge; Crop voyage in India and world; Agriculture scope; Importance of agriculture and agricultural resources available in India; Crop significance and classifications; National agriculture setup in India; Current scenario of Indian agriculture; Indian agricultural concerns and future prospects

## Course Name: Ability and Skill Enhancement III

## Course Code: 20014100

**Course Outline - Final Assessment – Preparing a documentary**

**Unit I: Book & Movie Reviews**

What is Book Review, Purpose & Importance of Book Review, Types of Book Review, Elements & Steps of Writing Book Review, What is Movie Review, Purpose & Importance of Movie Review, Types of Movie Review, Elements & Steps of Writing Movie Review.

**Unit II: LSWR Skills**

Reading Comprehension, Rewriting Mythology/Folklore, Debate, News Analysis, Role Plays.

**Unit III: Emotional Intelligence & Handling Emotions**

What is emotional intelligence, E.Q. Tests, performing under pressure, how to take right decisions under pressure keeping balance in difficult emotional situations. The science of emotional intelligence, characteristics of emotional intelligence, Emotions handling-

identifying good and bad emotions, how to control emotions, how to manage negative emotions keeping balance of mental stability, stress and distress.

**Unit IV: Group Discussion Skills**
What is GD, Types of Group Discussions, Do's & Don'ts, Participation, Thinking, Structuring, Group Behaviour, Leadership Skills, Interpersonal Skills, Persuasive Skills, Conceptualization Skills.

**Unit V: Documentary Making**
What is documentary, aims & objectives, documentary for social cause, Documentary/Movie Screening & Reviews, preparing a documentary, Narration.

***Semester - IV***

| S.No. | Course Code | Course Name | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1. | 20014200 | Crop Production Technology –II (Rabi Crops) | 1 | 0 | 0 | 1 |
| 2. | 20014300 | Crop Production Technology –II (Rabi Crops) Lab | 0 | 0 | 2 | 1 |
| 3. | 20014400 | Production Technology for Ornamental Crops, MAP and Landscaping | 1 | 0 | 0 | 1 |
| 4. | 20014500 | Production Technology for Ornamental Crops, MAP and Landscaping Lab | 0 | 0 | 2 | 1 |
| 5. | 20014600 | Renewable Energy and Green Technology | 1 | 0 | 0 | 1 |
| 6. | 20014700 | Renewable Energy and Green Technology Lab | 0 | 0 | 2 | 1 |
| 7. | 20014800 | Problematic Soils and their Management | 2 | 0 | 0 | 2 |
| 8. | 20014900 | Production Technology for Fruit and Plantation Crops | 2 | 0 | 0 | 1 |
| 9. | 20015000 | Production Technology for Fruit and Plantation Crops Lab | 0 | 0 | 2 | 1 |
| 10. | 20015100 | Principles of Seed Technology | 2 | 0 | 0 | 2 |
| 11. | 20015200 | Principles of Seed Technology lab | 0 | 0 | 2 | 1 |
| 12. | 20015300 | Plant Biotechnology | 2 | 0 | 0 | 2 |
| 13. | 20015400 | Plant Biotechnology Lab | 0 | 0 | 2 | 1 |
| 14. | 20015500 | Agricultural Marketing Trade & Prices | 2 | 0 | 0 | 2 |
| 15. | 20015600 | Agricultural Marketing Trade & Prices Lab | 0 | 0 | 2 | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 16. | 20015700 | Fundamentals of Agriculture Extension Education | 2 | 0 | 0 | 2 |
| 17. | 20015800 | Fundamentals of Agriculture Extension Education Lab | 0 | 0 | 2 | 1 |
| 18. | - | Elective Course | 2 | 0 | 0 | 2 |
| 19. | - | Elective Course Lab | 0 | 0 | 2 | 1 |
| 20. | 20015900 | Ability and Skill Enhancement IV | 2 | 0 | 0 | 2 |
| 21. | 99002800 | Workshops & Seminars | - | - | - | 1 |
| 22. | 99002700 | Human Values & Social Service/NCC/NSS | - | - | - | 1 |
| | **Total** | | **19** | **0** | **18** | **29** |

**Electives**

| Elective | Course Code | Course Name |
|---|---|---|
| **Elective I** | 20016000 | Agribusiness Management |
| | 20016100 | Agribusiness Management Lab |
| | 20016200 | Agrochemicals |
| | 20016300 | Agrochemicals Lab |
| | 20016400 | Commercial Plant Breeding |
| | 20016500 | Commercial Plant Breeding Lab |
| | 20016600 | Landscaping |
| | 20016700 | Landscaping Lab |

## Course Name: Crop Production Technology –II (Rabi Crops)

## Course Code: 20014200

**Course Outline**

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops; cereals –wheat and barley, pulses-chickpea, lentil, peas, oilseeds-rapeseed, mustard and sunflower; sugar crops-sugarcane; medicinal and aromatic crops-mentha, lemon grass and citronella, Forage crops-berseem, lucerne and oat.

## Course Name: Crop Production Technology –II (Rabi Crops) Lab

## Course Code: 20014300

**Course Outline**

1. Sowing methods of wheat and sugarcane, identification of weeds in *rabi* season crops.
2. Study of morphological characteristics of *rabi* crops,
3. Study of yield contributing characters of *rabi* season crops, yield and juice quality analysis of sugarcane,
4. Study of important agronomic experiments of *rabi* crops at experimental farms.
5. Study of *rabi* forage experiments, oil extraction of medicinal crops, visit to research stations of related crops.

## Course Name: Production Technology for Ornamental Crops, MAP and Landscaping

## Course Code: 20014400

**Course Outline**

Importance and scope of ornamental crops, medicinal and aromatic plants and landscaping. Principles of landscaping. Landscape uses of trees, shrubs and climbers. Production technology of important cut flowers like rose, gerbera, carnation, lilium and orchids under protected conditions and gladiolus, tuberose, chrysanthemum under open conditions. Package of practices for loose flowers like marigold and jasmine under open conditions. 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. Processing and value addition in ornamental crops and MAPs produce.

## Course Name: Production Technology for Ornamental Crops, MAP and Landscaping Lab

## Course Code: 20014500

**Course Outline**

1. Identification of Ornamental plants. Identification of Medicinal and Aromatic Plants. Nursery bed preparation and seed sowing.
2. Training and pruning of Ornamental plants. Planning and layout of garden.
3. Bed preparation and planting of MAP. Protected structures – care and maintenance.
4. Intercultural operations in flowers and MAP. Harvesting and post harvest handling of cut and loose flowers.
5. Processing of MAP. Visit to commercial flower/MAP unit.

## Course Name: Renewable Energy and Green Technology

## Course Code: 20014600

**Course Outline**

**Unit I**

Classification of energy sources, contribution of these of sources in agricultural sector, Familiarization with biomass utilization for biofuel production and their application, Familiarization with types of biogas plants and gasifiers, biogas, bioalcohol, biodiesel and biooil production and their utilization as bioenergy resource.

**Unit II**

introduction of solar energy, collection and their application, Familiarization with solar energy gadgets: solar cooker, solar water heater, application of solar energy: solar drying, solar pond, solar distillation, solar photovoltaic system and their application, introduction of wind energy and their application.

