# Integral University, Lucknow
# Integral Institute of Agricultural Science and Technology
# Evaluation Scheme of Undergraduate program
# B. Sc. (Hons.) Agriculture
# w.e.f. Session 2019-20

## Elective Courses

| Course Code | Subject | Periods Per h/week/sem | | | Evaluation Scheme Theory Mid sem | | | Evaluation Scheme Practical Examination | | | | | End sem Theory Exam | Subject total | Credit | Total Credit Points |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Sessional | | | End sem exam | Sub Total (sessional + exam) | | | | |
| | | L | T | P | CT | TA | Total | CT | TA | Total | Total | | | | | |
| AG235 | **Agribusiness Management** | 2 | 0 | 2 | 10 | 10 | **20** | 5 | 5 | **10** | **20** | **50** | **50** | **100** | 2:0:1 | **3** |
| AG236 | **Agrochemicals** | 2 | 0 | 2 | 10 | 10 | **20** | 5 | 5 | **10** | **20** | **50** | **50** | **100** | 2:0:1 | **3** |
| AG237 | **Commercial Plant Breeding** | 1 | 0 | 4 | 10 | 10 | **20** | 5 | 5 | **10** | **20** | **50** | **50** | **100** | 1:0:2 | **3** |
| HT331 | **Landscaping** | 2 | 0 | 2 | 10 | 10 | **20** | 5 | 5 | **10** | **20** | **50** | **50** | **100** | 2:0:1 | **3** |
| AG348 | **Food Safety and Standards** | 2 | 0 | 2 | 10 | 10 | **20** | 5 | 5 | **10** | **20** | **50** | **50** | **100** | 2:0:1 | **3** |
| AG349 | **Biopesticides and Biofertilizers** | 2 | 0 | 2 | 10 | 10 | **20** | 5 | 5 | **10** | **20** | **50** | **50** | **100** | 2:0:1 | **3** |
| HT330 | **Protected Cultivation** | 2 | 0 | 2 | 10 | 10 | **20** | 5 | 5 | **10** | **20** | **50** | **50** | **100** | 2:0:1 | **3** |
| AG328 | **Micro propagation Technologies** | 1 | 0 | 4 | 10 | 10 | **20** | 5 | 5 | **10** | **20** | **50** | **50** | **100** | 1:0:2 | **3** |
| HT325 | **Hi-tech. Horticulture** | 2 | 0 | 2 | 10 | 10 | **20** | 5 | 5 | **10** | **20** | **50** | **50** | **100** | 2:0:1 | **3** |
| AG238 | **Weed Management** | 2 | 0 | 2 | 10 | 10 | **20** | 5 | 5 | **10** | **20** | **50** | **50** | **100** | 2:0:1 | **3** |
| AG351 | **System Simulation and Agro-advisory** | 2 | 0 | 2 | 10 | 10 | **20** | 5 | 5 | **10** | **20** | **50** | **50** | **100** | 2:0:1 | **3** |
| AG321 | **Agricultural Journalism** | 2 | 0 | 2 | 10 | 10 | **20** | 5 | 5 | **10** | **20** | **50** | **50** | **100** | 2:0:1 | **3** |

***Students can opt any one paper from the elective courses***

# Integral University, Lucknow
## Integral Institute of Agricultural Science and Technology
## Evaluation Scheme of Undergraduate program
## B. Sc. (Hons.) Agriculture
## w.e.f. Session 2019-20
## Elective Courses

| Course Code | Course Title | Periods Per h/week/sem | | | Evaluation Scheme Theory Mid sem | | | Evaluation Scheme Practical Examination | | | | | End sem Theory Exam | Subject total | Credit | Total Credit Points | Attributes | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Sessional | | | End sem exam | Sub Total (sessional + exam) | | | | | | | | | | | |
| | | L | T | P | CT | TA | Total | CT | TA | Total | Total | | | | | | Employability | Entrepreneurship | Skill Development | Gender Equality | Environment & Sustainability | Human Value | Professional Ethics |
| AG235 | **Agribusiness Management** | 2 | 0 | 2 | 10 | 10 | **20** | 5 | 5 | **10** | **20** | **50** | **50** | **100** | 2:0:1 | **3** | √ | √ | √ | | | | |
| AG236 | **Agrochemicals** | 2 | 0 | 2 | 10 | 10 | **20** | 5 | 5 | **10** | **20** | **50** | **50** | **100** | 2:0:1 | **3** | √ | √ | √ | | √ | | |
| AG237 | **Commercial Plant Breeding** | 1 | 0 | 4 | 10 | 10 | **20** | 5 | 5 | **10** | **20** | **50** | **50** | **100** | 1:0:2 | **3** | √ | √ | √ | | √ | | |
| HT331 | **Landscaping** | 2 | 0 | 2 | 10 | 10 | **20** | 5 | 5 | **10** | **20** | **50** | **50** | **100** | 2:0:1 | **3** | √ | √ | √ | | √ | | |
| AG348 | **Food Safety and Standards** | 2 | 0 | 2 | 10 | 10 | **20** | 5 | 5 | **10** | **20** | **50** | **50** | **100** | 2:0:1 | **3** | √ | √ | √ | | √ | √ | |
| AG349 | **Biopesticides and Biofertilizers** | 2 | 0 | 2 | 10 | 10 | **20** | 5 | 5 | **10** | **20** | **50** | **50** | **100** | 2:0:1 | **3** | √ | √ | | | √ | | |
| HT330 | **Protected Cultivation** | 2 | 0 | 2 | 10 | 10 | **20** | 5 | 5 | **10** | **20** | **50** | **50** | **100** | 2:0:1 | **3** | √ | √ | √ | | √ | | |
| AG328 | **Micro propagation Technologies** | 1 | 0 | 4 | 10 | 10 | **20** | 5 | 5 | **10** | **20** | **50** | **50** | **100** | 1:0:2 | **3** | √ | √ | √ | | | | |
| HT325 | **Hi-tech. Horticulture** | 2 | 0 | 2 | 10 | 10 | **20** | 5 | 5 | **10** | **20** | **50** | **50** | **100** | 2:0:1 | **3** | √ | √ | | | √ | | |
| AG238 | **Weed Management** | 2 | 0 | 2 | 10 | 10 | **20** | 5 | 5 | **10** | **20** | **50** | **50** | **100** | 2:0:1 | **3** | √ | √ | √ | | | | |
| AG351 | **System Simulation and Agro-advisory** | 2 | 0 | 2 | 10 | 10 | **20** | 5 | 5 | **10** | **20** | **50** | **50** | **100** | 2:0:1 | **3** | √ | √ | | | √ | | |
| AG321 | **Agricultural Journalism** | 2 | 0 | 2 | 10 | 10 | **20** | 5 | 5 | **10** | **20** | **50** | **50** | **100** | 2:0:1 | **3** | √ | √ | √ | | | | |
| | | 2 | 0 | 2 | 10 | 10 | **20** | 5 | 5 | **10** | **20** | **50** | **50** | **100** | 2:0:1 | **3** | √ | √ | √ | | √ | | |
| | **Total** | | | | | | | | | | | | | | | | | | | | | | |

