

**SYLLABUS**

**FOR**

**AGRICULTURAL SCIENCES AND  
TECHNOLOGY**

**[B.Sc. (Hons.) Ag.]**  
(Third Semester)



**PRAYAGRAJ**

**FACULTY OF  
AGRICULTURAL  
SCIENCES AND  
TECHNOLOGY**

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title: CROP PRODUCTION TECHNOLOGY  
– I (KHARIF CROPS)**

**Course Code: AGUCBG301T**

**Semester: III**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>

### Objective:

This subject helps to study about the cultivation practices of various cereals, pulses, oilseeds, fibre and forage crops along with its geographical distribution and economic importance, its different sowing methods and to study of yield contributing characters of Kharif season crops.

### Course Syllabus (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.

### Syllabus organised in Unit (Theory)

Unit	Content	Hours
<b>1</b>	<b>General Introduction</b> Origin, geographical distribution, economic importance, soil and climatic, varieties, cultural practices and yield of Kharif crops.	<b>4</b>
<b>2</b>	<b>Cultivation of Cereal Crops</b> Cereals – rice, maize, sorghum, pearl millet and finger millet.	<b>4</b>
<b>3</b>	<b>Cultivation of Pulses &amp; Oilseed Crops</b> pulses-pigeonpea, mungbean and urdbean, oilseeds- groundnut, and soybean.	<b>4</b>
<b>4</b>	<b>Cultivation of Fibre and Forage Crops</b> fibre crops- cotton & jute; forage crops-sorghum, cowpea, cluster bean and napier.	<b>4</b>

### Course Outcomes

- Know the Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Kharif crops.
- Skilled on identification of weeds in Kharif season crops.
- To understand the yield attributing characters of kharif crops and estimate yield of kharif crops.

### Recommended Text Books

- Production technology of kharif crop-Pratick Sanodiya, Kalyani publication.
- Crop Management: Under irrigated and rainfed conditions- Singh, S.S, Publisher, Kalyani.
- Principles and Practices of Agronomy- Singh, S.S. 1993, Kalyani Publishers, New Delhi.
- Textbook of field crops production- Prasad R. 2002. Indian Council of Agricultural Research, New Delhi.

### Recommended Reference Books

- Principles of Agronomy (2nd edition)- Reddy, T. Yellamanda and Reddy, G.H. Sankara. 2016, Kalyani Publishers, Ludhiana.
- Agronomy of Field Crops- Reddy, S.R. 2004, Kalyani Publishers, New Delhi.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title: CROP PRODUCTION TECHNOLOGY  
- I (KHARIF CROPS) LAB**

**Course Code: AGUCBG201P**

**Semester: III**

L	T	P	C
0	0	1	1

### Objective:

- Aim of study to practically skilled the student about the nursery preparation and transplanting technique of kharif season crop.
- Seed germination and seed vigour test.

### Course Syllabus (Practical)

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, 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 and agronomic experiment at experimental farm. Study the forage experiment, morphology and description of Kharif season crop, visit the research station of related crops.

### Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
Identification of kharif crops and seeds	Visit the students' farm/college farm; observe the existing crops, their morphological characters for easy identification.	2
Different methods of rice nursery Preparation and its transplanting	Selection of Nursery site, Wet nursery, seed treatment, fertiliser application, Transplanting, dapog nursery, SRI technology.	2
Seed treatment of major crops	Rotary seed dressing drum, Earthen pot method, Slurry methods, Soaking seeds/ Dipping roots of seedling.	2
Sowing methods of different Kharif season crops	Sowing of soybean, pigeonpea and mungbean. maize, groundnut and cotton.	2
Effect of seed size on germination and seedling vigour of kharif crops	Seed germination (%), Seedling height (cm), Root length (cm), soyabean seed, mung bean seed.	2
Effect of sowing depth and methods on germination of crops	Bigger sized seed, small seed, thumb rule, seed dispersal, Broadcasting methods.	2
To study various methods of fertilizer application	Top dressing, split application, basal dose, Broadcasting, placement, time of application, nature of fertilizer, soil type.	2
Study of growth and yield contributing characters	Germination, Seedling growth, Vegetative growth, Flowering, Fruit growth, Fruit maturity, CGR, RGR, NAR, SLA, LAI.	2
Visit to the agronomic and forage experiments	Layout, experimental design, replication, treatment, Variation, critical difference etc.	2
Numerical exercises on fertilizer, seed requirement and plant population	Types of fertilizers, recommended dose, N content in Urea, DAP etc.	2
To work out the cost of cultivation	Ploughing cost, tractor cost, fertilizer cost, labour cost per day, harvesting cost, supervision cost etc.	2
Fertilizer application in crops- top dressing and foliar feeding of nutrients	Broadcasting of fertilizers Urea and DAP in the standing crop, foliar fertilization of Zn, Ca and Fe.	2
Identification of weeds in kharif season crops	Cock's comb, dudhi, math, chimanchara, parthenium, <i>Echinochloa colon</i> , <i>Cyperus rotundus</i> L.	2
To study morphological description of Kharif season crop (rice).	Root and shoot system, Clum, panicle, awn, spikelets, Caryopsis etc.	2
Yield attributes and calculation of theoretical yield	Number of panicles, panicle length, number of total grain per panicle, Number of filled grain per panicle, test weight, grain yield, harvest Index etc.	4
To study of crop varieties (Pigeon pea) and agronomic experiments at experimental farm.	Pusa-855, Amar, Azad, Narendra Arhar-1.	2

**Course Outcomes**

- Acquire skill and technique involve in field and crop observation and understand the nature of field crop production including the knowledge, skills and abilities required for field cropproduction.
- Skilled on field observations, including sowing-methods, depth, plant density, Nursery bed and transplanting, Crop density and geometry, Optimum plantpopulation.
- Skills in field crop production and understand about the procedure of harvesting and threshing of crops.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title:** FUNDAMENTALS OF PLANT BREEDING

**Course Code:** AGUCBG302T

**Semester:** III

**L   T   P   C**  
**2   0   0   2**

### Objective:

To impart knowledge to the students on the principles and procedures of plant breeding in self and cross pollinated crops to develop the high yielding varieties / hybrids.

### Course Syllabus (Theory)

Historical development, concept, nature and role of plant breeding, major achievements and future prospects; Genetics in relation to plant breeding, modes of reproduction and apomixes, self-incompatibility and male sterility- genetic consequences, cultivar options. Domestication, Acclimatization and Introduction; Centres of origin/ diversity, components of Genetic variation; Heritability and genetic advance; Genetic basis and breeding methods in self- pollinated crops - mass and pure line selection, hybridization techniques and handling of segregating population; Multiline concept. Concepts of population genetics and Hardy-Weinberg Law, Genetic basis and methods of breeding cross pollinated crops, modes of selection; Population improvement Schemes- Ear to row method, Modified Ear to Row, recurrent selection schemes; Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties; Breeding methods in asexually propagated crops, clonal selection and hybridization; Maintenance of breeding records and data collection; Wide hybridization and prebreeding; 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; Intellectual Property Rights, Patenting, Plant Breeders and & Farmer's Rights.

### Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	<b>Introduction and Concept</b> Historical development, concept, nature and role of plant breeding, major achievements and future prospect; Genetics in relation to plant breeding, modes of reproduction and apomixes, self-incompatibility and male sterility- genetic consequences, cultivar options.	4
2	<b>Genetic variation and Breeding methods</b> Domestication, Acclimatization and Introduction; Centres of origin/ diversity, components of Genetic variation; Heritability and genetic advance; Genetic basis and breeding methods in self- pollinated crops - mass and pure line selection, hybridization techniques and handling of segregating population	8
3	<b>Population Genetics</b> Multiline concept. Concepts of population genetics and Hardy-Weinberg Law, Genetic basis and methods of breeding cross pollinated crops, modes of selection; Population improvement Schemes- Ear to row method, Modified Ear to Row, recurrent selection schemes; Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties	8
4	<b>Hybridization and polyplody</b> Breeding methods in asexually propagated crops, clonal selection and hybridization; Maintenance of breeding records and data collection; Wide hybridization and prebreeding; Polyploidy in relation to plant breeding, mutation breeding-methods and uses; Breeding for important biotic and abiotic stresses	8
5	<b>Biotechnology and Plant Breeding</b> Biotechnological tools-DNA markers and marker assisted selection. Participatory plant breeding; Intellectual Property Rights, Patenting, Plant Breeders and & Farmer's Rights.	4

### Course Outcomes

- Student will be able to learn breeding procedures in self and cross pollinated crops.
- Understand the exploitation of heterosis utilizing male sterility and other methods.
- know about the various population improvement programmes.
- Study about the fundamentals of mutation, polyploidy and wide hybridization and their role in crop improvement.

### Recommended Text Books

- Plant breeding- Singh, B. D., kalyani publishing House, New Delhi.

- Essential of Plant breeding: Principles and Methods- Singh, P., kalyani publishing House, NewDelhi.
- Principles and Practice of Plant Breeding- J. R. Sharma.. Front Cover. Tata McGraw-Hill Pub.
- Principles of Plant Breeding (1st & 2nd Edition) by RW Allard, Wiley India Pvt.Ltd.

**Recommended Reference Books**

- Principles of Plant Breeding- Allard, R.W, John Wiley and Sons, NewYork.
- An introduction to genetic analysis- Suzuki et Al. Suzuki/Jeffrey H. Miller, W. H. Freeman and Company, New York.
- Breeding Field Crops. Fifth edition-D. A. Sleper and J. M. Poehlman, Oxford: BlackwellPublishing

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title: FUNDAMENTALS OF PLANT BREEDING**

**Course Code: AGUCBG302P**

**Semester: III**

**L T P C**  
**0 0 2 1**

### Objective:

The aim of this lab is to teach and skilled the student on emasculation and pollination techniques of various crops.