## Course Name: Renewable Energy and Green Technology Lab

## Course Code: 20014700

**Course Outline**

1. Familiarization with renewable energy gadgets.
2. To study biogas plants,
3. To study gasifier,
4. To study the production process of biodiesel,
5. To study briquetting machine,
6. To study the production process of bio-fuels.
7. Familiarization with different solar energy gadgets.
8. To study solar photovoltaic system: solar light, solar pumping, solar fencing.
9. To study solar cooker, To study solar drying system.
10. To study solar distillation and solar pond.

## Course Name: Problematic Soils and their Management

## Course Code: 20014800

**Course Outline**

Soil quality and health, Distribution of Waste land and problem soils in India. Their categorization based on properties. Reclamation and management of Saline and sodic soils,

Acid soils, Acid Sulphate soils, Eroded and Compacted soils, Flooded soils, Polluted soils. Irrigation water – quality and standards, utilization of saline water in agriculture. Remote sensing and GIS in diagnosis and management of problem soils. Multipurpose tree species, bio remediation through MPTs of soils, land capability and
classification, land suitability classification. Problematic soils under different Agro-ecosystems.

## Course Name: Production Technology for Fruit and Plantation Crops

## Course Code: 20014900

**Course Outline**

Importance and scope of fruit and plantation crop industry in India; Importance of rootstocks; Production technologies for the cultivation of major fruits-mango, banana, citrus, grape, guava, litchi, papaya, sapota, apple, pear, peach, walnut, almond and; minor fruits-date, ber, pineapple, pomegranate, jackfruit, strawberry, plantation crops-coconut, arecanut, cashew, tea, coffee & rubber.

## Course Name: Production Technology for Fruit and Plantation Crops Lab

## Course Code: 20015000

**Course Outline**

1. Seed propagation. Scarification and stratification of seeds.
2. Propagation methods for fruit and plantation crops.
3. Description and identification of fruit.
4. Preparation of plant bio regulators and their uses,
5. Important pests, diseases and physiological disorders of above fruit and plantation crops, Visit to commercial orchards.

## Course Name: Principles of Seed Technology

## Course Code: 20015100

**Course Outline**

**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. Foundation and certified seed production of important cereals, pulses, oilseeds, fodder and vegetables.

**Unit II**

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, 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.Seed drying, processing and their steps, seed testing for quality assessment, seed treatment, its importance, method of application and seed packing.

**Unit III**

Seed storage; general principles, stages and factors affecting seed longevity during storage. Measures for pest and disease control during storage. 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 Name: Principles of Seed Technology Lab

## Course Code: 20015200

**Course Outline**

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

## Course Name: Plant Biotechnology

## Course Code: 20015300

**Course Outline**

**Unit I**

Concepts of Plant Biotechnology- History of Plant Tissue Culture and Plant Genetic Engineering; Scope and importance in Crop Improvement- Totipotency and Morphogenesis,Nutritional requirements of *in-vitro* cultures; Techniques of In-vitro cultures, Micro propagation, Anther culture, Pollen culture, Ovule culture, Embryo culture,

Test tube fertilization, Endosperm culture, applications. Somaclonal variation: Types, Reasons: Somatic embryogenesis and synthetic seed production technology; Protoplast isolation, culture, manipulation and fusion; products of somatic hybrids and cybrids.

**Unit II**

Applications in crop improvement. Genetic engineering; Restriction enzymes; Vectors for gene transfer- gene cloning-direct and indirect method of gene transfer transgenic plants and their applications. Blotting techniques- DNA finger printing – DNA based markers- RFLP, AFLP, RAPD, SSR and DNA Probes.

**Suggested Readings**


1. Singh, B D, 2004. *Biotechnology Expanding Horizons* 2nd Edn. Kalyani Publishers, New Delhi.
2. Gupta, P.K., 2015. *Elements of Biotechnology* 2nd Edn. Rastogi and Co., Meerut.
3. Razdan M K, 2014. *Introduction to plant Tissue Culture* 2nd Edn. Science Publishers, inc. USA.
4. Gautam V K, 2005. *Agricultural Biotechnology*. Sublime Publications
5. Thomar, R.S., Parakhia, M.V., Patel, S.V. and Golakia, B.A., 2010. *Molecular markers and Plant biotechnology*, New Publishers, New Delhi.
6. Gupta, P.K. 1994. *Elements of biotechnology*. Rastogi Pub. Meerut.
7. Chahal, G.S. and Gosal, S.S.2003. *Principles and procedures of plant approaches breeding Biotechnological and conventional*. Narosa Publishing House, New Delhi


## Course Name: Plant Biotechnology Lab

## Course Code: 20015400

**Course Outline**

1. Requirements of Plant tissue culture laboratory:
2. Techniques in Plant tissue culture- Media
3. Components and preparation; sterilization techniques and inoculation of various explants, callus
4. induction and plant regeneration;
5. Demonstration of Micropropagation, Anther culture, embryo culture,
6. Hardening/ Acclimatization of regenerated plants, somatic embryogenesis and synthetic seed production,
7. Demonstration of isolation and culture of protoplast,
8. demonstration of isolation of DNA, gene transfer technique and gel electrophoresis techniques

**Suggested Readings:**

1. Purohit, S.S., 2004. *A Laboratory Manual of Plant Biotechnology* 2nd Edn. Agribios, India.
2. Singh, B.D. 2012.*Plant biotechnology*. Kalyani publishers, Ludhiana
3. Gupta, P.K. 1994. *Elements of biotechnology*. Rastogi Pub. Meerut.
4. Chahal, G.S. and Gosal, S.S.2003. *Principles and procedures of plant approaches breeding Biotechnological and conventional*. Narosa Publishing House, New Delhi

## Course Name: Agricultural Marketing Trade & Prices

## Course Code: 20015500

**Course Outline**

**Unit I**

Agricultural Marketing: Concepts and definitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation, classification and characteristics of agricultural markets; demand, supply and producer's surplus of agri-commodities: nature and determinants of demand and supply of farm products, producer's surplus – meaning and its types,marketable and marketed surplus, factors affecting marketable surplus of agri-commodities;

**Unit II**

product life cycle (PLC) and competitive strategies: Meaning and stages in PLC; characteristics of PLC; strategies in different stages of PLC; pricing and promotion strategies: pricing considerations and approaches – cost based and competition based pricing; market promotion – advertising, personal selling, sales promotion and publicity – their meaning and merits & demerits; marketing process and functions: Marketing process-concentration, dispersion and equalization; exchange functions – buying and selling; physical functions – storage, transport and processing; facilitating functions – packaging, branding, grading, quality control and labeling (Agmark); Market functionaries and marketing channels: Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel;number of channel levels;