**B.Sc. (Hons.) Agriculture**
**Course Title: Agribusiness Management**
**Course Code:AG235**
**w.e.f. Session 2019-20**

**Theory** **3(2+1)**

**Unit 1.**

Transformation of agriculture into agribusiness, various stakeholders and components ofagribusiness systems. Importance of agribusiness in the Indian economy and New AgriculturalPolicy. Distinctive features of Agribusiness Management: Importance and needs of agro-basedindustries, Classification of industries and types of agro based industries.

**Unit 2.**

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. Businessenvironment: PEST & SWOT analysis. Management functions: Roles & activities, Organizationculture. Planning, meaning, definition, types of plans. Purpose or mission, goals or objectives,Strategies, polices procedures, rules, programs and budget. Components of a business plan, Stepsin planning and implementation.

**Unit 3.**

Organization staffing, directing and motivation. Ordering,leading, supervision, communications, control. Capital Management and Financial management ofAgribusiness. 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.

**Unit 4.**

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

**Practical**

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

**Suggested Readings:**


- Information and Communication Technologies Management in Turbulent Business Environments by SC Lenny Koh and Stuart Maguire
- Knowledge Management Systems: Information and Communication Technologies for Knowledge Management by Ronald Maier
- Handbook on Foreign Trade Policy and Guide to Export & Import by The Institute of Chartered Accountants of India, New Delhi
- Agricultural and Food Marketing Management by I.M. Crawford

**Course Objective:**

- To make students aware about the concept of agribusiness.
- To make students aware about the different type of the agro based industries.
- To make students aware of micro and macro environmental forces and their impact on agri-business.
- To make students aware about agricultural marketing.
- To make students familiar with financial management.

**Course Outcome:**

***After completion of the course, a student will be able to***

| COURSE OUTCOME (CO) | DESCRIPTION |
|---|---|
| **CO1** | Students are well aware about the agribusiness concepts and importance. |
| **CO2** | Students are well aware about different type agro-based industries and their importance. |
| **CO3** | Students have knowledge about agribusiness environment including suppliers, competitors, customers, political and economic system. |
| **CO4** | Students have knowledge about different marketing techniques, PLC, pricing strategies and marketing mix. |
| **CO5** | Student can understand financial management concepts applied to the agro-based industries. |

**CO-PO-PSO mapping**

| **PO** | **PO** | | | | | | | | | | | | **PSO** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO** | **POI** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
| **CO1** | **3** | 1 | **3** | **3** | 1 | 1 | 3 | 1 | 2 | **3** | 3 | 3 | **3** | **3** | **2** |
| **CO2** | **3** | 2 | **3** | **3** | 1 | 1 | 3 | 1 | 3 | **3** | 3 | 3 | **2** | **3** | **2** |
| **CO3** | **3** | 1 | **2** | **3** | 1 | 1 | 3 | **2** | 2 | 2 | 3 | 3 | **3** | **3** | **2** |
| **CO4** | **3** | 1 | **2** | **3** | 1 | **2** | 3 | 2 | 3 | 3 | 3 | 3 | **3** | **3** | **2** |
| **CO5** | **3** | 2 | **3** | **3** | 1 | **2** | 3 | 1 | 2 | 2 | 3 | 3 | **2** | **2** | **2** |

**B.Sc. (Hons.) Agriculture**
**Course Title: Agrochemicals**
**Course Code: AG236**
**w.e.f. Session 2019-20**

**Theory** **3(2+1)**

**Unit 1.**

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 ofagrochemicals for sustainable agriculture.