### Course Syllabus (Practical)

Plant Breeder's kit, Study of germplasm of various crops. Study of floral structure of self-pollinated and cross pollinated crops. Emasculation and hybridization techniques in self & cross pollinated crops. Consequences of inbreeding on genetic structure of resulting populations. Study of male sterility system. Handling of segregation populations. Methods of calculating mean, range, variance, standard deviation, heritability. Designs used in plant breeding experiments, analysis of Randomized Block Design. To work out the mode of pollination in a given crop and extent of natural out-crossing. Prediction of performance of double cross hybrids.

### Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
Plant Breeder's kit,	Forceps, scissors, fine pointed forceps, alcohol, tags, Sharp pointer, U- clips, pencil and butter paper bags etc.	2
Study of germplasm of various crops	Germ plasm of rice, wheat, maize, pigeon pea	2
Study of floral structure of self pollinated crops	Wheat , rice, maize Clum, panicle, awn, spiklets, Caryopsis	2
Study of floral structure of cross pollinated crops	Stamen, anther, stigma, Zygomorphic, racemes, Inflorescence	2
Emasculation and hybridization techniques in self pollinatedcrops : Green gram, Black gram, Rice, Wheat, Groundnut, Soybean,	Hand emasculation, Suction methods, alcohol and cold treatment, Use of gemetocides	2
Emasculation and hybridization techniques in self pollinatedcrops : Sesame, Chickpea, Okra, Tomato, Brinjal, Chilli	Hand emasculation, Suction methods, alcohol and cold treatment, Use of gemetocides	2
Emasculation and hybridization techniques in cross pollinated crops : Maize, Bajra,	Tassel, Detassel, Bagging 1 or 2 days, Cut the tip of the cob, butter paper cover	2
Emasculation and hybridization techniques in often cross pollinated crops : Sorghum, Pigeonpea,	Tassel, Detassel, Bagging 1 or 2 days, Cut the tip of the cob, butter paper cover	2
Designs used in plant breeding experiment	Layout, experimental design, replication, treatment, randomization, control, Variation, critical difference etc. RBD, CRD, LSD	2
Analysis of Rondonized Block Design		2
To work out the mode of pollination in a given crop and extent of natural outcrossing	Morphological examination of flowers, Space isolation, Effects of selfing	2
Prediction of performance of double cross hybrids	Jenkins (1934) methods,	2
Study of male sterility system	Acetocarmine Stain, Fertility and sterility in A, B, R and TGMS lines, CMS, GMS, CGMS, TGMS, PGMS	2
Handling of segregating system	Accession Register, germplasm Bank, Descriptive blank register, Cropping programme, Single plant selection register, Row test Comparative yield/ yield evaluation trial, Quality observations Note book, Record of crosses, F1 generation, F2 segregation generation	2
Methods of calculating mean, range, variance, standard deviation, heritability.	Mean, mode, median, and trimmed mean.	2
Consequences of inbreeding on genetic structure of resulting populations.	Inbreeding depression, Hybrid vigour or heterosis, homozygosity, hetrozygosity.	2

### Course Outcomes

- Student will be able to learn breeding procedures in self and cross pollinated crops.
- Skilled on emasmulation techniques in self and cross pollinated crops.
- Student will be able to understand the design used in plant breeding experiment.



## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title:** AGRICULTURAL FINANCE AND COOPERATION

**Course Code:** AGUCBG203T

**Semester:** III

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>

**Objective:** To have general knowledge on various financial and marketing institutions. Providing a sound on preparation of financial statements and various cooperative services.

### Course Syllabus (Theory)

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, cooperatives warehousing; role of ICA, NCUI, NCDC, NAFED.

### Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	<b>Agricultural Finance and Credit analysis –</b> Agriculture 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. Cost of credit. Recent development in agricultural credit	8
2	<b>Sources Of Agriculture Finance And Higher Finance Institution</b> 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	8
3	<b>Preparation of Financial Statements and Project Reports</b> Preparation and analysis of financial statements – Balance Sheet and Income Statement. Basic guidelines for preparation of project reports- Bank norms – SWOT analysis.	8
4	<b>Agriculture Cooperation and its Role</b> 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, cooperatives warehousing; role of ICA, NCUI, NCDC, NAFED.	8

### Course Outcomes

- Student will be able to learn sources of Agricultural Micro-Macro financing and credit systems along with history of financing agriculture in India.
- Learn about Significance and limitations of crop insurance with farming cooperatives.
- To acquire Knowledge of successful cooperative systems in India and newly launched crop insurance schemes.
- Able on estimation of credit requirement of farm business and skilled in analysis of project reports and balancesheet.
- Skilled on analysis and performance of commercial banks, cooperative banks to acquire first-hand knowledge of their management, schemes and procedures.

### Recommended Text Books

- Agriculture Finance and management- Reddy, S. and Raguram Ram, P., Oxford and IBH, New Delhi.
- Agriculture Finance: Theory and Practice- Singh, J. P. , Ashish Publishing house, New Delhi.
- Introduction to agriculture finance- Pandey, U. K., Kalyani Publication, New Delhi.



**Recommended Reference Books**

- Agricultural Finance and Management-S. Subba Reddy and P. Raghu Ram, Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi.
- Agricultural economics-S. Subba Reddy, P. Raghu Ram, T.V. Neelakanta Sastry and I. Bhavani Devi, Second Edition, Oxford& IBH Publishing Co. Pvt. Ltd, NewDelhi.
- An introduction to Agricultural Finance- U. K. Pandey, Kalyani Publishers, NewDelhi.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title:** AGRICULTURAL FINANCE AND COOPERATION LAB

**Course Code:** AGUCBG303T

**Semester:** III

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**Objective:** The three main objectives of institutional finance for the agricultural and rural sector are  
(a) promoting growth, (b) ensuring better equity, and (c) making financial operations viable.

### Course Syllabus (Practical)

Determination of most profitable level of capital use. Optimum allocation of limited amount of capital among different enterprise. Analysis of progress and performance of cooperatives using published data. Analysis of progress and performance of commercial banks and RRBs using published data. Visit to a commercial bank, cooperative bank and cooperative society to acquire firsthand knowledge of their management, schemes and procedures. 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. Appraisal of a loan proposal- A case study. Techno-economic parameters for preparation of projects. Preparation of Bankable projects for various agricultural products and its value added products. Seminar on selected topics.

### Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
Study of various business models in agri-business.	Production, Processing, Infrastructure, cold store, warehouse, transport services, Contract farming, India's Retail Sector, Indian super market etc.	2
Study of farm records.	Physical Farm Records, Financial Farm Records, Supplementary Farm Records, Farm map, soil map, feed records, land utilization record, Production records, Labour records etc.	2
Study of farm inventory.	Meaning, purpose, objective, Process, component etc.	2
Study of systems of book keeping.	Double entry system and Single entry system, difference and advantages.	2
Study of farm accountancy.	Double entry system and Single entry system, Journal, Ledger, Cash book, Trail balance, Final accounts.	2
Study of measures of farm income.	Labour Costs, Machinery Costs, Livestock Costs, Land Costs, Building Costs, Input Costs, Interest on Working and Fixed capital.	2
Study of measures of farm efficiency.	Physical and financial efficiency, aggregates or absolute and ratio measure.	2
Study of farm planning techniques & situations.	Objectives, importance, steps, Budgeting and linear programming.	2
Study of farm budgeting techniques & types.	Partial and complete budgeting, added and return cost, reduce and return cost.	2
Study of problems of partial budgeting.	Compare the costs and benefits of alternatives faced by a farm business.	2
Study of cost ratios & capital ratio.	Operation cost, Over head charges, Gross cost ratio, Capital per unit of gross income, Rate of capital turnover.	2
Study of balance sheet & financial ratio analysis	Assets, Liabilities, Current asset, Intermediate or working asset, Long term assets or fixed asset, Intermediate liabilities, long term liabilities.	2
Study of farm income statement	Receipt, Expense, Net income, Net cash income, Net operating income, Net farm income, objectives, data and management etc.	2
Study of methods of valuation of farm inventory.	Market price, net selling price, cost minus/less depreciation, Replacement cost minus/less depreciation, income capitalization.	2
Study of farm adjustment programme under uncertainty.	Price Uncertainty, Yield Uncertainty, Technological Uncertainty, Institutional Uncertainty, risk of uncertainty.	2
Study of preparation of cash flow plan	Cash balance, total operational scale, total capital scale, operating expenses, capital investment etc.	2

**Course Outcomes:**

- Student will be able to understand the capital use, estimation credit, making bankstatement.
- Skilledon measuresoffarmincome, farmefficiency, valuationoffarminventoryandstudyaboutthe cost ratios & capitalratio.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title:** AGRICULTURE INFORMATICS

**Course Code:** AGUCBG304T

**Semester:** III

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>

### Objective:

- The course has been designed to give exposure to fundamentals of Computer System to Bachelors of Agriculture students.
- The course helps the students in understanding the basic concepts of computers and different components of a computer.
- The concept of data analysis is used by implementing the data analysis using MS-Office in order to give hands on experience to students.
- The course also includes an overview of IT application for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management, different process in agricultural domain.

### Course Syllabus (Theory)

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

### Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	<b>Fundamental of computer and MS Office</b> Introduction to Computers, Operating Systems, definition and types, Applications of MS-Office for document creation & Editing, Data presentation, interpretation and graph creation, statistical analysis, mathematical expressions, Database, concepts and types, uses of DBMS in Agriculture, World Wide Web (WWW): Concepts and components.	4
2	<b>Introduction to programming</b> Introduction to computer programming languages, concepts and standard input/output operations.	4
3	<b>e-Learning</b> 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; Geospatial technology for generating valuable agri-information.	4
4	<b>Agriculture informatics</b> 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.	4

### Course Outcomes

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

- Understand analogy of computer.
- Basic knowledge of MS Office.
- Some basic knowledge of Internet and WWW.
- Skilled on use of IT application and different IT tools in the field of Agricultural science.

**Recommended Text Books**

- Introductory Agri-informatics- Subrat K. Mahapatra, Subrata K Mohanty, Jewel Bhuiya and Jayashankar Pradhan, Jain Brothers.
- A Textbook of Agro-informatics- Dr. Kalpana M, Dr. Sumathi CS Agrobios.