**Unit III**

marketing channels for different farm products; Integration, efficiency, costs and price spread: Meaning, definition and types of market integration; marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs; Role of Govt. in agricultural marketing: Public sector institutions- CWC, SWC, FCI, CACP & DMI – their objectives and functions; cooperative marketing in India; Risk in marketing: Types of risk in marketing; speculation & hedging; an overview of futures trading; Agricultural prices and policy: Meaning and functions of price; ad ministered prices; need for agricultural price policy; Trade: Concept of International Trade and its need, theories of absolute and comparative advantage. Present status and prospects of international trade in agri-

commodities; GATT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR ,

**Suggested Readings**


1. Ghosal, SN., Agricultural Financing in India, Asia Publishing House, Bombay, 1966
2. Johi, S.S. and C.V.Moore., Essentials of Farm Financial Management, Today and Tommorow's Printers and Publishers, New Delhi, 1970
3. John, J.Hamptron., Financial Decision Making: Concepts, Problems and Cases, Prentice-Hall of India , New Delhi, 1983
4. Kenneth, Duft D., Principles of Management in Agribusiness, Reston Publishing Company, Reston, 1979
5. Mamoria, C.B. and R.D. Saksena., Co-operation in India, Kitab Mahal, Allahabad, 1973
6. Mamoria, C.B. and Saxena., Agricultural Problems in India, Kitab Mahal, Allahabad
7. Mukhi, H R. 1983. Cooperation in India and Abroad. New Heights Publishers, New Delhi.
8. Muniraj, R., Farm Finance for Development, Oxford & IBH Publishing Company Private Ltd., New Delhi, 1987
9. Subba Reddy, S. and P.Raghuram., Agricultural Finance and Management, Oxford & IBH Publishing Company Private Ltd., New Delhi, 2005
10. Subba Reddy, S., P.Raghu ram., P. Sastry, T.V.N. and Bhavani Devi I. 2010. Agricultural Economics., Oxford & IBH Publishing Company Private Ltd., New Delhi, 2010
11. William, G. Murray and Nelson Aarson, G., Agricultural Finance, The Iowa State University Press, Ames, Iowa, 1960


## Course Name: Agricultural Marketing Trade & Prices lab

## Course Code: 20015600

**Course Outline**

1. Plotting and study of demand and supply curves and calculation of elasticities;
2. Study of relationship between market arrivals and prices of some selected commodities; Computation of marketable and marketed surplus of important commodities; Study of price behaviour over time for some selected commodities;
3. Construction of index numbers; Visit to a local market to study various marketing functions performed by different agencies,
4. identification of marketing channels for selected commodity, collection of data regarding marketing costs, margins and price spread and presentation of report in the class;
5. Visit to market institutions – NAFED, SWC, CWC, cooperative marketing society, etc. to study their organization and functioning;
6. Application of principles of comparative advantage of International Trade

## Course Name: Fundamentals of Agriculture Extension Education

## Course Code: 20015700

**Course Outline**

Syllabus to be shared at a later stage.

## Course Name: Fundamentals of Agriculture Extension Education lab

## Course Code: 20015800

**Course Outline**

Syllabus to be shared at a later stage.

## Course Name: Agribusiness Management

## Course Code: 20016000

**Course Outline**

Transformation of agriculture into agribusiness, various stakeholders and components of agribusiness systems. Importance of agribusiness in the Indian economy and New Agricultural Policy. Distinctive features of Agribusiness Management: Importance and needs of agro-based industries, Classification of industries 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. Management functions: Roles & activities, Organization culture. Planning, meaning, definition, types of plans. Purpose or mission, goals or objectives, Strategies, polices 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. 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. Project Management definition, project cycle, identification, formulation, appraisal, implementation, monitoring and evaluation. Project Appraisal and evaluation techniques.

## Course Name: Agribusiness Management Lab

## Course Code:20016100

**Course Outline**

1. Study of agri-input markets: Seed, fertilizers, pesticides.
2. Study of output markets: grains, fruits, vegetables, flowers.
3. Study of product markets, retails trade commodity trading, and value added products. Study of financing institutions- Cooperative, Commercial banks, RRBs, Agribusiness Finance Limited, NABARD. Preparations of projects and Feasibility reports for agribusiness entrepreneur.
4. Appraisal/evaluation techniques of identifying viable project- Non-discounting techniques. Case study of agro-based industries.
5. Trend and growth rate of prices of agricultural commodities.
6. Net present worth technique for selection of viable project. Internal rate of return.

## Course Name: Agrochemicals

## Course Code: 20016200

**Course Outline**

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.
Herbicides-Major classes, properties and important herbicides. Fate of herbicides.
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. Introduction and classification of insecticides: inorganic and organic insecticides Organochlorine, Organophosphates, Carbamates, Synthetic pyrethroids Neonicotinoids, Biorationals, Insecticide Act and rules, Insecticides banned, withdrawn and restricted use, Fate of insecticides in soil & plant. IGRs Biopesticides, Reduced risk insecticides, Botanicals, plant and animal systemic insecticides their characteristics and uses. Fertilizers and their importance. Nitrogenous fertilizers: Feedstocks 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,

nitro phosphates and NPK complexes. Fertilizer control order. Fertilizer logistics and marketing.
Plant bio-pesticides for ecological agriculture, Bio-insect repellent.

## Course Name: Agrochemicals Lab

## Course Code: 20016200

**Course Outline**

1. Sampling of fertilizers and pesticides.
2. Pesticides application technology to study about various pesticides appliances. Quick tests for identification of common fertilizers.
3. Identification of anion and cation in fertilizer. Calculation of doses of insecticides to be used.
4. To study and identify various formulations of insecticide available kin market. Estimation of nitrogen in Urea.
5. Estimation of water soluble P2O5 and citrate soluble P2O5 in single super phosphate. Estimation of potassium in Muraite of Potash/ Sulphate of Potash by flame photometer. Determination of copper content in copper oxychloride.
6. Determination of sulphur content in sulphur fungicide. Determination of thiram. Determination of ziram content.

## Course Name: Commercial Plant Breeding

## Course Code: 20016300

**Course Outline**

Types of crops and modes of plant reproduction. Line development and maintenance breeding in self- and cross-pollinated crops (A/B/R and two line system) for development of hybrids and seed production. Genetic purity test of commercial hybrids. Advances in hybrid seed production of maize, rice, sorghum, pearl millet, castor, sunflower, cotton pigeon pea, Brassica etc. Quality seed production of vegetable crops under open and protected environment. Alternative strategies for the development of the line and cultivars: haploid inducer, tissue culture techniques and biotechnological tools. IPR issues in commercial plant breeding: DUS testing and registration of varieties under PPV & FR Act. 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 Name: Commercial Plant Breeding lab

## Course Code: 20016400

**Course Outline**

1. Floral biology in self- and cross-pollinated species, selfing and crossing techniques. Techniques of seed production in self- and cross-pollinated crops using A/B/R and two line system.
2. Learning techniques in hybrid seed production using male-sterility in field crops. Understanding the difficulties in hybrid seed production,
3. Tools and techniques for optimizing hybrid seed production.
4. Concept of rouging in seed production plot.
5. Concept of line its multiplication and purification in hybrid seed production.
6. Role of pollinators in hybrid seed production.
7. Hybrid seed production techniques in sorghum, pearl millet, maize, rice, rapeseed-mustard, sunflower, castor, pigeon pea, cotton and vegetable crops.
8. Sampling and analytical procedures for purity testing and detection of spurious seed.
9. Seed drying and storage structure in quality seed management.
10. Screening techniques during seed process.