**Unit 2.**

Herbicides-Major classes, properties and important herbicides. Fate of herbicides.Fungicides - Classification – Inorganic fungicides - characteristics, preparation and use ofsulfur and copper, Mode of action-Bordeaux mixture and copper oxychloride.Organic fungicides- Mode of action- Dithiocarbamates-characteristics, preparation and useof Zineb and maneb.Systemic fungicides- Benomyl, carboxin, oxycarboxin, Metalaxyl, Carbendazim,characteristics and use.

**Unit 3.**

Introduction and classification of insecticides: inorganic andorganic insecticides Organochlorine, Organophosphates, Carbamates, Synthetic pyrethroidsNeonicotinoids, Biorationals, Insecticide Act and rules, Insecticides banned, withdrawn andrestricted use, Fate of insecticides in soil & plant. IGRs Biopesticides, Reduced risk insecticides,Botanicals, plant and animal systemic insecticides their characteristics and uses.

**Unit 4.**

Fertilizers and their importance. Nitrogenous fertilizers: Feedstocks and Manufacturing ofammonium sulphate, ammonium nitrate, ammonium chloride, urea. Slow release N-fertilizers.Phosphatic fertilizers: feedstock and manufacturing of single superphosphate. Preparationof bone meal and basic slag. Potassic fertilizers: Natural sources of potash, manufacturing ofpotassiumchloride, potassium sulphate and potassium nitrate.Mixed and complex fertilizers: Sources and compatibility–preparation of major, secondaryand micronutrient mixtures. Complex fertilizers: Manufacturing of ammonium phosphates,nitrophosphates and NPK complexes. Fertilizer control order. Fertilizer logistics and marketing.Plant bio-pesticides for ecological agriculture, Bio-insect repellent.

**Practical**

Sampling of fertilizers and pesticides. Pesticides application technology to study about variouspesticides appliances. Quick tests for identification of common fertilizers. Identification of anionand cation in fertilizer. Calculation of doses of insecticides to be used. To study and identify variousformulations of insecticide available kin market. Estimation of nitrogen in Urea. Estimation ofwater soluble $P_2O_5$ and citrate soluble $P_2O_5$ in single super phosphate. Estimation of potassium inMuraite of Potash/Sulphate of Potash by flame photometer. Determination of copper content incopper oxychloride. Determination of sulphur content in sulphur fungicide. Determinationof thiram. Determination of ziram content.

## Suggested readings:


- Chemistry and Technology of Agrochemical Formulations by Knowles, Alan (Ed.), Springer
- Pesticides in Agriculture and Environment by Wilis B. Wheeler
- Pesticides: Health, Safety and the Environment by Allen Poulter
- Agricultural Pests and their Control by V. B. Awasthi

**Course Objectives:**

1. Current concept of agrochemicals.
2. To learn about formulation of agrochemicals.
3. To impart the knowledge of the principles and components of fertilizers used in crops.
4. To familiarize the students about the basics methods of used different pesticides etc.
5. To study the basic concept sulphur content in soil.

**Course Outcome:**

| | |
|---|---|
| **CO1** | Students learned about the Introduction, definition, goal and current concepts of different agrochemical. |
| **CO2** | Knowledge of sampling of fertilizer and pesticide |
| **CO3** | Students familiarize with the different methods of pesticides, herbicides and insecticides |
| **CO4** | Gained the knowledge of the various concepts plant bio-pesticides foe ecological agriculture |
| **CO5** | Studied the basic concept of fertilizer and their importance. |

**CO-PO-PSO mapping**

| **PO** | **PO** | | | | | | | | | | | | **PSO** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO** | **POI** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
| **CO1** | 3 | 1 | 2 | 2 | 2 | 1 | 1 | 2 | 1 | 2 | 2 | 2 | **3** | **2** | **1** |
| **CO2** | 3 | 1 | 2 | 2 | 3 | 1 | 1 | 2 | 1 | 3 | 3 | 2 | **2** | **2** | **1** |
| **CO3** | 3 | 1 | 2 | 3 | 3 | 1 | 2 | 2 | 1 | 3 | 3 | 2 | **3** | **2** | **1** |
| **CO4** | 3 | 1 | 2 | 2 | 3 | 1 | 1 | 2 | 1 | 2 | 2 | 1 | **3** | **3** | **1** |
| **CO5** | 3 | 1 | 2 | 3 | 2 | 1 | 1 | 2 | 1 | 3 | 2 | 1 | **2** | **2** | **1** |

**B.Sc. (Hons.) Agriculture**
**Course Title: Commercial Plant Breeding**
**Course Code: AG237**
**w.e.f. Session 2019-20**

**Theory** **3(1+2)**

**Unit 1.**

Types of crops and modes of plant reproduction. Line development and maintenance breedingin self and cross pollinated crops (A/B/R and two line system) for development of hybrids andseed production.

**Unit 2.**

Genetic purity test of commercial hybrids. Advances in hybrid seed productionof maize, rice, sorghum, pearl millet, castor, sunflower, cotton pigeon pea, Brassica etc. Qualityseed production of vegetable crops under open and protected environment.

**Unit 3.**

Alternative strategiesfor the development of the line and cultivars: haploid inducer, tissue culture techniques andbiotechnological tools. IPR issues in commercial plant breeding: DUS testing and registration ofvarieties under PPV & FR Act. Variety testing, release and notification systems in India. Principlesand techniques of seed production, types of seeds, quality testing in self and cross pollinated crops.