**Recommended Reference Books**

- Principles of programming language- Er. Anil Pangal, publication NUREG/CR Pearson.
- E Agriculture and Rural development-Charalampos Patrillakis, Blessing Muambe.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title:** Agriculture Informatics LAB

**Course Code:** AGUCBG304P

**Semester:** III

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

### Objective:

- The course helps the students in understanding the basic concepts of computers and different components of a computer.
- This course helps students for creating and editing MS Word, MS Excel and MS powerpoint.

### Course Syllabus (Practical)

Study of Computer Components, accessories, practice of important DOS Commands. 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. MS-EXCEL - Creating a spreadsheet, use of statistical tools, writing expressions, creating graphs, analysis of scientific data. MS-ACCESS: Creating Database, preparing queries and reports, demonstration of Agri-information system. Introduction to World Wide Web (WWW). Introduction of programming languages. Hands on Crop Simulation Models (CSM) such as DSSAT/Crop-Info/Crop Syst/ Wofost; Computation of water and nutrient requirements of crop using CSM and IT tools. Introduction of Geospatial Technology for generating valuable information for Agriculture. Hands on Decision Support System. Preparation of contingent crop planning.

### Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
Study of computer components and accessories	Definition, features, Units, function of units, memory device, storage, input and output device	2
Practice for important DOS Commands	System Software (BIOS, Operating System, Device Drivers), Application and Utility programs, General purpose packages.	2
Introduction to different operating systems such as MS-Windows, Unix/ Linux, Creating, Files and Folders, File Management.	Resize window, create, rename folder, delete , cut paste, copy paste operation	2
Word-Processing1	Open document, paragraph, line and word formatting, Operations on block, File Operations, Print and other tools	2
Word-Processing 2	Table preparation	2
Presentation	Preparation of slide	2
Spreadsheet 1 & Spreadsheet 2	Range of cell, Formula in the cell, absolute and relative cell Sum column, average column, sum and average row, Sqrt , Median, Mode, Correlation, Regression,t-test	2
Spreadsheet 3	Range, standard deviation, mean deviation, standard error, coefficient of variation and variance	2
DBMS / RDBMS creating and updating database	Design and create a database to store district level food Production Information for UP state using DBMS/ RDBMS Software.	2
Querying/Retrieving data Relation	Create a query to obtain crop yields and sort by district	2
Introduction to World Wide Web (WWW)	Internet, WWW, Web Browsers, Search engine Concepts & Description, basic internet access	2
Demonstration of Agri-information system	Visit different URL (Agricultural Web Site), information available, list of beneficial site etc., Component of AIS	2
Hands on Crop Simulation Models (CSM) such as DSSAT / Crop-Info / CropSyst / WOFOST;	Computation of water and nutrient requirements of crop using CSM and IT tools	2
Introduction of Geospatial Technology for generating valuable information for Agriculture	Definition, Research paper, importance in agriculture	2
Hands on Decision Support System	Components, types, Application, taxonomy, Developmental framework	2
Introduction of programming languages. Preparation of contingent crop plan	Definition, name list, use MLL , HLL, and LLL, Algorithm and Flowchart	2

**Course Outcomes**

- Student will be able to understand this course and has a better handling of MS Office and programming languages.
- Skilled on uses of Agri Information system, Crop stimulation model and its uses in agricultural sciences.



## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title: PRINCIPLES OF SEED TECHNOLOGY**

**Course Code: AGUCBG305T**

**Semester: III**

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**2 0 0 2**

### Objective:

- To strengthen undergraduate student in the field of seed science & technology.
- To impart training for entrepreneurship programme.
- To initiate basic research related to genetic purity, seed health and seed storage.

### Course Syllabus (Theory)

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. 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. 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.

### Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	<b>Seed Production</b> 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	8
2	<b>Seed certification</b> Principle 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,	8
3	<b>Seed Testing and storage</b> 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. Seed storage; general principles, stages and factors affecting seed longevity during storage. Measures for pest and disease control during storage.	8
4	<b>Seed marketing:</b> 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.	8

### Course Outcomes

- Skilled in core competency of the subject & understand the comparative evidence on development of seed.
- High analytical ability in understanding the application of scientific principles and students will acquire skills & handling operations of different equipment's in seed science laboratory.
- Understand the importance of seed certification and skilled on seed testing and storage along with seed marketing.

### Recommended Text Books

- Hand book of seed processing and marketing- Gaur. S.C, Agrobios, India.
- Seed Science and Technology: An Illustrated text book- Vanangamudi, 2015, New India Publishing Agency, India.

**Recommended Reference Books**

- Principles of Seed Technology- G.N. Kulkarni, Kalyani Publishers,Ludhiana.
- Principles of seed technology- P. K. Upadhyay,, Kalyani publisher,Ludhiana.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title: PRINCIPLES OF SEED TECHNOLOGY LAB**

**Course Code: AGUCBG305P**

**Semester: III**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**Objective:**

- To understand the meaning of seed, its structure, development and maturation and their importance in crop production
- To initiate basic methods and principle related to seed quality testing and seed standards
- To set forth basic knowledge on various processing operations and principles involved in successful seed storage.

**Course Syllabus (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.

**Syllabus organised in Unit (Practical)**

Topics	Description with Practical Applications	Hours
Seed production in major cereals: Wheat, Rice, Maize, Sorghum, Bajra and Ragi	Land, sowing time, seed rate, fertilizer dose, roughing, yield, genetic purity, germination per cent, Rice commercial hybrid varieties, three line approach.	2
Seed production in major pulses: Urd, Mung, Pigeonpea, Lentil, Gram, Field bean, pea.	Land, sowing time, seed rate, fertilizer dose, roughing, yield, genetic purity, germination per cent, hybrid varieties, HYV.	2
Seed production in major oilseeds: Soybean, Sunflower, Rapeseed, Groundnut and Mustard.	Land, sowing time, seed rate, spacing, sowing methods, fertilizer dose, roughing, yield, genetic purity, germination per cent, hybrid varieties.	2
Seed production in important vegetable crops Brinjal, tomato, onion, Chilli, Okara, Pumpkin	Foundation and certified seed, seed rate, isolation distance, field inspection, roughing, yield per cent, genetic purity, germination per cent etc.	2
Seed production in important vegetable crops: Bottle gourd, bitter gourd, ridge gourd, Sponge gourd	Foundation and certified seed, sowing time, fertilizer dose, seed rate, isolation distance, field inspection, roughing, yield per cent, genetic purity, germination per cent etc.	2
Seed sampling and testing procedure	Seed lot, sampling, types of sample: simple and composite, submitted sample, working sample.	2
Physical purity	Seed blower, purity work board, forceps, magnifying glass, spatula, dishes, needle and balance.	2
Seed Germination test	Germination on towel paper, Germination in petridish, germination in sand and soil.	2
Seed Viability test	Tetrazolium test, embryo excision test, Indigo carmine test, Radiographis methods, Glutamic acid decarboxylase test etc.	2
Seed and seedling vigour test	Direct test: brick gravel test, Paper piercing test, Indirect test: First count methods, seedling growth rate, Seedling dry weight, Vigour index length and mass, tetrazolium test.	2
Genetic purity test: Grow out test; Genetic purity test: electrophoresis	Gel electrophoresis unit, pH meter, power supply unit, mortar pestle, razor blade, eppendorf tube.	4
Seed certification: Procedure,	Registration of seed plot, Verification of seed source, field inspection, supervision, Seed sampling and testing, tagging and sealing.	2
Field inspection, Preparation of field inspection report.	Name of seed grower, district, village, Location of farm, name of crop, varieties, sowing date, spacing, stage of seed crop, isolation distance etc.	2

Visit to seed production farms	Type of cross, Procurement of seed, field selection isolation, synchronization, Planting ratio, Pollination etc.	2
Visit to seed testing laboratories and seed processing plant	Physical purity, germination, seed vigour and viability, seed health, genetic purity etc.	2

**Course Outcomes**

- Student will be able to understand the importance of legal procedures related to seed quality control.
- Able to understand the procedure for seed certification.
- Able to grasp the importance of Indian minimum seed certification standards.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title:** PRODUCTION TECHNOLOGY FOR  
VEGETABLES AND SPICES

**Course Code:** AGUCBG306T

**Semester:** III

**L T P C**  
**4 0 0 3**

### Objective:

To educate in details about the production technology of vegetables and spices.

### Course Syllabus (Theory)

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).

### Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	<b>Introduction:</b> Importance of vegetables & spices in human nutrition and national economy, kitchen gardening.	12
2	<b>Production technology of vegetable and spices:</b> 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.	12
3	<b>Production technology for Cole and bulb crops:</b> 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 ( French bean, Peas; Cole crops such as Cabbage, Cauliflower, Knol-khol; Bulb crops such as Onion, Garlic).	12
4	<b>Production technology for Root, tuber and leafy crops:</b> 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 ( Root crops such as Carrot, Raddish, Beetroot; Tuber crops such as Potato; Leafy vegetables such as Amaranth, Palak. Perennial vegetables).	12

### Course Outcomes

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

- To know importance of vegetables and spices crops.
- Understand the scientific cultivation methods of vegetables and spices.
- To study classification of Vegetables.
- Skilled on vegetable gardening with special reference to kitchen gardening.
- To know more about origin, area, climate, soil, improved varieties and cultivation practices such as time and methods of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield.

### Recommended Text Books

- A textbook on production technology of vegetables (2009)- Choudhary, B. R. Kalyani Publisher.
- Modern Technology in Vegetable Production- Pranab Hazra, A.Chattopadhyay, K.Karmakar and S.Dutta.2010, New India Publishing Agency, New Delhi.
- Basic Concepts of Vegetable Science- Neeraj Pratap Singh, International Book Distributing Co. New Delhi, Academic Press, New Delhi.

### Recommended Reference Books

- Vegetable crop in India- Yawalkar, K.S, Agri Horticulture Pub. House, Nagpur.
- Handbook of Vegetable Crops (2008)- Dhaliwal, M. S., Kalyani Publisher.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title:** PRODUCTION TECHNOLOGY FOR  
VEGETABLES AND SPICES LAB

**Course Code:** AGUCBG306P

**Semester:** III

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

### Objective:

- This course helps the students in understanding morphological characters, cultivation and harvesting of different vegetables and spices.
- To educate students in nursery bed preparation and raising healthy seedling.