## Course Name: Landscaping

## Course Code: 20016500

**Course Outline**

Importance and scope of landscaping. Principles of landscaping, garden styles and types, terrace gardening, vertical gardening, garden components, adornments, lawn making, rockery, water garden, walk-paths, bridges, other constructed features etc. gardens for special purposes. Trees: selection, propagation, planting schemes, canopy management, shrubs and herbaceous perennials: selection, propagation, planting schemes, architecture. Climber and creepers: importance, selection, propagation, planting, Annuals: selection, propagation, planting scheme, Other garden plants: palms, ferns, grasses and cacti succulents. Pot plants: selection, arrangement, management. Bio-aesthetic planning: definition, need, planning; landscaping of urban and rural areas, Peri-urban landscaping, Landscaping of schools, public places like bus station, railway station, townships, river banks, hospitals, play grounds, airports, industries, institutions. Bonsai: principles and management, lawn: establishment and maintenance. CAD application.

## Course Name: Landscaping lab

## Course Code: 20016600

**Course Outline**

1. Identification of trees, shrubs, annuals, pot plants;
2. Propagation of trees, shrubs and annuals, care and maintenance of plants, potting and repotting, identification of tools and implements used in landscape design, training and pruning of plants for special effects, lawn establishment and maintenance, layout of formal gardens, informal gardens, special type of gardens (sunken garden, terrace garden, rock garden) and designing of conservatory and lathe house.
3. Use of computer software, visit to important gardens/ parks/ institutes.

## Course Name: Ability and Skill Enhancement Module IV

## Course Code:20015900

**Course Outline - Final Assessment – Mock Interviews & PI Kit Submission**

**Unit I : Tele – Etiquettes**
Receiving Calls, Placing a call, Ending Calls, Transferring calls, Taking Message/ Voice Mails, Placing call on hold, Handling Complaints.

**Unit II: Confidence Building & Brain Storming**
How to build confidence by positive thinking, identifying negative thoughts, how to control negative thoughts entering our mind, identifying personal talents, and its ways to improve, how to develop good habits and having principles and follow them at all times.

Need to learn new things, ideas and skills, what is brain storming, why do we need it, what are the different ways of brain storming through logics and reasoning, Brain Storming Session.

**Unit III: PI Kit**
What is resume, Format of Resume, Formatting, Resume Preparation, Covering Letter, PI Kit.

**Unit IV: Interview Skills**
Mastering the art of giving interviews in - selection or placement interviews, web /video conferencing, Mock Interview, HR Expert Mock Interview, Telephonic Interviews.

**Unit V: Internship Preparation: Company Specific Research and Presentation**
Identifying domain specific industries, researching the industry, Industry analysis, Presentation on specific industry/company.

***Semester - V***

| S. No. | Course Code | Course Name | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1. | 20016800 | Principles of Integrated Pest and Disease Management | 2 | 0 | 0 | 2 |
| 2. | 20016900 | Principles of Integrated Pest and Disease Management Lab | 0 | 0 | 2 | 1 |
| 3. | 20017000 | Manures, Fertilizers and Soil Fertility Management | 2 | 0 | 0 | 2 |
| 4. | 20017100 | Manures, Fertilizers and Soil Fertility Management lab | 0 | 0 | 2 | 1 |
| 5. | 20017200 | Pests of Crops and Stored Grain and their Management | 2 | 0 | 0 | 2 |
| 6. | 20017300 | Pests of Crops and Stored Grain and their Management Lab | 0 | 0 | 2 | 1 |
| 7. | 20017400 | Diseases of Field and Horticultural Crops and their Management -I | 2 | 0 | 0 | 2 |
| 8. | 20017500 | Diseases of Field and Horticultural Crops and their Management -I Lab | 0 | 0 | 2 | 1 |
| 9. | 20017600 | Crop Improvement-I *(Kharif Crops)* | 1 | 0 | 0 | 1 |
| 10. | 20017700 | Crop Improvement-I Lab *(Kharif Crops)* | 0 | 0 | 2 | 1 |
| 11. | 20017800 | Food Safety & standards | 2 | 0 | 0 | 2 |
| 12. | 20017900 | Food Safety & standards Lab | 0 | 0 | 2 | 1 |
| 13. | 20018000 | Bio pesticides & Bio fertilizers | 2 | 0 | 0 | 2 |
| 14. | 20018100 | Bio pesticides & Bio fertilizers | 0 | 0 | 2 | 1 |
| 15. | 20018200 | Practical Crop Production – I (*Kharif* crops) | 0 | 0 | 4 | 2 |
| 16. | 20018300 | Intellectual Property Rights | 1 | 0 | 0 | 1 |
| 17. | - | Elective Course | 2 | 0 | 0 | 2 |
| 18. | - | Elective Course II | 0 | 0 | 2 | 1 |
| 19. | 20018400 | Ability and Skill Enhancement -V | 2 | 0 | 0 | 2 |
| 20. | 20018500 | Summer Internship and Report | 0 | 0 | 8 | 4 |
| 21. | 99002800 | Workshops & Seminars | - | - | - | 1 |
| 22. | 99002700 | Human Values & Social Service/NCC/NSS | - | - | - | 1 |
| | **Total** | | **18** | **0** | **28** | **34** |

| Elective | Course Code | Course Name |
|---|---|---|
| | 20018600 | Geoinformatics and Nano-technology and Precision Farming |
| | 20018700 | Geoinformatics and Nano-technology and Precision Farming Lab |

| | | |
|---|---|---|
| **Elective II** | 20018800 | Farming System & Sustainable Agriculture |
| | 20018900 | Weed Management |
| | 20019000 | Weed Management Lab |
| | 20019100 | Micro propagation Technologies |
| | 20019200 | Micro propagation Technologies Lab |

## Course Name: Principles of Integrated Pest and Disease Management

## Course Code: 20016800

**Course Outline**

Categories of insect pests and diseases, IPM: Introduction, history, importance, concepts, principles and tools of IPM. Economic importance of insect pests, diseases and pest risk analysis. Methods of detection and diagnosis of insect pest and diseases. Calculation and dynamics of economic injury level and importance of Economic threshold level. Methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control. Ecological management of crop environment. Introduction to conventional pesticides for the insect pests and disease management. Survey surveillance and forecasting of Insect pest and diseases. Development and validation of IPM module. Implementation and impact of IPM (IPM module for Insect pest and disease. Safety issues in pesticide uses. Political, social and legal implication of IP.

## Course Name: Principles of Integrated Pest and Disease Management Lab

## Course Code: 20016900

**Course Outline**

1. Methods of diagnosis and detection of various insect pests, and plant diseases,
2. Methods of insect pests and plant disease measurement, Assessment of crop yield losses, calculations based on economics of IPM,
3. Identification of biocontrol agents, different predators and natural enemies. Mass multiplication of *Trichoderma, Pseudomona*s, *Trichogramma*, NPV etc.
4. Identification and nature of damage of important insect pests and diseases and their management. Crop (agroecosystem) dynamics of a selected insect pest and diseases.
5. Plan & assess preventive strategies (IPM module) and decision making. crop monitoring attacked by insect, pest and diseases .
6. Awareness campaign at farmers fields.