**Practical**

Floral biology in self and cross pollinated species, selfing and crossing techniques. Techniquesof seed production in self and cross pollinated crops using A/B/R and two line system. Learningtechniques in hybrid seed production using male-sterility in field crops. Understandingthe difficulties in hybrid seed production, Tools and techniques for optimizing hybrid seedproduction. Concept of rouging in seed production plot. Concept of line its multiplication andpurification in hybrid seed production. Role of pollinators in hybrid seed production. Hybrid seedproduction techniques in sorghum, pearl millet, maize, rice, rapeseed-mustard, sunflower, castor,pigeon pea, cotton and vegetable crops. Sampling and analytical procedures for purity testingand detection of spurious seed. Seed drying and storage structure in quality seed management.Screening techniques during seed processing viz., grading and packaging. Visit to public privateseed production and processing plants.

**Suggested Readings:**


- Singh, B.D., 1997. *Plant Breeding*: *Principles and Methods*. Kalyani Publishers, New Delhi. P. 702.
- Pundan Singh, 1992. *Genetic.* Kalyani Publishers, New Delhi, P. 509.
- Nagat T, Lorz H &Widholm JM. 2008. *Biotechnology in Agriculture and Forestry.* Springer.
- Trivedi PC. 2000. *Plant Biotechnology: Recent Advances*. Panima Publishers
- Spangenberg G. 2001. *Molecular Breeding of Forage Crops*. Kluwer Academic Publishers.
- Chahal GS &Gosal SS. 2002. *Principles and Procedures of Plant Breeding: Biotechnological and Conventional Approaches.* Narosa Publishers.

**Course Objective**

1. Basic knowledge of modes of reproduction
2. To learn about the line development and maintenance breeding
3. To impart the knowledge of genetic purity testing
4. To familiarize the students with haploid inducer mechanism
5. To study the variety testing, release and notification system in India.

**Course Outcome:**

***After completion of the course, a student will be able to***

| COURSE OUTCOME (CO) | DESCRIPTION |
|---|---|
| **CO1** | To learn about the types of crops and modes of plant reproduction |
| **CO2** | To familiarize the students with development of hybrids and its seed production of different crops |
| **CO3** | To gain the knowledge about PPV & FR Act and its implication in breeding |
| **CO4** | To understand the tissue culture techniques and biotechnological tools |
| **CO5** | To study the quality testing in self and cross-pollinated crops |

**CO-PO-PSO mapping**

| PO | PO | | | | | | | | | | | | PSO | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO | POI | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| **CO1** | **3** | 1 | **3** | **3** | 1 | 1 | 1 | 1 | 1 | **3** | 1 | 3 | **3** | **3** | **1** |
| **CO2** | **3** | 2 | **3** | **3** | 1 | 1 | 1 | 1 | 1 | **3** | 2 | 3 | **2** | **3** | **2** |
| **CO3** | **3** | 1 | **2** | **3** | 1 | 1 | 1 | **2** | 1 | 2 | 3 | 3 | **3** | **3** | **2** |
| **CO4** | **3** | 1 | **2** | **3** | 1 | **2** | 1 | 2 | 1 | 3 | 2 | 3 | **3** | **3** | **2** |
| **CO5** | **3** | 2 | **3** | **3** | 1 | **2** | 1 | 1 | 1 | 2 | 3 | 3 | **2** | **2** | **2** |

**B.Sc. (Hons.) Agriculture**
**Course Title: Weed Management**
**Course Code: AG238**
**w.e.f. Session 2020-21**

**Theory** **3(2+1)**

**Unit 1.**

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

**Unit 2.**

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

**Unit 3.**

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

**Unit 4.**

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

**Practical**

Techniques of weed preservation. Weed identification and their losses study. Biology ofimportant weeds. Study of herbicide formulations and mixture of herbicide. Herbicide and agrochemicalsstudy. Shift of weed flora study in long term experiments. Study of methods of herbicideapplication, spraying equipments. Calculations of herbicide doses and weed control efficiency andweed index.

**Suggested Readings:**


- Rajagopal, A., Aravindan, R. and Shanmugavelu, K.G., 2015. *Weed management of Horticultural*
- *Crops.* Agrobios (India), Jodhpur. Gupta, O.P. 2015. *Modern Weed Management*. Agro Bios (India), Jodhpur.
- Gupta O P. 1984. Scientific Weed Management in the Tropics and Sub- Tropics. Today and Tomorrow's Printers and Publishers. New Delhi.
- Rao V S. 1992. Principles of Weed Science. Oxford and IBH Publishing Co. Ltd. New Delhi.
- Reddy Yellamanda T and Shankar Reddy G H. 1995. Principles of Agronomy. Kalyani Publishers Ludhiana.

**Course Objective**

1. Basic knowledge of modes of reproduction
2. To learn about the line development and maintenance breeding
3. To impart the knowledge of genetic purity testing
4. To familiarize the students with haploid inducer mechanism
5. To study the variety testing, release and notification system in India.

