



Integral University, Lucknow
Integral Institute of Agricultural Science and Technology
Evaluation Scheme of Undergraduate program
w.e.f. Session 2019-20

B. Sc. (Hons.) Agriculture

Semester – IV

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								
		L	T	P	CT	TA	Total	Sessional			End sem exam	Sub Total (sessional + exam)					Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics		
								CT	TA	Total														Total	
AG221	Crop Production Technology–II (Rabi Crops)	1	0	2	10	10	20	5	5	10	20	50	50	100	1:0:1	2	√		√						
HT227	Production Technology for Ornamental Crops, MAP and Landscaping	1	0	2	10	10	20	5	5	10	20	50	50	100	1:0:1	2	√		√		√				
AE275	Renewable Energy and Green Technology	1	0	2	10	10	20	5	5	10	20	50	50	100	1:0:1	2	√	√			√				
AG222	Problematic Soils and their Management	2	0	0	10	10	20	-	-	-	-	-	80	100	2:0:0	2	√	√			√				
HT228	Production Technology for Fruit and Plantation Crops	1	0	2	10	10	20	5	5	10	20	50	50	100	1:0:1	2	√	√	√		√				
AG223	Principles of Seed Technology	1	0	4	10	10	20	5	5	10	20	50	50	100	1:0:2	3	√								
MT223	Statistical Methods	1	0	2	10	10	20	5	5	10	20	50	50	100	1:0:1	2	√		√						
BM272	Agricultural Marketing Trade & Prices	2	0	2	10	10	20	5	5	10	20	50	50	100	2:0:1	3	√								
AG224	Introductory Agro-meteorology & Climate Change	1	0	2	10	10	20	5	5	10	20	50	50	100	1:0:1	2	√				√				
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*	√	√	√						
AG238	Weed Management	2	0	2	10	10	20	5	5	10	20	50	50	100	2:0:1	3*	√		√		√				
	Total															20+3*=23									

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

B. Sc. (Hons.) Agriculture
SEMESTER-IV
Course Title: Crop Production Technology-II (Rabi crops)
Course Code: AG221
w.e.f. Session 2019-20

Theory

2 (1+1)

Unit 1.

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

Unit 2.

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Pulses-chickpea, lentil, peas,

Unit 3.

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of oilseeds-rapeseed, mustard and sunflower;

Unit 4.

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of sugar crops-sugarcane; medicinal and aromatic crops-mentha, lemon grass and citronella, Forage crops-berseem, lucerne and oat.

Practical

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

Suggested Readings:

- Reddy Yellamanda T and Shankar Reddy G H. 1995. Principles of Agronomy. Kalyani Publishers Ludhiana
- Yawalkar K S and Agarwal J P. 1977. Manures and Fertilizers. Agricultural Horticultural Publishing House, Nagpur
- Acquaah G. 2005. *Principles of Crop Production: Theory, Techniques and Technology*. Prentice Hall.
- Balasubrananiyan P & Palaniappan SP. 2010. *Principles and Practices of Agronomy*. Agrobios.
- Reddy SR. 2011. *Principles of Agronomy*. Kalyani Publishers

**B. Sc. (Hons.) Agriculture
SEMESTER-IV**

Course Title: Production Technology for Ornamental Crops, MAPs and Landscaping

Course Code: HT227

w.e.f. Session 2019-20

Theory

2 (1+1)

Unit 1.

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

Unit 2.

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

Unit 3.

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

Unit 4.

Production technology of important aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, rose, geranium, vetiver. Processing and value addition in ornamental crops and MAPs produce.

Practical

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

Suggested Readings:

- Arora JS. 2013. *Introductory Ornamental Horticulture*. Kalyani Publishers.
- Bal JS. 2013. *Fruit Growing*. Kalyani Publishers.
- Chadha KL. 2012. *Handbook of Horticulture*. ICAR
- Dhaliwal MS. 2014. *Handbook of Vegetable Crops*. Kalyani Publishers
- Battacharjee, S. K. and De, L. C. 2005. *Post Harvest Technology of Flowers and Ornamentals Plants*. Ponteer Publisher, Jaipur, India.
- Kitinoja, L. and Kader, A. A. 2003. *Small-Scale Postharvest Handling practice: A Manual for Horticulture crops* (4 ed). US Davis, PHT Research and information Center.