### Course Syllabus (Practical)

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

### Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
Preparation of Nursery Beds and Seed Sowing for Raising Healthy Seedlings of Horticultural Crops	Location of nursery bed, soil, size, fertilizer and manure application, sowing of seed	2
Identification of Important Vegetable Crops( Cucurbitaceae and Solanaceae) on the basis of Different Morphological Traits	Forceps, hand lens, paper sheet, paper and pen, stem, root leaf characteristics	2
Identification of Important Legumes and leafy Vegetable Crops on the basis of Different Morphological Traits	stem, root leaf characteristics, french bean, cluster bean, cowpea, garden pea, amaranthus, fenugreek, spinach	4
Identification of Important root, bulb and cole Vegetable Crops on the basis of Different Morphological Traits	stem, root leaf characteristics, carrot, radish, turnip, cauliflower, cabbage, Onion, garlic	4
Identification and description of different spices	Forceps, paper sheet and pen, stem, root, leaf, flower characteristics	4
To study the methods of Vegetable seed extraction	Juice and seed extraction, fermentation methods, acid and alkali treatment	4
Fertilizer doses for various vegetable crops as per recommendation for N, P and K	Potato, Tomato, brinjal, root, bulb and cole Vegetable Crops, Legumes and leafy Vegetable Crops	4
To Study Economics of Vegetables and Spices Cultivation	Cost of cultivation, Yield (MT/ha), Net income (Rs.) (at the lowest price), Market price range (Rs.)	4
Harvesting, maturity indices, grading of spices	Maturity and time of harvest, Number of days after fruit setting, Shape of transversely cut fruit, Ratio between sugar and acids, Loss of chlorophyll, TSS	4

### Course Outcomes

- By the end of this course students will learn about appropriate production practices, careful harvesting, and proper packaging and grading all contribute to good produce quality.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title:** ENVIRONMENTAL STUDIES AND  
DISASTER MANAGEMENT

**Course Code:** AGUCBG307T

**Semester:** III

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>

### Objective:

- To study about environment and ecosystems
- To study about different types of natural resource.
- Knowledge and concept of biodiversity and its conservation.
- Basic knowledge and concept of causes, effect and control of different type of environmental pollution.
- To study climate change and disaster management.

### Course Syllabus (Theory)

Environmental studies Definition, scope and importance, Natural Resources, Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources, Ecosystems-Concept of an ecosystem, Structure and function of an ecosystem, Biodiversity and its conservation, Value, Environmental Pollution, Solid Waste Management, Social Issues, Environmental ethics, Wasteland reclamation, 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, Environment and human health, Women and Child Welfare, Natural Disasters, Climatic change, Man Made Disasters, Disaster Management.

### Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	<b>Scope and Importance</b> Environmental studies Definition, scope and importance, Natural Resources, Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources.	8
2	<b>Ecosystem and Biodiversity</b> Ecosystems-Concept of an ecosystem, Structure and function of an ecosystem, Biodiversity and its conservation.	8
3	<b>Environmental pollution and Protection</b> Environmental Pollution, Solid Waste Management, Social Issues, Environmental ethics, Wasteland reclamation, Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection. Act. Forest Conservation Act.	8
4	<b>Environmental legislation, Public awareness and Climate Change</b> Issues involved in enforcement of environmental legislation. Public awareness, Environment and human health, Women and Child Welfare, Natural Disasters, Climatic change, Man Made Disasters, Disaster Management.	8

### Course Outcomes

- Students will learn about natural resource, its importance and environmental impacts of human activities on natural resource.
- Gain knowledge about the conservation of biodiversity and its importance.
- Aware students about problems of environmental pollution, its impact on human and ecosystem and control measures.

### Recommended Text Books

- Disaster Management- Gupta HK., Indian National Science Academy. Orient Blackswan. Yy.
- Coping with catastrophe. Handbook of Disaster Management- Hodgkinson PE & Stewart M, Routledge. 1
- Disaster Management- YY Sharma VK. 2001. National Centre for Disaster Management, India.

### Recommended Reference Books

- Environmental Science: A Practical Manual- G. Swarajya Lakshmi.



## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title:** ENVIRONMENTAL STUDIES AND  
DISASTER MANAGEMENT LAB

**Course Code:** AGUCBG307P

**Semester:** III

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

### Objective:

The main aim of this lab is to teach the students theoretically with highlights on practicals for better and deep understanding on environmental problems; and reflect critically on their roles, responsibilities and identities as citizens, consumers and environmental actors in a complex, interconnected world.

### Syllabus organised in Unit (Practical)

Determination of Chemical Oxygen Demand in Waste Water Sample, Determination of Dissolved Oxygen in Waste Water Sample, Determination of Total Dissolved Solids in Waste Water Sample, Analysis of Total Hardness of Waste Water Sample, Analysis of Waste Water/Sludge for Heavy Metals, Estimation of Non-Respirable Dust in Air by using Dust Sampler, Estimation of Non-Respirable Dust in Air by using Dust Sampler, Visit to In situ or Ex situ Conservation Centre/ Social Service Organization/ Environmental Education Centre, Visit to Local Polluted Site -Observations and Remedial Measures.

### Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
Determination of Chemical Oxygen Demand in Waste Water Sample	amount of dichromate is determined by direct titration using Ferrous Ammonium Sulfate (FAS) as the titrant and ferroin (1, 10 phenanthroline ferrous sulfate) as the indicator	<b>4</b>
Determination of Dissolved Oxygen in Waste Water Sample	Two methods are commonly used to determine DO concentration: (1) The iodometric method which is a titration-based method and depends on oxidizing property of DO and (2) The membrane electrode procedure, which works based on the rate of diffusion of molecular oxygen across a membrane.	<b>4</b>
Determination of Total Dissolved Solids in Waste Water Sample	To measure total suspended and dissolved solids, a sample of water is placed in a drying oven to evaporate the water, leaving the solids.	<b>4</b>
Analysis of Total Hardness of Waste Water Sample	The hardness of a water is governed by the content of calcium and magnesium salts, largely combined with bicarbonate and carbonate. Hardness can be measured by calculation from the concentration of calcium and magnesium ions in the sample	<b>4</b>
Analysis of Waste Water/Sludge for Heavy Metals	Metal analysis can be done by various techniques like Atomic Absorption Spectrophotometer or flame photometer.	<b>4</b>
Estimation of Non-Respirable Dust in Air by using Dust Sampler	Coarse dust was collected in a cone, weighed before and after sampling. After sampling, dust box cleaned to remove the total dust in the cone. Difference in weight is divided by the volume of the air sampled and is expressed in $\mu\text{g}/\text{m}^3$ .	<b>4</b>
Visit to In situ or Ex situ Conservation Centre/ Social Service Organization/ Environmental Education Centre	Visit will enhance their practical experience about the various sites. How the social organization works, what are the issues they take up all will be studied.	<b>4</b>
Visit to Local Polluted Site -Observations and Remedial Measures	Collection of samples from polluted site, their testing and finally the remedial measures will be planned.	<b>4</b>

### Course Outcomes

- Students will learn about testing of various parameters in waste water sample.
- They will learn about the different parameters, their standard values. Gain knowledge about the control measures.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title:** STATISTICAL METHODS

**Course Code:** AGUCBG308T

**Semester:** III

L	T	P	C
1	0	0	1

### Objective:

- To inspire knowledge of Statistics in agriculture.
- To impart knowledge on Statistical concepts like Data Collection, Measures of Central Tendency and Dispersion, Probability and Distributions, Binomial & Poisson Distributions, Sampling methods.

### Course Syllabus (Theory)

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, 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  $2 \times 2$  Contingency Table. 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.

### Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	<b>Probability:</b> 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.	4
2	<b>Probability distribution:</b> Binomial & Poisson Distributions, Definition of Correlation, Scatter Diagram. Karl Pearson's Coefficient of Correlation. Linear Regression Equations.	4
3	<b>Test of significance:</b> Introduction to Test of Significance, One sample & two sample test t for Means, Chi-Square Test of Independence of Attributes in $2 \times 2$ Contingency Table. Introduction to Analysis of Variance, Analysis of One Way Classification.	4
4	<b>Sampling Techniques:</b> 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.	4

### Course Outcomes

- Acquaintance with some basic concepts in statistics.
- Making familiar with some elementary statistical methods of analysis of data viz. Measures of Central Tendency, Dispersion, Moments, Skewness, and Kurtosis and to interpret them. Analysis of data pertaining to attributes and to interpret the results.
- Students will acquire the basic knowledge of complete enumeration and sample, sampling frame, sampling distribution.

### Recommended Text Books

- Problems and Solutions in Statistics. 7th Edition- Kapoor VK., Sultan Chand and Sons.
- Statistical Methods & Applications- Carla Rampichini, Hybrid (Transformative Journal).

### Recommended Reference Books

- Statistical Methods for Agricultural Workers- Panse, V. G. and P.V. Sukhatme. (1967), Indian Council of Agricultural Research, New Delhi, India.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title:** STATISTICAL METHODS LAB

**Course Code:** AGUCBG308P

**Semester:** III

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

### Objective:

The prominent aim of the study is to provide the fundamental knowledge of Computer hardware, software with its application and DOS keys to the students.

### Course Syllabus (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  $2 \times 2$  contingency table. Analysis of Variance One Way Classification. Analysis of Variance Two Way Classification. Selection of random sample using Simple Random Sampling.

### Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hour
Graphical Representation of data	1. Construction of Discrete and continuous frequency distribution 2. Construction of Bar Diagram, Histogram, Pie Diagram, Frequency curve and Frequency polygon	4
Measures of Central tendency	1. Definition, Formula and Calculation of Mean, Median, Mode, Geometric Mean and Harmonic Mean for grouped and ungrouped data 2. Definition, Formula and Calculation of Quartiles, Deciles and Percentiles for grouped and ungrouped data	4
Measures of Dispersion	1. Definition, Formula and Calculation of absolute measures of Dispersion, Range, Quartile Deviation, Mean Deviation, Standard Deviation 2. Definition, Formula and Calculation of relative measures of Dispersion, CD and CV for grouped and ungrouped data	4
Moments, Skewness and Kurtosis	1. Definition and types of moments, skewness and Kurtosis 2. Formula and calculation of raw moments, moments about origin, central moments and different types of coefficient of skewness and kurtosis	4
Correlation and Regression	1. Definition and types of Correlation and Regression. 2. Calculation of Correlation and regression coefficient along with their test of significance	4
Test of Significance	1. Definition of Null and Alternative Hypothesis and different tests of significance 2. Application of t test for single mean, t-test for independent samples, paired t test, F-test, Chi-square test	4
Analysis of Variance (One way and Two way classification)	1. Definition and steps of analysis of one way and two way classification. 2. Analysis of CRD and RBD as an example of one way and two way ANOVA	4
Sampling Methods	1. Definition of SRS, SRSWR and SRSWOR and difference between census and sampling 2. Procedures of selecting a simple random sample	4

### Course Outcomes

Theory By the end of the course, the students will be able to:

- Calculation of Mean, Median, Mode, Geometric Mean and Harmonic Mean.
- Formula and Calculation of absolute measures of Dispersion, Range, Quartile Deviation.
- Definition and types of Correlation and Regression.
- Definition and types of Correlation and Regression.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title:** Livestock and Poultry Management

**Course Code:** AGUCBG309T

**Semester:** III

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>4</b>	<b>0</b>	<b>0</b>	<b>2</b>

### Objective:

- To meet the basic and overall knowledge requirement of the students, the extension workers and the progressive farmers on various livestock specifically the farm animals including poultry with respect to physiological and reproductive system.
- To have expertisation on the housing system, feeding requirements, feeding habits and use of low-cost feed technology for better economic return.
- To have minimum basic concepts on different disease encountered in the farm animal and poultry and their preventive and control measures.
- To make students practically stronger to undertake entrepreneurship in the livestock and poultry sector.
- To know the importance and contribution of livestock in the state and national economy.

### Course Syllabus (Theory)

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.

### Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	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.	8
2	Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry. Improvement of farm animals and poultry	8
3	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.	8
4	Introduction of livestock and poultry diseases. Prevention (including vaccination schedule) and control of important diseases of livestock and poultry.	8

### Course outcomes

- The course knowledge directly reflects on the operation of livestock and poultry farming being taken as a major component of integrated farming system in agriculture.
- Mini farming unit provides a sustainable source of income to landless farmers and generate employment opportunity in rural areas. The course provides basic knowledge for its operation.
- It is the greatest source of information for the students, enlightened farmers and the person/planners associated with the implementation of animal husbandry programmes of state as well as national level.
- This course chapters will serve as animal husbandry compendium for young entrepreneurs.
- This course encompasses all relevant information and database and serve as resource of knowledge of hand to help the person in animal husbandry sector in harnessing the maximum potential of animal health and production.

**Recommended Text Books**

- A Textbook of Animal Husbandry – G.C. Benerjee.
- Livestock Production and Management – N.S.R. Sastri, C.K. Thomas, R.A. Singh.

**Recommended Reference Books**

- Essentials of Animal Production and Management – R.Singh.
- A Handbook of Animal Husbandry –ICAR.
- A Textbook of Livestock Production Management in Tropics – D.N.Verma.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title:** LIVESTOCK AND POULTRY MANAGEMENT LAB

**Course Code:** AGUCBG309P

**Semester:** III

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

### Objective:

- To acquaint the students with identification and handling of farm animals and poultry.
- To make students aware of the status and activities of institute animal farm.

### Course Syllabus (Practical)

External body parts of cattle, buffalo, sheep, goat, swine and poultry. Handling and restraining of livestock. Identification methods of farm animals and poultry. 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. Culling of livestock and poultry. Planning and layout of housing for different types of livestock. Computation of rations for livestock. Formulation of concentrate mixtures. Clean milk production, milking methods. Hatchery operations, incubation and hatching equipments. Management of chicks, growers and layers. Debeaking, dusting and vaccination. Economics of cattle, buffalo, sheep, goat, swine and poultry production.

### Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hour
Identification of External body parts of cattle, buffalo, sheep, goat, swine	Head, Neck, Body or Barrel, Fore limbs or Fore quarters and Hind limbs or Hind quarters.	2
Identification for the external body parts of Poultry Birds	Comb, beak, wattles, ears, earlobes, eyes, eye rings, wings, tail, thighs, hocks, shanks, spurs, claws, and toes	2
Housing principles, space requirements for different species of livestock and poultry	Size and direction of house, flooring, floor size, shed size and material, roof design, roof type, and manger, door, calving boxes, isolation boxes	4
Identification of feeds and fodders	Roughages, leguminous and non leguminous, hay and straw, cereals, millets, milled products	2
Handling of livestock	Drenching, dressing and vaccination, wire net muzzle, halter, travis, lifting fore and hind leg of cattle, casting, Reuff's methods	2
Visit to IDF and IPF to study breeds of livestock and poultry	Feeding and breeding management, disease control, housing, milking, dairy and poultry products, daily routine and farm records	4
Planning and layout of housing for different types of livestock.	Topography and drainage, soil type, sunlight and wind exposure, water supply, durability, electricity, conventional housing, tail to tail system, loose housing system	4
Computation of rations for livestock.	Liberal feeding, individual feeding, laxative, economical, Pearson's square method, Algebraic method or simultaneous equation, double Pearson method	2
Clean milk production, milking methods.	Healthy cow, Clean cow, Clean barn, Clean milker, Transport, processing & distribution of milk, hand milking, machine milking	4
Hatchery operations, incubation and hatching equipments	Hot air incubator, Hot water incubator, Gas operated incubator, Oil operated incubator, Size, design and construction of the hatchery	2
To study debeaking, dusting and vaccination in poultry	Debeaking importance and methods, Methods of vaccination,	2
Management of chicks, growers and layers.	Housing, light, feeding, ration of layer mash of chickens, cage layer management	2

### Course Outcomes

- By the end of this course students will gather the knowledge housing and handling of farm and poultry animals.
- By visiting IDF and IPF students will learn daily routine, feeding and breeding managements, disease control for livestock and poultry.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title: PROFESSIONAL PROFICIENCY (B.Sc. Ag)- III**

**Course Code: PTSPPBG20T**

**Semester: III**

L	T	P	C
4	0	0	2

### Objective:

Students should be able to read and write correct English, attain reasonable fluency in the Language and should also be exposed to introductory lessons of Aptitude Building.

### Course Syllabus (Theory)

Hard skill includes Basic Grammar, Close Test, Conjunction, Preposition, Construction of Sentences, Reading Comprehensions, Para Jumbles, Para Completion, Vocabulary. Communication & Writing Skill Efforts should be made to overcome the expertize in speaking and writing of English Essay hence improve their fluency in English & writing skills on different aspects. Suggested topic include: Each student should speak and write essay on selected topic from Literature and Social Sphere, Political sphere, Science, Environment & Technology. Aptitude Building: Quantitative Aptitude-Data Interpretation, Data Sufficiency, Number Series, Time and Work, Time and Distance, Simple and Compound Interest, Ratio and Proportion, Averages, Mixture and Alligation, Pipes and Cisterns, Situation Reaction Test.

### Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	<b>Hard Skills</b> Hard skill includes Basic Grammar, Close Test, Conjunction, Preposition, Construction of Sentences, Reading Comprehensions, Para Jumbles, Para Completion, Vocabulary.	10
2	<b>Communication &amp; Writing Skill</b> Efforts should be made to overcome the expertize in speaking and writing of English Essay hence improve their fluency in English & writing skills on different aspects. Suggested topic include: Each student should speak and write essay on selected topic from Literature and Social Sphere, Political sphere, Science, Environment & Technology.	25
3	<b>Aptitude Building</b> <b>Quantitative Aptitude</b> <ul style="list-style-type: none"> <li>Data Interpretation</li> <li>Data Sufficiency</li> <li>Number Series</li> <li>Time and Work</li> <li>Time and Distance</li> <li>Simple and Compound Interest</li> <li>Ratio and Proportion</li> <li>Averages</li> <li>Mixture and Alligation</li> <li>Pipes and Cisterns</li> <li>Situation Reaction Test</li> </ul> <b>LOGICAL REASONING</b> <b>Logical Reasoning</b> <ul style="list-style-type: none"> <li>Coding &amp; Decoding</li> <li>Syllogism</li> <li>Machine Input Output</li> <li>Puzzles</li> <li>Seating Arrangements</li> <li>Direction Sense Test</li> <li>Blood Relations</li> <li>Problems based on Ages</li> <li>Ranking and Order</li> <li>Data Sufficiency</li> <li>Statement and Conclusions</li> <li>Statement and Assumptions</li> <li>Statement and Arguments</li> <li>Logical Reasoning</li> </ul>	10



## Syllabus for B.Sc. (Hons.) Agriculture

	• Word Sequence	
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### Course Outcomes

- Better representation of himself/herself in terms of communication & writing skills, overall personality development and aptitude building required for Government sector jobs.
- This program will help students employable and ready for Banking services, UPSC, UPPSC and other state level Competitive examination/ Agro-Industries /NGO's and other Public and Private Sector jobs.

Syllabus for B.Sc. (Hons.) Agriculture

# **SYLLABUS**

**FOR**

## **AGRICULTURAL SCIENCES AND TECHNOLOGY**

**[B.Sc. (Hons.) Ag.]**  
(Four Semester)



**PRAYAGRAJ**

**FACULTY OF  
AGRICULTURAL SCIENCES  
AND TECHNOLOGY**

## Syllabus for B.Sc.(Hons.) Agriculture

**Course Title:** CROP PRODUCTION TECHNOLOGY -II  
(RABI CROPS)

**Course Code:** AGUCBG401T

**Semester:** IV

**L T P C**  
**2 0 0 2**

### Objective:

This subject helps to study about the cultivation practices of various cereals, pulses, oilseeds, fibre and forage crops along with its geographical distribution and economic importance, its different Sowing methods and to study of yield contributing characters of Rabi season crops.