**Course Outcome:**

***After completion of the course, a student will be able to***

| COURSE OUTCOME (CO) | DESCRIPTION |
|---|---|
| **CO1** | To learn about the types of weeds |
| **CO2** | To familiarize with the classification of weeds and herbicides |
| **CO3** | To gain the knowledge about Bio-herbicides and their application in agriculture |
| **CO4** | To understand the Integration of herbicides management |
| **CO5** | To study the Integration of herbicides with non chemical methods |

**CO-PO- PSO mapping**

| PO | PO | | | | | | | | | | | | PSO | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO | POI | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| **CO1** | 3 | 2 | 3 | 3 | 2 | 1 | 1 | 2 | 1 | 3 | 1 | 3 | 3 | 3 | 1 |
| **CO2** | 3 | 2 | 3 | 3 | 2 | 1 | 1 | 2 | 1 | 3 | 2 | 2 | 2 | 3 | 1 |
| **CO3** | 3 | 1 | 2 | 3 | 1 | 1 | 1 | 2 | 1 | 2 | 3 | 3 | 3 | 2 | 2 |
| **CO4** | 3 | 1 | 2 | 3 | 1 | 2 | 1 | 2 | 1 | 3 | 2 | 3 | 3 | 2 | 2 |
| **CO5** | 3 | 2 | 3 | 3 | 1 | 2 | 1 | 1 | 1 | 2 | 3 | 3 | 2 | 2 | 2 |

**B.Sc. (Hons.) Agriculture**
**Semester V**
**Syllabus: Micro propagation Technologies**
**Course Code: AG328**
**w.e.f. Session 2020-21**

**Theory** **3 (1+2)**

**Unit 1.**

Introduction, History, Advantages and limitations; Types of cultures (seed, embryo, organ, callus, cell).

**Unit 2.**

Stages of micropropagation, Axillary bud proliferation (Shoot tip and meristem culture, bud culture).

**Unit 3.**

Organogenesis (callus and direct organ formation), Somatic embryogenesis, cell suspension cultures, Production of secondary metabolites, Somaclonal variation, Cryopreservation.

**Practical**

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

**Suggested Readings:**


- Plant Tissue Culture: Theory and Practice by S.S. Bhojwani, M.K. Razdan
- Introduction to Plant Biotechnology by H. S. Chawla
- Practical Book of Biotechnology & Plant Tissue Culture by Madhavi Adhav and Santosh Nagar
- Plant Tissue Culture: Protocols in Plant Biotechnology by M. C. Gayatri and R. Kavyashree

**COURSE: Micro propagation Technologies**
**COURSE CODE: AG328**

**COURSE OBJECTIVES:**

- Knowledge and concept of different types of cultures
- Basics Stages of micropropagation,
- Knowledge of Axillary bud proliferation
- Study of Organogenesis, Somatic embryogenesis, cell suspension cultures,
- Study based on Production of secondary metabolites, Somaclonal variation, Cryopreservation.

**COURSE OUTCOMES (CO):**

***After completion of the course, a student will be able to***

| COURSE OUTCOME (CO) | DESCRIPTION |
|---|---|
| **CO1** | Knowledge and concept of different types of cultures |
| **CO2** | Basics Stages of micropropagation, |
| **CO3** | Knowledge of Axillary bud proliferation |
| **CO4** | Study of Organogenesis, Somatic embryogenesis, cell suspension cultures, |
| **CO5** | Study based on Production of secondary metabolites, Somaclonal variation, Cryopreservation. |

**CO-PO-PSO mapping**

| PO | PO | | | | | | | | | | | | PSO | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO | POI | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 3 | 1 | 1 | 2 | 2 | 3 | 3 | 2 |
| CO2 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 1 | 3 | 2 | 3 | 2 |
| CO3 | 3 | 2 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 1 | 2 | 3 | 3 | 2 |
| CO4 | 2 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 1 | 1 | 3 | 3 | 3 | 3 |
| CO5 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 1 | 1 | 2 | 2 | 3 | 3 |

**B.Sc. (Hons.) Agriculture**
**Semester V**
**Syllabus: Hi-tech. Horticulture**
**Course Code: HT325**
**w.e.f. Session 2020-21**

**Theory** **3 (2+1)**

**Unit 1.**

Introduction & importance; Nursery management and mechanization; micro propagation of horticultural crops; Modern field preparation and planting methods

**Unit 2.**

Protected cultivation: advantages, controlled conditions, method and techniques, Micro irrigation systems and its components; EC, pH based fertilizer scheduling, canopy management, high density orcharding

**Unit 3.**

Components of precision farming: Remote sensing, Geographical Information System (GIS), Differential Geo-positioning System (DGPS), Variable Rate applicator (VRA)

**Unit 4.**

Application of precision farming in horticultural crops (fruits, vegetables and ornamental crops); mechanized harvesting of produce

**Practical**

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.

**Suggested Readings:**


- Singh, D.K., 2007. *Modern Vegetable varieties and production*. IBN publishers, Technology International Book Distributing Co, Lucknow.
- P.L. Taroj, B.B. Vashishtha, D.G.Dhandar. 2004. *Advances in Arid Horticulture*. Internal Book Distributing Co., Lucknow.
- T. Pradeep Kumar, B. Suma, Jyothi Bhaskar and K.N.Sathesan. 2008. *Management of Horticultural Crops*. New India Publishing Agency
- K.L.Chadha, 1993. *Advances in Horticulture*. Malhotra publishing house. New Delhi
- M.S.Dhaliwal, 2008. *Handbook of Vegetable Crops*. Kalyani Publishers. Ludhiana
- Uma Shankar,2008. *Vegetable Pest Management Guide for Farmers*. International Book Distribution Co. Publication. Lucknow.