B. Sc. (Hons.) Agriculture
SEMESTER-IV
Course Title: Renewable Energy and Green Technology
Course Code: AE275
w.e.f. Session 2019-20

Theory

2(1+1)

Unit 1.

Classification of energy sources, contribution of these of sources in agricultural sector, Familiarization with biomass utilization for biofuel production and their application,

Unit 2.

Familiarization with types of biogas plants and gasifiers, biogas, bioalcohol, biodiesel and bio-oil production and their utilization as bioenergy resource, introduction of solar energy, collection and their application,

Unit 3.

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.

Practical

Familiarization with renewable energy gadgets. To study biogas plants, To study gasifier, To study the production process of biodiesel, To study briquetting machine, To study the production process of bio-fuels. Familiarization with different solar energy gadgets. To study solar photovoltaic system: solar light, solar pumping, solar fencing. To study solar cooker, To study solar drying system. To study solar distillation and solar pond.

Suggested Readings:

- Rai, G.D. 2013. Non-Conventional Energy Sources, Khanna Publishers, Delhi.
- Rai, G.D., Solar Energy Utilization, Khanna Publishers, Delhi.
- Khandelwal, K.C. & S. S. Mahdi. 1990. Biogas Technology- A Practical Handbook.
- Rathore N. S., Kurchania A. K., Panwar N. L. 2007. Non Conventional Energy Sources, Himanshu Publications.
- Tiwari, G.N. and Ghoshal, M.K. 2005. Renewable Energy Resources: Basic Principles and Applications. Narosa Pub. House. Delhi.
- Rathore N. S., Kurchania A. K., Panwar N. L. 2007. Renewable Energy, Theory and Practice, Himanshu Publications.

B. Sc. (Hons.) Agriculture
SEMESTER-IV
Course Title: Problematic Soils and their Management
Course Code: AG222
w.e.f. Session 2019-20

Theory

2(2+0)

Unit 1.

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

Unit 2.

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.

Unit 3.

Remotesensing 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

Suggested Readings:

- Soil Analysis Testing: Steps For Getting Your Soil Tested Kindle Edition, By Annie Wilkinson
- *Fundamentals of Soil Science* Indian Society of Soil Science. 1998. IARI, New Delhi
- Hillel D. 1982. *Introduction to Soil Physics*. Academic Press, London
- Brady Nyle C and Ray R Well, 2014. *Nature and properties of soils*. Pearson Education Inc., New Delhi
- Das DK. 2011. *Introductory Soil Science*. Third Revised Edition, Kalyani Publishers.
- Open Access Books - Soil Science | InTechOpen
<https://www.intechopen.com/books/subject/soil-science/books/all/1/list>

B. Sc. (Hons.) Agriculture
SEMESTER-IV
Course Title: Production Technology for Fruit and Plantation Crops
Course Code: HT228
w.e.f. Session 2019-20

Theory

2(1+1)

Unit 1.

Importance and scope of fruit and plantation crop industry in India; Importance of rootstocks

Unit 2.

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

Unit 3.

Production technologies for the cultivation of minor fruits- date, ber, pineapple, pomegranate, jackfruit, strawberry, plantation crops-coconut, arecanut, cashew, tea, coffee & rubber

Practical

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

Suggested Readings:

- Neeraj Pratap Singh, 2005. Basic concepts of Fruit Science 1st Edn. IBDC Publishers.
- Gardner/Bardford/Hooker, J.R.. Fundamentals of Fruit Production. Mac Graw Hill Book Co., New York.
- Kumar, N., 1990. Introduction to Horticulture. Rajyalakshmi publications, Nagarcovil, Tamil Nadu.
- Chadha,K.L.(ICAR), Handbook of Horticulture. ICAR, NewDelhi
- Kausal Kumar Misra and Rajesh Kumar, 2014. *Fundamentals of Horticulture*. Biotech Books.

B. Sc. (Hons.) Agriculture
SEMESTER-IV
Course Title: Principles of Seed Technology
Course Code: AG223
w.e.f. Session 2019-20

Theory

3(1+2)

Unit 1.

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

Unit 2.

Foundation and certified seed production of important cereals, pulses, oilseeds, fodder and vegetables. Seed certification, phases of certification, procedure for seed certification, field inspection. Seed Act and Seed Act enforcement. Duty and powers of seed inspector, offences and penalties. Seeds Control Order 1983, Varietal Identification through Grow Out Test and Electrophoresis, Molecular and Biochemical test.