### Course Syllabus (Theory)

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-rape seed, mustard and sunflower; sugar crops-sugarcane; medicinal and aromatic crops-mentha, lemon grass and citronella, Forage crops-berseem, lucerne and oat.

### Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	<b>General Introduction</b> Origin, geographical distribution, economic importance, soil and climatic, varieties, cultural practices and yield of Rabi crops.	8
2	<b>Cultivation of Cereal &amp; Pulses Crops</b> Cereals – wheat and barley, Pulses-chickpea, lentil, peas	8
3	<b>Cultivation of Oilseed &amp; Sugar Crops</b> Oilseeds-rape seed, mustard and sunflower; sugar crops-sugarcane.	8
4	<b>Cultivation of Medicinal and Forage Crops</b> Medicinal and aromatic crops-mentha, lemon grass and citronella, Forage crops-berseem, lucerne and oat.	8

### Course Outcomes

- Know the origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Rabi crops.
- Identify weeds in Rabi season crops.
- To understand the yield attributing characters of Rabi crops and Estimate yield of Rabi crops.

### Recommended Text Books

- Modern techniques of raising field crops- Chhidda Singh, Prem Singh and Rajbir Singh- CBS Publishers & Distributors.
- Field crops production-Food grain crops Volume I- Dr. Rajendra Prasad, Indian Council of Agricultural Research, New Delhi.
- Field crops production-Commercial crops Volume II- Dr. Rajendra Prasad, Indian Council of Agricultural Research, New Delhi.

### Recommended Reference Books

- Crops of India, Scientific Publishers-N.R.Das.
- Agronomy of Field Crops- Reddy, S.R. 2004. Kalyani Publishers, New Delhi.

## Syllabus for B.Sc.(Hons.) Agriculture

**Course Title: CROP PRODUCTION TECHNOLOGY  
- I (RABI CROPS) LAB**

**Course Code: AGUCBG401P**

**Semester: IV**

**L T P C**  
**0 0 2 1**

### Objective:

- Aim of study to practically skilled the student about the nursery preparation, sowing and transplanting technique of rabi season crop.
- To have a better knowledge of weeds in rabi season crops.
- To provide yield contributing characters of rabi season crops.

### Course Syllabus (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.

### Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
Seed bed preparation of different Rabi Crops	Rope, Measuring tape, Spade, iron pegs, Wooden Planks etc.	2
To know the sowing methods of wheat	Broadcasting, Behind local plough, Drilling. Dubbing, Zero till seed drill technique, Furrow irrigated raised bed.	2
To know about the sowing methods of sugarcane	Tractor, Ladder/plank, Spade, hand hoe, rake, measuring tape, seed, fertilizers, Ridges and furrow method, trench method etc.	2
To study identification of weeds in rabi season crops	Manual on weed management, books on botany, taxonomy, weed science, herbarium, pencil, white paper etc.	2
To study weed control measures	Manual mechanical and chemical, hand pulling, hand hoeing, Tillage, moving, flooding, burning etc.	2
To study of morphological characteristics of rabi crops	Leaf, stem, flower, root, fruit, seed, height, duration etc.	2
Study of yield contributing characters of rabi season crops,	No. of plants /m, No. of productive tillers/plant, Total no of grains/ear, head Test weight (1000 seed weight), No. of pods/plant No. of seeds/pod, No. of tubers/plant Average weight of tuber.	2
Yield and Juice quality analysis of sugarcane	Refractometer (brix), tissue paper and syrup, cane yield, juice yield, sugar yield (t/ha) and sugar recovery (%).	2
Study of important agronomic experiments of rabi crops at experimental farms.	Climate and weather condition, Temperature, Rainfall, Relative humidity, Experiment detail, Design, Gross area of the plot, Net area of the plot, No. of replication, No. of treatment, Varieties.	2
Study of rabi forage experiments	Climate and weather condition, Temperature, Rainfall, Relative humidity, Experiment detail, Design, Gross area of the plot, Net area of the plot, No. of replication, No. of treatment, Varieties, irrigation channel, spacing.	4
Oil extraction of medicinal Crops	Petroleum benzene, Distillation apparatus, trimble oilseed sample, heating mentlesoxhlet glass ware and balance.	2
Visit to research stations of related crops.	Area of the farm, Under cultivation, Single crop area, Double crop area, Under building, roads, channels, threshing floor,	2

	Characteristics of the soil, pH, texture, Area under irrigation, Source under irrigation.	
Identification of Common Manures and Fertilizers	Bulky and concentrated organic manures, Urea, SSP, MOP, Ammonium Sulphate etc.	<b>2</b>

### Course Outcomes

- Students will aware the nature of field crop production including the knowledge, skills and abilities required for field cropproduction.
- Carryoutfieldobservations,includingsowing-methods,depth,plantdensity,Crop density and geometry, Optimum plantpopulation.
- To encourage the development of employability skills in field cropproduction.
- Understand about the procedure of harvesting and threshing ofcrops.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title:** PRODUCTION TECHNOLOGY FOR  
ORNAMENTAL CROPS, MAP AND  
LANDSCAPING

**Course Code:** AGUCBG402T

**Semester:** IV

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>

**Objective:**

- To know importance of Ornamental crops, Medicinal and aromatic crops
- To provide better understanding for cultivation, harvesting, packaging, processing and value addition of ornamental & MAPs.

**Course Syllabus (Theory)**

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, liliun 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.

**Syllabus organised in Unit (Theory)**

Unit	Content	Hours
1	<b>Introduction &amp; Landscaping</b> Importance and scope of ornamental crops, medicinal and aromatic plants and landscaping. Principles of landscaping. Landscape uses of trees, shrubs and climbers.	4
2	<b>Production and packaging of ornamental crops</b> Production technology of important cut flowers like rose, gerbera, carnation, liliun 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.	4
3	<b>Production and packaging of medicinal crops</b> Production technology of important medicinal plants like ashwagandha, asparagus, aloe, costus, Cinnamomum, periwinkle, isabgol.	4
4	<b>Production and packaging of aromatic crops</b> 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.	4

**Course Outcomes**

- Know about origin, area, climate, soil, improved varieties and cultivation practices such as time and methods of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield.
- Understand the scientific cultivation methods of different ornamentals, Medicinal and aromatic crop.

**Recommended Text Books**

- Floriculture in India by G. S. Randhawa and Mukhopadhyay.
- Introduction to Spices, Plantation crops, Medicinal and Aromatic plants- N. Kumar, Abdul Khader, P. Rangaswami, I. Irulappan.

**Recommended Reference Books**

- Textbook of Floriculture and Landscaping by Anil K. Singh and Anjana Sisodia.
- Handbook of Horticulture by K. L. Chaddha.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title:** PRODUCTION TECHNOLOGY FOR ORNAMENTAL CROPS, MAP AND LANDSCAPING LAB

**Course Code:** AGUCBG402P

**Semester:** IV

**L T P C**  
**0 0 2 1**

### Objective:

The aim of this lab is to teach and skilled the student for identification, nursery bed preparation, harvesting and post harvest handling of ornamental, medicinal and aromatic crops.

### Course Syllabus (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.

### Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
Identification of Ornamental, medicinal and aromatic plants	Common and botanical name, family, Chromosome no.	4
To prepare nursery bed and seed sowing of ornamental crops	Soil treatment, seed treatment, seed sowing method, seed rate, watering etc.	4
To study of propagation of ornamental crops and MAPs	Vegetative propagation, 'T' Budding, Stem cuttings, Air Layering or Cuttings	4
Training and Pruning of Ornamentals	Hand Shears, Pruning Loppers, Pruning Saw, Pole Tree Saw, Types of pruning, Thinning out, Heading Back, Bulk Pruning, Thin wood Pruning	4
To study the protected structure used for flower cultivation	Green house, its types, cladding material, Glass, FRP (Fibre Reinforced Plastic), polythene, PVC, Polycarbonates sheets, Growing system, growing condition and medium, irrigation, fertigation etc.	4
To study the protected structure- care and maintenance	Green house cooling: ventilation, roof shading, evaporative cooling, Fan and pad cooling system	4
To study the interculture operation in flowers and MAP	Weed control, pinching, Disbudding, De sucking, weeding, hoeing, earthing up etc.	2
To study the harvesting and post harvest handling of cut flower	Harvesting, conditioning, precooling, grading, buncing, wrapping, storage, transport, sales	2
To study the oil extraction methods of MAPs	Hydrodistillation, Hydrodiffusion, Water distillation, Water steam distillation, Direct steam distillation, Supercritical fluid extraction (SFE), Microwave distillation etc.	2
To visit to commercial flower/MAP unit	Area of farm, farm under cultivation,	2

### Course Outcomes

Theory By the end of the course, the students will be able to

- Understand the identification, training & pruning of various ornamental, MAPs.



## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title: FARM MACHINERY AND POWER**

**Course Code: AGUCBG403T**

**Semester: IV**

**L T P C**  
**1 0 0 1**

### Objective:

To enable the students to understand the basic principles and parts internal combustion engine and different tillage, sowing, intercultural, plant protection equipment, working principles of threshers, harvesting of field and horticultural crops.

### Course Syllabus (Theory)

Status of Farm Power in India, Sources of Farm Power, I.C. engines, working principles of I C 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, 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.

### Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	Status of Farm Power in India, Sources of Farm Power, I.C. engines, working principles of I C 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,	4
2	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.	4
3	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.	4
4	Familiarization with Plant Protection equipment, Familiarization with harvesting and threshing equipment.	4

### Course Outcomes

- To understand the working principle of different systems and parts of internal combustion engines.
- To equip the students with technical knowledge and skills required for the operation of tillage, sowing and intercultural and plant protection machinery needed for agricultural farms.
- To train the students with skills required for the operation, maintenance and evaluation of harvesting, threshing machinery needed for agricultural farms.

### Recommended Text Books

- Elements of Agricultural Engineering- Jagdiswar Sahay, Standard Publishers Distributors.
- Farm machinery –Principles and applications- Surendra Singh, ICAR, New Delhi.