## Course Name: Manures, Fertilizers and Soil Fertility Management

## Course Code: 20017000

**Course Outline**

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

## Course Name: Manures, Fertilizers and Soil Fertility Management Lab

## Course Code: 20017100

**Course Outline**

1. Introduction of analytical instruments and their principles, calibration and applications.
2. Colorimetry and flame photometry. Estimation of soil organic carbon.
3. Estimation of alkaline hydrolysable N in soils. Estimation of soil extractable P in soils. Estimation of exchangeable K; Ca and Mg in soils.
4. Estimation of soil extractable S in soils. Estimation of DTPA extractable Zn in soils. Estimation of N in plants. Estimation of P in plants. Estimation of K in plants. Estimation of S in plants.

## Course Name: Pests of Crops and Stored Grain and their Management

## Course Code: 20017200

**Course Outline**

General account on nature and type of damage by different arthropods pests. Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage, and management of major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests of various field crop, vegetable crop, fruit crop, plantation crops, ornamental crops, spices and condiments. Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain. Insect pests, mites, rodents, birds and microorganisms associated with stored grain and their management. Storage structure and methods of grain storage and fundamental principles of grain store management.

## Course Name: Pests of Crops and Stored Grain and their Management Lab

## Course Code: 20017300

**Course Outline**

1. Identification of different types of damage.
2. Identification and study of life cycle and seasonal history of various insect pests attacking crops and their produce: (a) Field Crops; (b) Vegetable Crops; (c) Fruit Crops; (d) Plantation, gardens, Narcotics, spices & condiments. Identification of insect pests and Mites associated with stored grain.
3. Determination of insect infestation by different methods. Assessment of losses due to insects. Calculations on the doses of insecticides application technique.
4. Fumigation of grain store / godown. Identification of rodents and rodent control operations in godowns. Identification of birds and bird control operations in godowns. Determination of moisture content of grain. Methods of grain sampling under storage condition.
5. Visit to Indian Storage Management and Research Institute, Hapur and Quality Laboratory,
6. Department of Food., Delhi. Visit to nearest FCI godowns.

## Course Name: Diseases of Field and Horticultural Crops and their Management -I

## Course Code: 20017400

**Course Outline**

Symptoms, etiology, disease cycle and management of major diseases of following crops: 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; Groundnut: early and late leaf spots, wilt Soybean: Rhizoctonia blight, bacterial spot, seed and seedling rot and mosaic; Pigeonpea:

Phytophthora blight, wilt and sterility mosaic; Finger millet: Blast and leaf spot; black & green gram: Cercospora leaf spot and anthracnose, web blight and yellow mosaic; Castor: Phytophthora blight; Tobacco: black shank, black root rot and mosaic. 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; 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; Ginger: soft rot; Colocasia: Phytophthora blight; Coconut: wilt and bud rot; Tea: blister blight; Coffee: rust.

## Course Name: Diseases of Field and Horticultural Crops and their Management -I Lab

## Course Code: 20017500

**Course Outline**

Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory. Field visit for the diagnosis of field problems. Collection and preservation of plant diseased specimens for herbarium.

## Course Name: Crop Improvement-I *(Kharif Crops)*

## Course Code: 20017600

**Course Outline**

Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fibres; fodders and cash crops; vegetable and horticultural crops; 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; 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 and quality (physical, chemical, nutritional); Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeonpea, etc. Ideotype concept and climate resilient crop varieties for future.

## Course Name: Crop Improvement-I Lab *(Kharif Crops)*

## Course Code: 20017700

**Course Outline**

1. Floral biology, emasculation and hybridization techniques in different crop species; viz., Rice, Jute, Maize, Sorghum, Pearl millet, Ragi, Pigeonpea, Urdbean, Mungbean, Soybean, Groundnut, Seasame, Caster, Cotton, Cowpea, Tobacco, Brinjal, Okra and Cucurbitaceous crops.
2. Maintenance breeding of different *kharif* crops. Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods; Study of field techniques for seed production and hybrid seeds production in *Kharif* crops; Estimation of heterosis, inbreeding depression and heritability;
3. Layout of field experiments; Study of quality characters, donor parents for different characters; Visit to seed production plots; Visit to AICRP plots of different field crops.

## Course Name: Food Safety & standards

## Course Code: 20017800

**Course Outline**

Food Safety – Definition, Importance, Scope and Factors affecting Food Safety. Hazards and Risks, Types of hazards - Biological, Chemical, Physical hazards. Management of hazards - Need. Control of parameters. Temperature control. Food storage. Product design. Hygiene and Sanitation in Food Service Establishments- Introduction. Sources of contamination and their control. Waste Disposal. Pest and Rodent Control. Personnel Hygiene. Food Safety Measures. Food Safety Management Tools- Basic concepts. PRPs, GHPs, GMPs, SSOPs etc. HACCP. ISO series. TQM - concept and need for quality, components of TQM, Kaizen. Risk Analysis. Accreditation and Auditing, Water Analysis, Surface Sanitation and Personal Hygiene. Food laws and Standards- Indian Food Regulatory Regime, FSSA. Global Scenario CAC. Other laws and standards related to food. Recent concerns- New and Emerging Pathogens. Packaging, Product labeling and Nutritional labeling. Genetically modified foods\ transgenics. Organic foods. Newer approaches to food safety. Recent Outbreaks. Indian and International Standards for food products.

## Course Name: Food Safety & standards Lab

## Course Code: 20017900

**Course Outline**

1. Water quality analysis physico-chemical and microbiological.
2. Preparation of different types of media.
3. Microbiological Examination of different food samples.
4. Assessment of surface sanitation by swab/rinse method.
5. Assessment of personal hygiene. Biochemical tests for identification of bacteria.
6. Scheme for the detection of food borne pathogens. Preparation of plans for Implementation of FSMS - HACCP, ISO: 22000.

## Course Name: Bio pesticides & Bio fertilizers

## Course Code: 20018000

**Course Outline**

Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and biorationales. Botanicals and their uses. Mass production technology of bio-pesticides. Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes. Methods of application of biopesticides. Methods of quality control and Techniques of biopesticides.Impediments and limitation in production and use of biopesticide. Biofertilizers - Introduction, status and scope. Structure and characteristic features of bacterial biofertilizers- *Azospirillum, Azotobacter, Bacillus, Pseudomonas, Rhizobium* and *Frankia*; Cynobacterial biofertilizers- *Anabaena*, *Nostoc*, Hapalosiphon and fungal biofertilizers- AM mycorrhiza and ectomycorhiza. Nitrogen fixation -Free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilization and phosphate mobilization, K solubilization. Production technology: Strain selection, sterilization, growth and fermentation, mass production of carrier
based and liquid biofertiizers. 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 Name: Bio pesticides & Bio fertilizers Lab

## Course Code: 20018100

**Course Outline**

1. Isolation and purification of important biopesticides: *Trichoderma Pseudomonas, Bacillus,*
2. *Metarhyzium* etc. and its production.
3. Identification of important botanicals.
4. Visit to biopesticide laboratory in nearby area.
5. Field visit to explore naturally infected cadavers. Identification of entomopathogenic entities in field condition.
6. Quality control of biopesticides.
7. Isolation and purification of *Azospirillum , Azotobacter, Rhizobium*, P-solubilizers and
8. cyanobacteria.
9. Mass multiplication and inoculums production of biofertilizers. Isolation of AM

## Course Name: Practical Crop Production – I (*Kharif* crops)

## Course Code: 20018200

**Course Outline**

1. Crop planning, raising field crops in multiple cropping systems:
2. Field preparation, seed,treatment, nursery raising, sowing, nutrient,
3. water and weed management and management of insect-
4. pests diseases of crops,
5. harvesting, threshing, drying winnowing,
6. storage and marketing of produce.
7. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies.
8. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students

## Course Name: Intellectual Property Rights

## Course Code: 20018300

**Course Outline**

Introduction and meaning of intellectual property, brief introduction to GATT, WTO, TRIPs and WIPO, Treaties for IPR protection: Madrid protocol, Berne Convention, Budapest treaty, etc.Types of Intellectual Property and legislations covering IPR in India:-Patents, Copyrights, 109

Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets. 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, Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database.