Unit 3.

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. Seed storage; general principles, stages and factors affecting seed longevity during storage. Measures for pest and disease control during storage

Unit4.

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.

Practical

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

Suggested Readings:

- Rattan Lal Agarwal. Seed Technology. 1995. 2nd edn. Oxford & IBH Publishing Pvt Ltd
- Sluis en Groot . 1985. Methods of Artificial Seed Testing. Enkhuizen (Holland) revised form
- International Rules for Seed Testing. ISTA (1985). Seed Science and Technology 13: 299-355.
- Schmidt, L. 2000. Guide to Handling Tropical and Subtropical Forest Seed. Danida

B. Sc. (Hons.) Agriculture
SEMESTER-IV
Course Title: Statistical Methods
Course Code: MT223
w.e.f. Session 2019-20

Theory

2(1+1)

Unit 1.

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.

Unit 2.

Binomial & Poisson Distributions, Definition of Correlation, Scatter Diagram. Karl Pearson's Coefficient of Correlation. Linear Regression Equations.

Unit 3.

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. Introduction to Analysis of Variance, Analysis of One Way Classification.

Unit 4.

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.

Practical

Graphical Representation of Data. Measures of Central Tendency (Ungrouped data) with Calculation of Quartiles, Deciles & Percentiles. Measures of Central Tendency (Grouped data) with Calculation of Quartiles, Deciles & Percentiles. Measures of Dispersion (Ungrouped Data). Measures of Dispersion (Grouped Data). Moments, Measures of Skewness & Kurtosis (Ungrouped Data). Moments, Measures of Skewness & Kurtosis (Grouped Data). Correlation & Regression Analysis. Application of One Sample t-test. Application of Two Sample Fisher's t-test. Chi-Square test of Goodness of Fit. Chi-Square test of Independence of Attributes for 2×2 contingency table. Analysis of Variance One Way Classification. Analysis of Variance Two Way Classification. Selection of random sample using Simple Random Sampling.

Suggested Readings:

- Cochran, W.G. and Cox, G.M. Experimental Design. Asia Publishing House.
- Kempthorne, O. (1965): The Design and Analysis of Experiments. John Wiley
- Montgomery, D. C. (2008): Design and Analysis of Experiments, John Wiley.
- Goon, A.M., Gupta, M.K. and Dasgupta, B. (2005): Fundamentals of Statistics. Vol. II, 8thEdn. World Press, Kolkata.
- Casella, G, (2008). Statistical Design. Springer. 6. Gupta, S.C. and Kapoor, V.K. Latest Revised Edition 2015. Fundamentals of Applied Statistics.

B. Sc. (Hons.) Agriculture
SEMESTER-IV
Course Title: Agricultural Marketing, Trade and Prices
Course Code: BM272
w.e.f. Session 2019-20

Theory

3 (2+1)

Unit 1

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 2

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; marketing channels for different farm products; Integration, efficiency, costs and price spread:

Unit 3

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;

Unit 4

Risk in marketing: Types of risk in marketing; speculation & hedging; an overview of futures trading; Agricultural prices and policy: Meaning and functions of price; administered 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.

Practical

Plotting and study of demand and supply curves and calculation of elasticities; 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; Construction of index numbers; Visit to a local market to study various marketing functions performed by different agencies, identification of marketing channels for selected commodity, collection of data regarding marketing costs, margins and price spread and presentation of report in the class; Visit to market institutions – NAFED, SWC, CWC, cooperative marketing society, etc. to study their organization and functioning; Application of principles of comparative advantage of international trade.

Suggested Readings:

- SS Acharya and N L Agarwal. 2005. *Agricultural Marketing in India*. Oxford and IBH Publishing Co. Pvt. Ltd
- Chandra P. 1984. *Projects: Preparation, Appraisal & Implementation*. McGraw Hill Inc.
- Dewett, K.K. and Chand, A.1979. *Modern Economic Theory*. S.Chand and Co., New Delhi
- Dewett, K.K. and Varma, J.D. 1986. *Elementary Economics*. S.Chand and Co., New Delhi.
- Gupta RD & Lekhi RK. 1982. *Elementary Economic Theory*. Kalyani Publishers.
- Kotler Philip and Armstrong. *Principles of Marketing*. Prentice-Hall.
- Jhingan, M.L. 2012. *Macro Economic Theory*. Vrinda publishers, New Delhi .