**COURSE OBJECTIVES:**

- Knowledge and concept nursery management and mechanization
- Basics Stages of micropropagation,
- Knowledge of Axillary bud proliferation
- To know about components of precision farming
- To learn about the mechanized harvesting of produce

**COURSE OUTCOMES (CO):**

***After completion of the course, a student will be able to***

| COURSE OUTCOME (CO) | DESCRIPTION |
|---|---|
| **CO1** | Knowledge and concept of different types nursery management and mechanization |
| **CO2** | To learn about basics Stages of micropropagation, |
| **CO3** | To learn about remote sensing and components of precision farming |
| **CO4** | Study of EC, pH based fertilizer schdeuling |
| **CO5** | To learn about canopy management, application of precision farming |

**CO-PO-PSO mapping**

| PO | PO | | | | | | | | | | | | PSO | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO | POI | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 3 | 1 | 1 | 2 | 2 | 3 | 3 | 2 |
| CO2 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 1 | 3 | 2 | 3 | 2 |
| CO3 | 3 | 2 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 1 | 2 | 3 | 3 | 1 |
| CO4 | 2 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 1 | 1 | 3 | 3 | 3 | 2 |
| CO5 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 1 | 1 | 2 | 2 | 3 | 2 |

**B.Sc. (Hons.) Agriculture**
**Semester V**
**Syllabus: Agricultural Journalism**
**Course Code: AG329**
**w.e.f. Session 2020-21**

**Theory** **3 (2+1)**

**Unit 1.**

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

**Unit 2.**

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

**Unit 3.**

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

**Unit 4.**

Writing the story: Organizing the material, treatment of the story, writing the news lead and the body, readability measures. Illustrating agricultural stories: Use of photographs, use of artwork (graphs, charts, maps, etc.), writing the captions. Editorial mechanics: Copy reading, headline and title writing, proofreading, lay outing.

**Practical**

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

**Suggested Readings:**


- Arvind Kumar (1999). The Electronic Media. Anmol Publications, New Delhi.
- Bhatt, S.C. (1993) Broadcast Journalism. Basic Principles Har Anand Publications, Delhi
- Bhatnagar, R. (2001). Print Media and Broadcast Journalism. Indian Publisher Distributors, Delhi
- Katyal, V.P (2007). Fundamentals of Media Ethics. Cyber Tech Publishers, New Delhi.

**COURSE OBJECTIVES:**

- Knowledge and concept of agricultural journalism
- Characteristics and kinds and functions of newspapers
- To learn about types of agricultural stories, subject matter of the agricultural story
- To know about illustration of agricultural stories
- To learn about the editorial mechanics, copy reading, headline and title writing

**COURSE OUTCOMES (CO):**

***After completion of the course, a student will be able to***

| COURSE OUTCOME (CO) | DESCRIPTION |
|---|---|
| **CO1** | To learn about agricultural journalism |
| **CO2** | To learn about newspapers and magazines as communication media |
| **CO3** | To learn about agricultural stories |
| **CO4** | To know about the writing the story, organization material |
| **CO5** | To learn about use of art work , writing captions, proof reading |

**CO-PO-PSO mapping**

| PO | PO | | | | | | | | | | | | PSO | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO | POI | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 3 | 1 | 1 | 2 | 2 | 2 | 2 | 3 |
| CO2 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 1 | 3 | 2 | 2 | 3 |
| CO3 | 3 | 2 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 1 | 2 | 2 | 2 | 3 |
| CO4 | 2 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 1 | 1 | 3 | 2 | 2 | 3 |
| CO5 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 3 |

**B.Sc. (Hons.) Agriculture**

**Syllabus: Landscaping**
**Course Code: HT331**
**w.e.f. Session 2020-21**

**Theory** **3 (2+1)**

**Unit 1.**

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.

**Unit 2.**

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,

**Unit 3.**

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,

**Unit 4.**

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.

**Practical**

Identification of trees, shrubs, annuals, pot plants; 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. Use of computer software, visit to important gardens/ parks/ institutes.

**Suggested Readings:**


- A.K. Tiwari and R. Kumar. 2012. *Fundamentals of ornamental horticulture and landscape*
- *gardening*. New India.
- H.S.Grewal and Parminder Singh. 2014. *Landscape designing and ornamental plants*
- R.K. Roy. *Fundamentals of Garden designing*.2013.New India publishing agency, Pitampura, New Delhi.
- Rajesh Srivastava. 2014. *Fundamentals of Garden designing*. Agrotech press, Jaipur, New Delhi.
- L.C. De. *Nursery and landscaping*.2013. Pointer publishers, Jaipur India.
- Bose, T.K. Malti, R.G. Dhua, R.S. & Das, P. 2004. Nayaprakash, Calcutta. Floriculture and Landscaping
- Arora, J.S. 2006. Kalyani publishers, Ludhiana. Introductory Ornamental Horticulture. Kalyani publishers, Ludhiana.