Origin and history including a brief introduction to UPOV for protection of plant varieties, Protection of plant varieties under UPOV and PPV&FR Act of India, Plant breeders rights, Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights. Traditional knowledge-meaning and rights of TK holders.
Convention on Biological Diversity, International treaty on plant genetic resources for food and agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing.

## Course Name: Geoinformatics and Nano-technology and Precision Farming

## Course Code: 20018600

**Course Outline**

Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture; Geo-informatics- definition, concepts, tool and techniques; their use in Precision Agriculture. Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies; Spatial data and their management in GIS; Remote sensing concepts and application in agriculture; Image processing and interpretation; Global positioning system (GPS), components and its functions; Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs; STCR approach for precision agriculture; 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 Name: Geoinformatics and Nano-technology and Precision Farming Lab

## Course Code: 20018700

**Course Outline**

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

## Course Name: Farming System & Sustainable Agriculture

## Course Code: 20018800

**Course Outline**

Farming System-scope, importance, and concept, Types and systems of farming system and factors affecting types of farming, Farming system components and their maintenance, 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; 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, 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, resource use efficiency and optimization techniques, Resource cycling and flow of energy in different farming system, farming system and environment, Visit of IFS model in different agro-climatic zones of nearby states University/ institutes and farmers field.

## Course Name: Weed Management

## Course Code: 20018900

**Course Outline**

Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem. Classification, reproduction and dissemination of weeds. 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. Bio-herbicides and their application in agriculture. Concept of herbicide mixture and utility in agriculture. Herbicide compatibility with agro-chemicals and their application. Integration of herbicides with non chemical methods of weed management. Herbicide Resistance and its management.

## Course Name: Weed Management lab

## Course Code: 20019000

**Course Outline**

1. Techniques of weed preservation. Weed identification and their losses study.

2. Biology of important weeds.
3. Study of herbicide formulations and mixture of herbicide. Herbicide and agrochemicals study.
4. Shift of weed flora study in long term experiments. Study of methods of herbicide application

## Course Name: Micro propagation Technologies

## Course Code: 20019100

**Course Outline**

Introduction, History, Advantages and limitations; Types of cultures (seed, embryo, organ, callus, cell), Stages of micropropagation, Axillary bud proliferation (Shoot tip and meristem culture, bud culture),Organogenesis (callus and direct organ formation), Somatic embryogenesis, cell suspension cultu res, Production of secondary metabolites, Somaclonal variation, Cryopreservation

## Course Name: Micro propagation Technologies lab

## Course Code: 20019200

1. Identification and use of equipments in tissue culture Laboratory, Nutrition media composition, sterilization techniques for media, containers and small instruments, sterilization techniques for explants,
2. Preparation of stocks and working solution,
3. Preparation of working medium, Culturing of explants: Seeds, shoot tip and single node, Callus induction,
4. Induction of somatic embryos regeneration of whole plants from different explants, Hardening procedures.

## Course Name: Ability and Skill Enhancement V

## Course Code: 20018400

**Course Outline – Final Assessment - Interview with an Entrepreneur /Leader**

**Unit I: Leadership**

What is leadership? Traits of Leadership, Identifying leaders and traits of Leadership, Movie/ Story/ Interviews of leaders: Identify leadership qualities, Debate/ Discussion/ Presentations on leaders.

**Unit II: Entrepreneurship**
What is Entrepreneurship, Traits of Successful Entrepreneurs, Movie/ Story/Interviews of Entrepreneurs: Identify Entrepreneurial qualities, Debate/ Discussion/Presentation on Entrepreneurs.

**Unit III: Organisational Skills & Employability Skills**
What are organizational skills, how to develop them, the skills needed to become a successful entrepreneur/administrator, good communication, ambition, courage, hardwork, planning, accountability. Organizational skills can be developed by discipline making a system, rules, delegation of power at workplace, etc.
How to enhance employability; skills, why do we need them, different workplaces, having different needs, different skills, how to recognize different work skills.

**Unit IV: Decision making**
The process of decision making, its steps, what are its basics, what are the basics of organizational decision making process, entrepreneurial decision making, how to make a right decision at right time, dilemma.

**Unit V: Interview Skills**
Conducting Interviews with Leaders/ Entrepreneurs, Preparing Questions, Interviewing the fellow person, do's & don'ts while taking interview.

***Semester- VI***

| S. No. | Course Code | Course Name | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1. | 20019300 | Rainfed Agriculture & Watershed Management | 1 | 0 | 0 | 1 |
| 2. | 20019400 | Rainfed Agriculture & Watershed Management lab | 0 | 0 | 2 | 1 |
| 3. | 20019500 | Protected Cultivation and Secondary Agriculture | 1 | 0 | 0 | 1 |
| 4. | 20019600 | Protected Cultivation and Secondary Agriculture lab | 0 | 0 | 2 | 1 |
| 5. | 20019700 | Diseases of Field and Horticultural Crops and their Management-II | 2 | 0 | 0 | 2 |
| 6. | 20019800 | Diseases of Field and Horticultural Crops and their Management-II Lab | 0 | 0 | 2 | 1 |
| 7. | 20019900 | Post-harvest Management and Value Addition of Fruits and Vegetables | 1 | 0 | 0 | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 8. | 20020000 | Post-harvest Management and Value Addition of Fruits and Vegetables lab | 0 | 0 | 2 | 1 |
| 9. | 20020100 | Management of Beneficial Insects | 1 | 0 | 0 | 1 |
| 10. | 20020200 | Management of Beneficial Insects lab | 0 | 0 | 2 | 1 |
| 11. | 20020300 | Crop Improvement-II (Rabi crops) | 1 | 0 | 0 | 1 |
| 12. | 20020400 | Crop Improvement-II (Rabi crops) Lab | 0 | 0 | 2 | 1 |
| 13. | 20020500 | Practical Crop Production –II (Rabi crops) | 0 | 0 | 4 | 2 |
| 14. | 20020600 | Principles of Organic Farming | 1 | 0 | 0 | 1 |
| 15. | 20020700 | Principles of Organic Farming lab | 0 | 0 | 2 | 1 |
| 16. | 20020800 | Farm Management, Production & Resource Economics | 1 | 0 | 0 | 1 |
| 17. | 20020900 | Farm Management, Production & Resource Economics Lab | 0 | 0 | 2 | 1 |
| 18. | 20021000 | Principles of Food Science and Nutrition | 2 | 0 | 0 | 2 |
| 19. | - | Elective Course | 2 | 0 | 0 | 2 |
| 20. | - | Elective Course Lab | 0 | 0 | 2 | 1 |
| 21. | 20021100 | Ability and Skill Enhancement VI | 2 | 0 | 0 | 2 |
| 22. | 99002800 | Workshops & Seminars | - | - | - | 1 |
| 23. | 99002700 | Human Values & Social Service/NCC/NSS | - | - | - | 1 |
| | **Total** | | **15** | **0** | **22** | **28** |

| Elective | Course Code | Course Name |
|---|---|---|
| **Elective III** | 20021200 | Hi-tech. Horticulture |
| | 20021300 | Hi-tech. Horticulture Lab |
| | 20021400 | Protected Cultivation |
| | 20021500 | Protected Cultivation Lab |
| | 20021600 | System Simulation and Agro-advisory |
| | 20021700 | System Simulation and Agro-advisory Lab |
| | 20021800 | Agricultural Journalism |
| | 20021900 | Agricultural Journalism Lab |