B. Sc. (Hons.) Agriculture
SEMESTER-IV
Course Title: Introductory Agrometeorology & Climate Change
Course Code: AG224
w.e.f. Session 2019-20

Theory

2(1+1)

Unit 1.

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

Unit 2.

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, Energy balance of earth; Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud;

Unit 3.

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.

Unit 4.

Agriculture and weather relations; Modifications of crop microclimate, climatic normals 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.

Practical

Visit of Agrometeorological Observatory, site selection of observatory, exposure of instruments and weather data recording. Measurement of total, shortwave and longwave radiation, and its estimation using Planck's intensity law. Measurement of albedo and sunshine duration, computation of Radiation Intensity using BSS. Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis. Measurement of soil temperature and computation of soil heat flux. Determination of vapor pressure and relative humidity. Determination of dew point temperature. Measurement of atmospheric pressure and analysis of atmospheric conditions. Measurement of wind speed and wind direction, preparation of wind rose. Measurement, tabulation and analysis of rain. Measurement of open pan evaporation and evapotranspiration. Computation of PET and AET.

Suggested Readings:

- G.S. L.H .V.Prasad Rao, 2008. Agricultural Meteorology. Prentice Hall of India Pvt. Ltd., New Delhi.
- H.S.Mavi and Graeme J.Tupper, 2005. Agrometeorology - Principles and applications of climate studies in agriculture. International Book Publishing Co., Lucknow.
- H.S.Mavi, 1994. Introduction to Agrometeorology. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
- H.V.Nanjappa and B.K.Ramachandrapa, 2007. Manual on Practical Agricultural Meteorology. Agrobios India. Jodhpur.
- S.R.Reddy, 1999. Principles of Agronomy. Kalyani Publishers, New Delhi.

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 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.

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. Business environment: PEST & SWOT analysis. Management functions: Roles & activities, Organization culture. Planning, meaning, definition, types of plans. Purpose or mission, goals or objectives, Strategies, policies procedures, rules, programs and budget. Components of a business plan, Steps in planning and implementation.

Unit 3.

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.

Unit 4.

Pricing policy, various pricing methods. 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 added products. Study of financing institutions- Cooperative, Commercial banks, RRBs, Agribusiness Finance Limited, NABARD. Preparations of projects and Feasibility reports for agribusiness entrepreneur. 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

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 of agrochemicals for sustainable agriculture.

Unit 2.

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.

Unit 3.

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.

Unit 4.

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, 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 various pesticides appliances. Quick tests for identification of common fertilizers. Identification of anion and cation in fertilizer. Calculation of doses of insecticides to be used. To study and identify various formulations of insecticide available in market. Estimation of nitrogen in Urea. Estimation of water soluble P_2O_5 and citrate soluble P_2O_5 in single super phosphate. Estimation of potassium in Murexite of Potash/Sulphate of Potash by flame photometer. Determination of copper content in copper oxychloride. Determination of sulphur content in sulphur fungicide. Determination of thiram. Determination of ziram content.

Suggested readings:

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

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 breeding in self and cross pollinated crops (A/B/R and two line system) for development of hybrids and seed production.

Unit 2.

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.

Unit 3.

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.

Practical

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. Learning techniques in hybrid seed production using male-sterility in field crops. Understanding the difficulties in hybrid seed production, Tools and techniques for optimizing hybrid seed production. Concept of rouging in seed production plot. Concept of line its multiplication and purification in hybrid seed production. Role of pollinators in hybrid seed production. Hybrid seed production techniques in sorghum, pearl millet, maize, rice, rapeseed-mustard, sunflower, castor, pigeon pea, cotton and vegetable crops. Sampling and analytical procedures for purity testing and 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 private seed 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.

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 on ecosystem. Classification, reproduction and dissemination of weeds.

Unit 2.

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

Unit 3.

Bio-herbicides and their application in agriculture. Concept of herbicide mixture and utility in 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 of important weeds. Study of herbicide formulations and mixture of herbicide. Herbicide and agrochemicals study. Shift of weed flora study in long term experiments. Study of methods of herbicide application, spraying equipments. Calculations of herbicide doses and weed control efficiency and weed 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.