**COURSE: Landscaping**
**COURSE CODE: HT331**

**COURSE OBJECTIVES:**

- Knowledge and concept of landscaping
- To know about principles of landscaping, garden styles and types
- To learn about trees selection, propagation, planting schemes, canopy management
- To know about other garden plants
- To learn about the landscaping of schools and public places

**COURSE OUTCOMES (CO):**

***After completion of the course, a student will be able to***

| COURSE OUTCOME (CO) | DESCRIPTION |
|---|---|
| **CO1** | To know the importance and scope of landscaping |
| **CO2** | To learn about trees selection, propagation, planting schemes, canopy management |
| **CO3** | To know about other garden plants |
| **CO4** | Knowledge and concept of peri urban landscaping |
| **CO5** | To learn about bio-aesthetic planning and landscaping of schools |

| PO | PO | | | | | | | | | | | | PSO | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO | POI | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 3 | 1 | 1 | 2 | 2 | 2 | 2 | 1 |
| CO2 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 1 | 3 | 2 | 2 | 1 |
| CO3 | 3 | 2 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 1 | 2 | 2 | 2 | 1 |
| CO4 | 2 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 1 | 1 | 3 | 2 | 2 | 1 |
| CO5 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 1 |

**B.Sc. (Hons.) Agriculture**
**Syllabus: Food Safety and Standards**
**Paper Code: AG348**
**w.e.f. Session 2020-21**

**Theory** **3(2+1)**

**Unit 1.**

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.

**Unit 2.**

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.

**Unit 3.**

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.

**Unit 4.**

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.

**Practical**

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

**COURSE OBJECTIVES:**

- Recognize and identify the food contaminants influencing the safety of agricultural products.
- Understand and apply properly the national and international legislation/ regulation.
- Implement food safety management systems for primary production.
- Evaluate food safety management systems and recommend the preventive measures.
- To be able to research a topic, synthesis current information and develop a presentation related to food safety and food quality

## COURSE OUTCOMES (CO):

***After completion of the course, a student will be able to***

| COURSE OUTCOME (CO) | DESCRIPTION |
|---|---|
| **CO1** | Students will have basic knowledge of the application of food quality and food safety system |
| **CO2** | Knowledge of identify the hazard of the food chain to ensure food safety |
| **CO3** | Basic knowledge of eexamine the chemical and microbiological quality of food samples |
| **CO4** | Basic concept of review of legislative approaches for the management of food safety |
| **CO5** | Knowledge of detect the adulteration in food samples |

**CO-PO-PSO mapping**

| PO | PO | | | | | | | | | | | | PSO | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO | POI | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 |
| CO2 | 3 | 2 | 3 | 2 | 2 | 2 | 3 | 2 | 1 | 2 | 3 | 2 | 3 | 3 | 3 |
| CO3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 3 |
| CO4 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 2 |
| CO5 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | 2 | 2 | 2 |

**B.Sc. (Hons.) Agriculture**
**Syllabus: Biopesticides & Biofertilizers**
**Paper Code: AG349**
**w.e.f. Session 2020-21**

**Theory** **3(2+1)**

**Unit 1.**

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

**Unit 2.**

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.

**Unit 3.**

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.

**Unit 4.**

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.

**Practical**

Isolation and purification of important biopesticides: *Trichoderma Pseudomonas, Bacillus, Metarhyzium* etc. and its production. Identification of important botanicals. Visit to biopesticide laboratory in nearby area. Field visit to explore naturally infected cadavers. Identification of entomopathogenic entities in field condition. Quality control of biopesticides. Isolation and purification of *Azospirillum , Azotobacter, Rhizobium,* P-solubilizers and cyanobacteria. Mass multiplication and inoculums production of biofertilizers. Isolation of AM fungi -Wet sieving method and sucrose gradient method. Mass production of AM inoculants.

**COURSE OBJECTIVES:**

- To learn about the importance of Biopesticides
- To provide knowledge of Mass production technology of bio-pesticides
- To learn about the importance of Biofertilizers
- To learn Nitrogen fixation -Free living and symbiotic nitrogen
- To study the Structure and characteristic features of biofertilizers

**COURSE OUTCOMES (CO):**

***After completion of the course, a student will be able to***

| COURSE OUTCOME (CO) | DESCRIPTION |
|---|---|
| **CO1** | The students will learn the importance of Biopesticides |
| **CO2** | The students will gain the knowledge of Mass production technology of bio-pesticides |
| **CO3** | The students will learn about the importance of Biofertilizers |
| **CO4** | The students will learn the Structure and characteristic features of biofertilizers |
| **CO5** | The students will learn Nitrogen fixation -Free living and symbiotic nitrogen |

## CO-PO-PSO mapping

| PO | PO | | | | | | | | | | | | PSO | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO | POI | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| **CO1** | 3 | 2 | 2 | 2 | 1 | 3 | 2 | 3 | 1 | 2 | 2 | 3 | 3 | 2 | 1 |
| **CO2** | 2 | 2 | 2 | 2 | 1 | 3 | 2 | 3 | 1 | 2 | 2 | 3 | 3 | 3 | 1 |
| **CO3** | 2 | 2 | 3 | 1 | 1 | 3 | 2 | 2 | 1 | 2 | 2 | 2 | 3 | 2 | 1 |
| **CO4** | 2 | 2 | 3 | 1 | 1 | 3 | 2 | 2 | 1 | 1 | 2 | 3 | 3 | 3 | 1 |
| **CO5** | 2 | 2 | 2 | 1 | 1 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 1 |

**B.Sc. (Hons.) Agriculture**
**Syllabus: Protected Cultivation**
**Paper Code: HT330**
**w.e.f. Session 2020-21**

**Theory** **3(2+1)**

**Unit 1.**

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

**Unit 2.**

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.