## Course Name: Rainfed Agriculture & Watershed Management

## Course Code: 20019300

**Course Outline**

Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India; Problems and prospects of rainfed agriculture in India ; Soil and climatic conditions prevalent in rainfed areas; Soil and water conservation techniques, Drought: types, effect of water deficit on physio-morphological characteristics of the plants, Crop adaptation and mitigation to drought; Water harvesting: importance, its techniques, Efficient utilization of water through soil and crop management practices, Management of crops in rainfed areas, Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management, factors affecting watershed management.

## Course Name: Rainfed Agriculture & Watershed Management Lab

## Course Code: 20019400

**Course Outline**

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

## Course Name: Protected Cultivation and Secondary Agriculture

## Course Code: 20019500

**Course Outline**

Green house technology: Introduction, Types of Green Houses; Plant response to Green house environment, Planning and design of greenhouses, Design criteria of green house for cooling and heating purposes. Green house equipments, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying. Cost estimation and economic analysis. Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation. Drying and dehydration; moisture measurement, EMC, drying theory, various drying method, commercial grain dryer (deep

bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, recirculatory dryer and solar dryer). Material handling equipment; conveyer and elevators, their principle, working and selection.

## Course Name: Protected Cultivation and Secondary Agriculture Lab

## Course Code: 20019600

**Course Outline**

1. Study of different type of green houses based on shape.
2. Determine the rate of air exchange in an active summer winter cooling system.
3. Determination of drying rate of agricultural products inside green house.
4. Study of green house equipments.
5. Visit to various Post Harvest Laboratories.
6. Determination of Moisture content of various grains by oven drying & infrared moisture methods.
7. Determination of engineering properties (shape and size, bulk density and porosity of biomaterials).
8. Determination of Moisture content of various grains by moisture meter.
9. Field visit to seed processing plant.

## Course Name: Diseases of Field and Horticultural Crops and their Management-II

## Course Code: 20019700

**Course Outline**

Symptoms, etiology, disease cycle and management of major diseases of following crops: 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; Groundnut: early and late leaf spots, wilt Soybean: Rhizoctonia blight, bacterial spot, seed and seedling rot and mosaic; Pigeonpea: Phytophthora blight, wilt and sterility mosaic; Finger millet: Blast and leaf spot; black & green gram: Cercospora leaf spot and anthracnose, web blight and yellow mosaic; Castor: Phytophthora blight; Tobacco: black shank, black root rot and mosaic. 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; 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; Ginger: soft rot; Colocasia: Phytophthora blight; Coconut: wilt and bud rot; Tea: blister blight; Coffee: rust

## Course Name: Diseases of Field and Horticultural Crops and their Management-II Lab

## Course Code: 20019800

**Course Outline**

1. Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory.
2. Field visit for the diagnosis of field problems.
3. Collection and preservation of plant diseased specimens for Herbarium;

Note: Students should submit 50 pressed and well mounted Specimens.

## Course Name: Post-harvest Management and Value Addition of Fruits and Vegetables

## Course Code: 20019900

**Course Outline**

**Unit I**

Importance of Postharvest Technology in horticultural crops. Maturity indices, harvesting, handling, grading of fruits, vegetables, cut flowers, plantation crops, spices, medicinal and aromatic plants. Pre-harvest factors affecting quality, factors responsible for deterioration of horticultural produce, physiological and bio-chemical changes, hardening and delaying ripening process. Postharvest treatments of horticultural crops.

**Unit II**

Quality parameters and specifications. Structure of fruits, vegetables and cut flowers related to physiological changes after harvest. Methods of storage for local market and export. Pre-harvest treatment and pre-cooling, prestorage treatments. Different systems of storage, packaging methods and types of packages, recent advances in packaging. Types of containers and cushioning materials, vacuum packaging, cold storage, poly shrink packaging, grape guard packing treatments. Modes of transport.

## Course Name: Post-harvest Management and Value Addition of Fruits and Vegetables Lab

## Course Code: 20020000

**Course Outline**

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, jelly,RTS, nectar, squash, osmotically dried products, fruit bar and candy and tomato products, canned products.
6. Quality evaluation of products -- physico-chemical and sensory. Visit to processing unit/ industry.

## Course Name: Management of Beneficial Insects

## Course Code:20020100

**Course Outline**

Importance of beneficial Insects, Beekeeping and pollinators, bee biology, commercial methods of rearing, equipment used, seasonal management, bee enemies and disease. Bee pasturage, bee foraging and communication. Insect pests and diseases of honey bee. Role of pollinators in cross pollinated plants. Types of silkworm, voltinism and biology of silkworm. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Rearing, mounting and harvesting of cocoons. Pest and diseases of silkworm, management, rearing appliances of mulberry silkworm and methods of disinfection. Species of lac insect, morphology, biology, host plant, lac production – seed lac, button lac, shellac, lac- products. Identification of major parasitoids and predators commonly being used in biological control. 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 Name: Management of Beneficial Insects Lab

## Course Code: 20020200

**Course Outline**

1. Honey bee species, castes of bees.
2. Beekeeping appliances and seasonal management, bee enemies and disease.
3. Bee pasturage, bee foraging and communication.
4. Types of silkworm, voltinism and biology of silkworm.
5. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves.
6. Species of lac insect, host plant identification.
7. Identification of other important pollinators weed killers and scavengers.

8. Visit to research and training institutions devoted to beekeeping, sericulture, lac culture and natural enemies.
9. Identification and techniques for mass multiplication of natural enemies.

## Course Name: Crop Improvement-II (Rabi crops)

## Course Code: 20020300

**Course Outline**

**Unit I**

Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds;fodder crops and cash crops; vegetable and horticultural crops; Plant genetic resources, its utilization and conservation; study of genetics of qualitative and quantitative characters;

**Unit II**

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 and quality (physical, chemical, nutritional); Hybrid seed production technology of rabi crops. Ideotype concept and climate resilient crop varieties for future.

## Course Name: Crop Improvement-II (Rabi crops) Lab

## Course Code: 20020400

**Course Outline**

1. Floral biology, emasculation and hybridization techniques in different crop species namely Wheat, Oat, Barley, Chickpea, Lentil, Field pea, Rajma, Horse gram, Rapeseed Mustard, Sunflower, Safflower, Potato, Berseem. Sugarcane, Tomato, Chilli, Onion;
2. Handling of germ plasm and segregating populations by different methods like pedigree, bulk and single seed decent methods;
3. Study of field techniques for seed production and hybrid seeds production in Rabi crops;
4. Estimation of heterosis, inbreeding depression and heritability;
5. Layout of field experiments; Study of quality characters, study of donor parents for different characters;
6. Visit to seed production plots; Visit to AICRP plots of different field crops

## Course Name: Practical Crop Production –II (Rabi crops)

## Course Code: 20020500

**Course Outline**

Crop planning, raising field crops in multiple cropping systems: Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.

## Course Name: Principles of Organic Farming

## Course Code: 20020600

**Course Outline**

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; 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 Name: Principles of Organic Farming Lab

## Course Code: 20020700

**Course Outline**

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

## Course Name: Farm Management, Production & Resource Economics

## Course Code: 20020800

**Course Outline**

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. 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. 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. 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, determinants of compensation. 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.

## Course Name: Farm Management, Production & Resource Economics Lab

## Course Code: 20020900

**Course Outline**

1. Preparation of farm layout.
2. Determination of cost of fencing of a farm.
3. Computation ofdepreciation cost of farm assets.
4. Application of equi-marginal returns/opportunity cost principle in allocation of farm resources.
5. Determination of most profitable level of inputs use in a farm production process. Determination of least cost combination of inputs.
6. Selection of most profitable enterprise combination.

7. Application of cost principles including CACP concepts in the estimation of cost of crop and livestock enterprises.
8. Preparation of farm plan and budget, farm records and accounts and profit & loss accounts. Collection and analysis of data on various resources in India.

## Course Name: Principles of Food Science and Nutrition

## Course Code: 20021000

**Course Outline**

**Unit I**

Concepts of Food Science (definitions, measurements, density, phase change, pH, osmosis, surface tension, colloidal systems etc.); Food composition and chemistry (water, carbohydrates, proteins, fats, vitamins, minerals, flavours, colours, miscellaneous bioactives, important reactions);

**Unit II**

Food microbiology (bacteria, yeast, moulds, spoilage of fresh & processed foods, Production offermented foods); Principles and methods of food processing and preservation (use of heat, low temperature, chemicals, radiation, drying etc.); 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.

## Course Name: Hi-tech. Horticulture

## Course Code:20021200

**Course Outline**

Introduction & importance; Nursery management and mechanization; micro propagation of horticultural crops; Modern field preparation and planting methods, Protected cultivation:advantages, controlled conditions, method and techniques, Micro irrigation systems and its components; EC, pH based fertilizer scheduling, canopy management, high density orcharding, Components of precision farming: Remote sensing, Geographical Information System (GIS), Differential Geo-positioning System (DGPS), Variable Rate applicator (VRA), application of precision farming in horticultural crops (fruits, vegetables and ornamental crops); mechanized harvesting of produce.

## Course Name: Hi-tech. Horticulture Lab

## Course Code:20021300

**Course Outline**

Types of polyhouses and shade net houses, Intercultural operations, tools and equipments identification and application, Micro propagation, Nursery-protrays, micro-irrigation, EC, pH based fertilizer scheduling, canopy management, visit to hi-tech orchard/nursery.

## Course Name: Protected Cultivation

## Course Code:20021400

**Course Outline**

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. Soil preparation and management, Substrate management. Types of benches and containers. Irrigation and fertigation management. Propagation and production of quality planting material of horticultural crops. Greenhouse cultivation of important horticultural crops – rose, carnation, chrysanthemum, gerbera, orchid, anthurium, lilium, tulip, tomato, bell pepper, cucumber, strawberry, pot plants, etc. Cultivation of economically important medicinal and aromatic plants. Off-season production of flowers and vegetables. Insect pest and disease management.

## Course Name: Protected Cultivation Lab

## Course Code:20021500

**Course Outline**

Raising of seedlings and saplings under protected conditions, use of protrays in quality planting material production, Bed preparation and planting of crop for production, Inter cultural operations, Soil EC and pH measurement, Regulation of irrigation and fertilizers through drip, fogging ad misting.

## Course Name: System Simulation and Agro-advisory

## Course Code:20021600

**Course Outline**

System Approach for representing soil-plant-atmospheric continuum, system boundaries, Crop models, concepts & techniques, types of crop models, data requirements, relational diagrams. Evaluation of crop responses to weather elements; Elementary crop growth models; calibration, validation, verification and sensitivity analysis. Potential and achievable crop production- concept and modelling techniques for their estimation. Crop production in moisture and nutrients limited conditions; components of soil water and nutrients balance. Weather forecasting, types, methods, tools & techniques, forecast verification; Value added weather forecast, ITK for weather forecast and its validity; Crop-Weather Calendars; Preparation of agro-advisory bulletin based on weather forecast. Use of crop simulation model for preparation of Agro-advisory and its effective dissemination.

## Course Name: System Simulation and Agro-advisory Lab

## Course Code: 20021700

**Course Outline**

1. Preparation of crop weather calendars.
2. Preparation of agro-advisories based on weather forecast using various approaches and synoptic charts.
3. Working with statistical and simulation models for crop growth.
4. Potential & achievable production; yield forecasting, insect & disease forecasting models. Simulation with limitations of water and nutrient management options.
5. Sensitivity analysis of varying weather and crop management practices.
6. Use of statistical approaches in data analysis and preparation of historical, past and present meteorological data for medium range weather forecast.
7. Feedback from farmers about the agro advisory.

## Course Name: Agricultural Journalism

## Course Code: 20021800

**Course Outline**

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. 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. 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. 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.

## Course Name: Agricultural Journalism Lab

## Course Code:20021900

**Course Outline**

1. Practice in interviewing.
2. Covering agricultural events.
3. Abstracting stories from research and scientific materials and from wire services.
4. Writing different types of agricultural stories. Selecting pictures and artwork for the agricultural story.
5. Practice in editing, copy reading, headline and title writing, proofreading, lay outing. Testing copy with a readability formula.
6. Visit to a publishing office.

## Course Name: Ability and Skill Enhancement VI

## Course Code:20021100

**Course Outline – Final Assessment – Report/Presentation**

**Unit I: Verbal Reasoning & English Aptitude**
Logical Sequence of Words, Verbal Analogy, Classification, Blood Relation Test, Syllogism, Reading Comprehension.

**Unit II: Winning Attitude**
Attitude is the most important thing for success, how to develop a winning attitude, what is it, when we need it, what is mindset, how to have a winning and positive mindset, how to win in difficult situations, Positive thinking, passion, dedication, confidence, well preparation, focus, hard work, planning, never give up, etc - some traits that help in developing winning attitude.

**Unit III: Understanding the News**
Reading Current News, Comparing & Analysing the news, Write an editorial, News Vocabulary, Presentation on any major news (political/social/sports/economics).

**Unit IV: Be a Journalist**

Chat Show, Panel Discussion, Parliamentary debate, News Inspired Theatrical Performance.

**Unit V: Report**
Preparing a report on major National/International News – Insights/ review of major news papers and news channels.

**Note:** The review of Syllabus happens on periodic basis for the benefit of the students. In case there are changes in curriculum due to review, students would be intimated in writing.

**---------- End of document----------**