**Unit 3.**

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

**Unit 4.**

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

**Practical**

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 OBJECTIVES:**

1.Development of better understanding regarding recent advances in crop management under protected cultivation.
2.Obtaining sufficiency in fruits, vegetables and flowers under protected cultivation in on and off season.
3.Better designing of infrastructure for protected cultivation in different agro-climatic conditions.
4.Enhancement of total crop duration of horticultural crops than traditional ones.
5.Developing low-cost indigenous protected cultivation technologies for enhancing productivity in horticultural crops.

**COURSE OUTCOMES (CO):**

***After completion of the course, a student will be able to***

| COURSE OUTCOME (CO) | DESCRIPTION |
|---|---|
| **CO1** | To get knowledge about green house technology, types of green houses and construction of green houses |
| **CO2** | Course will give the knowledge of green house equipment's, materials of construction for traditional and low-cost green houses |
| **CO3** | This course will help the students to learn about Irrigation systems used in greenhouses, shade net house in protected cultivation |
| **CO4** | By this course student get the of concepts of cleaning and grading Moisture measurement |
| **CO5** | Apply horticultural skills and knowledge to operate various business entities found in the horticultural industry |

**CO-PO-PSO MAPPING:**

| PO | PO | | | | | | | | | | | | PSO | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO | POI | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| **CO1** | 3 | 2 | 2 | 2 | 3 | 3 | 2 | 3 | 2 | 2 | 2 | 3 | 3 | 2 | 1 |
| **CO2** | 2 | 2 | 2 | 2 | 3 | 3 | 1 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 1 |
| **CO3** | 2 | 2 | 3 | 2 | 3 | 3 | 1 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 1 |
| **CO4** | 2 | 2 | 3 | 2 | 3 | 3 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 1 |
| **CO5** | 2 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 1 |

**B.Sc. (Hons.) Agriculture**
**Syllabus: System Simulation and Agro-advisory**
**Course Code: AG351**
**w.e.f. Session 2020-21**

**Theory** **3 (2+1)**

**Unit 1.**

System Approach for representing soil-plant-atmospheric continuum, system boundaries, Crop models, concepts & techniques, types of crop models, data requirements, relational diagrams.

**Unit 2.**

Evaluation of crop responses to weather elements; Elementary crop growth models; calibration, validation, verification and sensitivity analysis. Potential and achievable crop production- concept and modeling techniques for their estimation. Crop production in moisture and nutrients limited conditions; components of soil water and nutrients balance.

**Unit 3.**

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.

**Practical**

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

**Suggested Readings:**


- Pushpa Singh and Narendra Singh. 2012. Modeling and Simulation. S K Kataria and Sons
- Gurvinder Singh, Rachhpal Singh & Saluja KK. 2003. Fundamentals of Computer Programming and Information Technology. Kalyani Publishers.
- Kumar A 2015. Computer Basics with Office Automation. IK International Publishing House Pvt Ltd.
- Maidasani D. 2016. Learning Computer Fundamentals, MS Office and Internet & Web Technology. 3rd edition, Laxmi Publications.

**Course Objectives:**

- Students of undergraduate will gain knowledge System Approach for representing soil-plant-atmospheric continuum, system boundaries, and Crop models.
- Proper understanding of Crop-Weather Calendars and forewarning model will be inculcated among the students.
- The knowledge gained in this course will be useful in understanding agro-advisories based on weather forecast.
- Understand the Use of statistical approaches in data analysis and preparation of historical, past and present meteorological data for medium range weather forecast.
- Understand the Preparation of agro-advisory bulletin based on weather forecast.

**Course Outcome:**

***After completion of the course, a student will be able to***

| COURSE OUTCOME (CO) | DESCRIPTION |
|---|---|
| **CO1** | Undergraduate will gain knowledge System Approach for representing soil-plant-atmospheric continuum, system boundaries, and Crop models. |
| **CO2** | Understanding of Crop-Weather Calendars and forewarning model will be inculcated among the students. |
| **CO3** | Comprehensive knowledge of Preparation of agro-advisories based on weather forecast using various approaches and Preparation of AAS based on weather forecast using synoptic charts |
| **CO4** | Understand the Use of statistical approaches in data analysis and preparation of historical, past and present meteorological data for medium range weather forecast. |
| **CO5** | Use of statistical approaches in data analysis and preparation of historical, past and present meteorological data for medium range weather forecast |

**CO-PO-PSO mapping**

| PO | PO | | | | | | | | | | | | PSO | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO | POI | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| **CO1** | 2 | 3 | 2 | 3 | 1 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 2 | 2 |
| **CO2** | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 3 | 2 | 3 | 1 | 2 | 3 | 3 | 1 |
| **CO3** | 3 | 2 | 1 | 1 | 2 | 2 | 2 | 3 | 1 | 1 | 1 | 3 | 3 | 2 | 2 |
| **CO4** | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | 2 | 1 | 3 | 3 | 3 | 1 |
| **CO5** | 3 | 1 | 2 | 1 | 2 | 2 | 3 | 3 | 2 | 2 | 1 | 3 | 2 | 2 | 2 |