### Recommended Reference Books

- Farm Tractor and maintenance and repair- Jain, S.C. and C.R. Rai. Standard Publishers, 1705- B, Nai sarak, Delhi-110006.
- Principles of Agricultural Engineering. Vol.I- Ojha, T.P. and A.M. Michael, A.M. Jain brothers, 16/893, East Park Road, Karol Bagh, New Delhi-110005.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title:** FARM MACHINERY AND POWER LAB

**Course Code:** AGUCBG403T

**Semester:** IV

**L T P C**  
**0 0 2 1**

**Objective:** To enable the students to understand the basic components of I. C. engine and to make them familiarize with various tiller implements & sprayers and dusters.

### Course Syllabus (Practical)

Study of different components of I.C. engine. To study air cleaning and cooling system of engine, Familiarization with clutch, transmission, differential and final drive of a tractor, Familiarization with lubrication and fuel supply system of engine, Familiarization with brake, steering, hydraulic control system of engine, Learning of tractor driving, Familiarization with operation of power tiller, Implements for hill agriculture, Familiarization with different types of primary and secondary tillage implements: mould plough, disc plough and disc harrow. Familiarization with seed cum- fertilizer drills their seed metering mechanism and calibration, planters and transplanter Familiarization with different types of sprayers and dusters Familiarization with different intercultivation equipment, Familiarization with harvesting and threshing machinery.

### Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
To study Internal combustion Engine components	Cylinder, Cylinder block, Cylinder head, Cylinder liner, Piston, crown of piston, Piston ring.	2
To study Four stroke cycle engine	Suction Stroke, Compression stroke, Power stroke, Exhaust stroke.	2
To dismantle, clean and reassemble a dry type of air cleaner	Screw driver, spanner set, cotton waste, cutting plier.	2
To dismantle, clean and reassemble a wet type air cleaner	Screw driver, spanner set, cotton waste, cutting plier.	2
To remove, inspect and reinstall clutch assembly in a tractor	Standard tools and equipment, bolts, and spring washers.	2
To dismantle, inspect and clean and reinstall The P.T.O shaft	Screw drivers, spanner set, cutting plier, hammer, cotton waste etc.	2
To study Air cooling system and its advantages	Total area of the fin surfaces, velocity and amount of the cooling air, temperature of the fins and of the cooling air etc.	2
To servicing the radiator	Double End spanner set, Ring spanner set, Adjustable spanner, Cutting plier, Screw driver, Wire brush.	2
To study the starting and stopping of Diesel Engine	Prepare the engine for starting, Prime the fuel system, Start the cylinder engine.	2
To service the fuel tank and fuel lines	Tank, Suction line, Fuel cock, Tank cap, Over flow line.	2
To study Tillage and classification of Tillage	Primary and secondary tillage, objective of tillage.	2
To study Indigenous or Country plough	Share, body, beam, hand.	2
To study Animal drawn and Tractor drawn mould Board ploughs	Animal drawn – Trailed type Tractor drawn – Semi mounted type - Mounted type, Cutting edge of share, Wing of Share, Gunnel of share, mould board.	2
To study the construction of a standard disc plough	Disc, Standard, Plough Frame, Rear Furrow Wheel, Scraper, Cross shaft.	2
To study care and maintenance of seed – cum – fertilizer drill	Daily: open furrow, apply grease, nut and bolt periodically.	2
To study cultivators and its important functions	Disc Cultivator, rotary Cultivator, Time cultivator.	2

**Course Outcomes**

- After the completion of the course student will get the knowledge of I. C. engine and to make them familiarize with various tillage implements & sprayers and dusters.
- They have the better understanding of intercultural equipment and harvesting and threshing machinery.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title:** AGRICULTURAL MARKETING TRADE & PRICES

**Course Code:** AGUCBG404T

**Semester:** I V

**L T P C**  
**2 0 0 1**

### Objective:

- The course has been designed to know about Agricultural Marketing: Concepts and definitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation, classification and characteristics of agricultural markets.
- The course helps the students in understanding the basic about Product life cycle (PLC) and competitive strategies: Meaning and stages in PLC; characteristics of PLC; strategies in different stages of PLC. Know more about Role of Govt. in agricultural marketing: Public sector institutions- CWC, SWC, FCI, CACP & DMI – their objectives and functions.

### Course Syllabus (Theory)

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; 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: 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; 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.

### Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	<b>Agricultural Marketing</b> 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.	4
2	<b>Product life cycle and Marketing</b> 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	4

	equalization; exchange functions – buying and selling; physical functions – storage, transport and processing.	
3	<b>Market functionaries and marketing channels</b> 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: 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.	4
4	<b>Role of Govt. in Agricultural marketing</b> 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; 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.	4

### Course Outcomes

- Student will be able to understand and appreciate the structure and working of the agricultural marketing system.
- Able to learn how agriculture marketing system affects the farmers, consumers and intermediaries.

### Recommended Text Books

- State of Indian Farmer: Agriculture Marketing by S.S. Acharya, Academic Foundation, New 2004.
- Marketing of Agricultural Products by Richard L. Kohls and Joseph, Prentice Hall of India, New Delhi, 2018.

### Recommended Reference Books

- Agriculture Marketing in India by S. Acharya and N. L. Agarwal, Oxford and IBH, New Delhi. 1999.
- Agriculture and Food Marketing in Developing Countries by Abbott, John Cave, Oxford, London, 2007.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title:** AGRICULTURAL MARKETING TRADE & PRICES LAB

**Course Code:** AGUCBG404P

**Semester:** IV

**L T P C**  
**0 0 2 1**

### Objective:

- The course helps the students in understanding commodities and their relationship with market price.
- This course helps to know about organization and functioning of various marketing agencies, institutions related to agriculture marketing.

### Course Syllabus (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.

### Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
Plotting and study of demand and supply curves and calculation of elasticities	Demand and supply curves, Law of demand and supply, cases of elasticity of demand.	2
Study of relationship between market arrivals and prices of some selected commodities	Commodity, price, arrival.	2
Computation of marketable and marketed surplus of important commodities	Marketable surplus, Total production, Total requirement, Marketed surplus = Marketable surplus – loss incurred during transit.	4
Study of price behaviour over time for some selected commodities	Commodity, Price.	2
Construction of index numbers	Purpose of the Index Number, Selection of Commodities, Selection of Prices, Selection of an Average, Selection of Weights.	2
Visit to a local market to study various marketing functions performed by different agencies.	Producer, middleman, retailers, Itinerant Traders and Village Merchants, Transport Agency, Communication Agency, advertisement Agency.	4
Identification of marketing channels for selected commodity	Direct Route, Indirect Route, marketing channel for cereals, pulses, cottons, fruits and vegetables.	2
Collection of data regarding marketing costs, margins and price spread and presentation of report in the class	Labour, transport, packaging, containers, rent, utilities (water and energy), advertising, selling expenses, depreciation allowances and interest charges.	4
Visit to market institutions – NAFED, SWC, CWC, cooperative marketing society, etc. to study their organization and functioning	NAFED function, state warehouse cooperation, central warehouse cooperation.	2
Application of principles of comparative advantage of international trade	Law or principle of comparative advantage, economic model, Comparative Cost Difference etc.	2

**Course Outcomes**

At the end of this course, students will get

- The knowledge of agriculture marketing in local markets.
- Student will be aware of various market agencies, institution and their role in agriculture marketing.



## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title:** INTRODUCTORY AGRO  
METEOROLOGY & CLIMATE CHANGE  
**Semester:** IV

**Course Code:** AGUCBG405T

**Objective:**

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- To study about different climatic factors affecting crop growth and development.
- Study about different weather aberrations.
- Study about climate change, its causes and impacts.

### Course Syllabus (Theory)

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, 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 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.

### Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	<b>Agricultural Meteorology</b> 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.	4
2	<b>Solar Radiation &amp; Atmospheric temperature</b> 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.	4
3	<b>Atmospheric Humidity &amp; Precipitation</b> Atmospheric humidity, concept of saturation, vapour 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.	4
4	<b>Weather hazards &amp; Weather forecasting</b> Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold-wave. Agriculture and weather relations; Modifications of crop microclimate, climatic normals for crop and livestock production. 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.	4



**Course Outcomes**

- Students will be able to understand the scope of agricultural meteorology, atmospheric pressure & its variation with height along with wind and types of wind.
- Study the nature and properties of solar radiation and daily and seasonal variations of temperature.
- Students will be able to understand the weather hazards and weather forecasting along with impact of weather and climate on agricultural production system.

**Recommended Text Books**

- Radha Krishna Murthy, V. 2016. Principles and Practices of agricultural disaster management, B.S. Publications, Koti, Hyderabad.
- Reddy, S.R. 2014. Introduction to Agriculture and Agrometeorology, Kalyani Publishers, Ludhiana, Punjab.

**Recommended Reference Books**

- Radha Krishna Murthy, V. 2002. Basic Principles of Agricultural meteorology, B.S. Publications, Koti, Hyderabad.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title:** INTRODUCTORY AGRO METEOROLOGY & CLIMATE CHANGE LAB

**Course Code:** AGUCBG405P

**Semester:** IV

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**0 0 2 1**

### Objective:

- To understand the meaning of seed, its structure, development and maturation and their importance in crop production
- To initiate basic methods and principle related to seed quality testing and seed Standards
- To set forth basic knowledge on various processing operations and principles involved in successful seed storage.

### Course Syllabus (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 sun shine 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.

### Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
Study of meteorological observatories, site selection and layout	Classes of meteorological observatories: Synoptic stations, Agricultural stations, Climatological station, Rainfall station.	2
Measurement of bright sunshine hours, total shortwave and long wave radiation estimation	Campbell-Stokes sunshine recorder, Sunshine cards, Sunshine plastic scale, sunshine card, sunshine scale, Radiation instruments: Pyrheliometer, Pyranometer, Albedometer, Net radiometer.	4
Measurement of maximum, minimum temperatures and soil temperature	Stevenson Screen (Single size), Maximum Thermometer, Minimum thermometer, Dry or wet bulb Thermometer, Soil thermometer, Grass Minimum Thermometer.	4
Measurement of wind speed and wind direction and preparation of wind rose	Cup counter anemometer, Wind vane, Barograph.	4
Determination of vapour pressure, relative humidity and dew point temperature	Psychrometer, Vapour pressure, Saturation deficit, Relative humidity, Dew drop temperature, Whirling Psychrometer, Assmann Psychrometer.	4
Measurement of rainfall and evaporation measuring instruments	Ordinary rain gauge with measuring cylinder, Self-recording rain gauge, Rate of Evaporation, Pan evaporimeter.	2
Analysis of rainfall data for climatological studies	Standard Meteorological week, Meteorological season, Central tendency, Dispersion of Rainfall, Dependability of Rainfall.	4
Measurement of atmospheric pressure and analysis of atmospheric conditions	Fortin's barometer, Kew pattern barometer, Aneroid barometer, Barograph.	2
Estimation of heat indices	Phenology, Growing Degree day, Base temperature, Photo-thermal unit, Helio-Thermal Unit, Hydrothermal unit.	2
Estimation of Potential Evapotranspiration (PET)	Thornthwaite method, Modified Penman Method.	4

**Course Outcomes**

- To grasp the importance of agro metrology in cultivation of crop.
- To understand the handling of agro metrological instruments.
- To really understand the procedure for measurement, tabulation and analysis of various data.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title: PRODUCTION TECHNOLOGY FOR FRUIT AND PLANTATION CROPS**

**Course Code: AGUCBG406T**

**Semester: IV**

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### Objective:

This course helps the students in understanding morphological characters, cultivation and harvesting of different fruits and plantation crops.

### Course Syllabus (Theory)

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.

### Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	<b>Introduction:</b> Importance and scope of fruit and plantation crop industry in India; Importance of rootstocks.	4
2	<b>Production technologies for the cultivation of major fruits</b> -mango, banana, citrus, grape, guava, litchi, papaya, sapota, apple, pear, peach, walnut, almond.	4
3	<b>Production technologies for the cultivation of minor fruits</b> - date, ber, pineapple, pomegranate, jackfruit, strawberry.	4
4	<b>Production technologies for the cultivation of plantation crops</b> -coconut, arecanut, cashew, tea, coffee & rubber.	4

### Course Outcomes

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

- To learn about scope and importance of fruits and plantation crops.
- Students will know more about origin, area, climate, soil, improved varieties and cultivation practices such as time and methods of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, harvesting and yield of different fruits and plantation crops.

### Recommended Text Books

- Pomology (Sub-Tropical Fruit) -T.K. Bose – Daya Publishing House.
- Pomology (Temperate Fruit) - T.K. Bose- Daya Publishing House.

### Recommended Reference Books

- Introduction to spices, Plantation crops and Aromatic plants- Kumar, N.J.B.M. Md. Abdul Khaddar, Ranga Swamy, P. and Irrulappan, I. 1997. Oxford & IBH, New Delhi.
- Hand Book of Coconut Palm- Thampan, P.K. 1981. Oxford IBH, New Delhi.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title:** PRODUCTION TECHNOLOGY FOR  
FRUIT AND PLANTATION CROPS LAB  
**Semester:** IV

**Course Code:** AGUCBG406P

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### Objective:

- To provide technical and scientific cultivation practices of different fruit and plantation crops.
- To provide field knowledge and acquaint the students with practical field
- To educate students in nursery bed preparation and raising healthy seedling.

### Course Syllabus (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.

### Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
Identification of fruit and plantation plants	Common name, Botanical name, family, Origin, Types of fruits and edible parts.	2
Classification of fruits and Plantation crops	Botanical classification, temperate fruits, tropical fruits, sub tropical, arid and semiarid fruits.	4
Description and identification of fruit crops and its varieties	Mango, papaya, banana, guava, sapota, citrus, anola, bael, pomegranate, ber, grape, apple.	2
Description and identification of plantation crops and its varieties	Coconut, cashew nut, coffee, tea, areca nut.	2
Seed propagation, scarification and stratification of seeds	Mechanical scarification, Acid scarification, Chemical treatments, Use of hormone.	2
Propagation methods of fruit crop	Inarching, Soft wood wedge grafting, Veneer grafting and side grafting, Cleft grafting, Epicotyl / stone grafting, Budding, Cutting, Layering-- Air, Tissue culture.	2
Propagation methods of plantation crops	Selection of seed, seedling, age of plant, Flowering rate, fruit set, yield, vegetative propagation, seed propagation.	2
Micro Propagation of fruit crops - Date palm and Banana	Explant, sterilization, media, somatic embryogenesis.	2
Preparation of plant bio-regulators and their uses	Auxins, Gibberellins, Cytokinins, Ethylene, Growth Inhibitors [Absciscic Acid (ABA)], Growth Retardants [CCC, AMO, 1618, Phosphon - D, Morphactin, MH], New plant growth regulators [Jasmonates/Jasmonic acid derivatives (JA ), Salicylic acid, s Brassinosteroids (BR ), Polyamines (PA ) etc.	2
Physiological disorders of important fruit crops	Mango-Spongy tissue, black tip, malformation, clustering in mango Banana- Kotta vazhai, Neer Vazhai, Grape-granulation, Rind pitting etc.	2
Physiological disorders of important Plantation crops	Coconuts: Button shedding / Crown choking, Barren Nut, Band or hidimundige disease, Coffee: Kondli.	2
Visit to commercial orchard	Area of the farm, Under cultivation, Single crop area, Double crop area, Under building, roads, channels, threshing floor, Characteristics of the soil, pH, texture, Area under irrigation, Source under irrigation.	2

**Course Outcomes**

- By the end of this course students will learn about appropriate production, propagation, identification of fruit and plantation crops.
- Role and use of bioregulators fruit and plantation crops.
- They have knowledge of important pests, diseases and physiological disorders of above fruit and plantation crops for good quality production.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title: RENEWABLE ENERGY AND GREEN TECHNOLOGY**

**Course Code: AGUCBG407T**

**Semester: IV**

### Objective:

**L T P C**  
**1 0 0 1**

- To study about renewable energysources.
- To study about different types of biogasplants.
- Knowledge and concept of solar energygadgets.
- To study wind energy and itsapplication.

### Course Syllabus (Theory)

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, 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.

### Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	<b>Introduction</b> Classification of energy sources, contribution of these of sources in agricultural sector	4
2	<b>Biogas plant and its application</b> 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	5
3	<b>Solar energy and its application</b> 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	5
4	<b>Wind energy</b> Introduction of wind energy and their application.	2

### Course Outcomes

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

- Understand the various forms of conventional energyresources.
- Explain the concept of various forms of renewable energy
- Understand the concept of Biomass energy resources and their classification, types of biogas Plants- applications

### Recommended Text Books

- Renewable Energy Sources and Their Environmental Impact, by Abbasi, S.A
- Renewable Energy Resources, by Twidell, John.

### Recommended Reference Books

- Renewable Energy Sources and Emerging Technologies, by Kothari, D.P.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title: RENEWABLE ENERGY AND GREEN TECHNOLOGY LAB**

**Course Code: AGUCBG407P**

**Semester: IV**

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### Objective:

The main aim of this lab is to teach the students theoretically with highlights on practicals for better and deep understanding on renewable energy gadgets.

### Syllabus organised in Unit (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.

### Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
To Study of Floating Drum Biogas Plants	Biogas technology, Process: hydrolysis, acid formation, methane generation, its Parts: digester, gas holder, slurry mixing tank, outlet tank.	2
To Study of Fixed Drum Biogas Plants	Janata Plant, PRAD in 1978, Deenbandhu Plant: advantages, disadvantage, application.	2
To Study of Different Types of Gasifiers	Updraft gasifier, Downdraft gasifier, Twin-fire gasifier, Cross draft gasifier, Fluidized bed gasifier, Other gasifier.	2
To Study of the Production Process of Biodiesel	Ethanol and Bio-diesel, Oil, methanol and sodium methylate catalyst, Dual Reactor System.	2
Study of Production Process of Briquettes	Land, Raw materials, Drying facility to dry raw materials, Shredding machine, Briquetting machine.	2
Study of Solar Photovoltaic Fencing	Energizer, Earthing (Grounding System), Fence system, Components: solar panel, Battery, Energizer, earthening system.	2
To study of Solar Cookers	Direct or focusing type, Indirect or box type solar cooker and Advanced type or separate collector and cooking chamber type solar cooker.	2
To Study of Solar Water Heater	Collector coupled to storage tank, Collector cum storage system.	2
To study solar dryer	Natural Convection type: Direct Solar dryers, Indirect Solar dryers, Direct cum indirect Solar dryers Forced circulation type: Bin type grain dryer.	2
Study of Solar Water Pumping System	Solar Photovoltaic Deep well Pump, types of motors: Permanent magnet DC motors, Wound-field motors, AC motors.	2
Study of Solar Lighting System	Solar Lantern, Solar Street Light System, Domestic Lighting System, Community PV Lighting System and PV Power Plant.	4
Study of Solar Distillation System	Single effect basin stills, Multiple effect basin stills, Wick stills, Emergency still.	2

### Course Outcomes

- Students will learn about renewable energy gadgets and briquetting machine.
- They will learn about the production technology for biodiesel biogas plants.



## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title: INTELLECTUAL PROPERTY RIGHTS**

**Course Code: AGUCBG408T**

**Semester: IV**

**L T P C**  
**1 0 0 1**

### Objective:

- This course provides the students basics of Intellectual Property Rights, Copy Right Laws Trade Marks and Issues related to Patents. The overall idea of the course is to help and encourage the student for startups and innovations.

### Course Syllabus (Theory)

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, 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.

### Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	<b>Intellectual Property</b> 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.	4
2	<b>Legislations of Intellectual Property</b> Types of Intellectual Property and legislations covering IPR in India:-Patents, Copyrights, 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	4
3	<b>Act of India for Plant Protection</b> 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.	4
4	<b>Biological diversity Act</b> 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.	4

### Course Outcomes

The students once they complete their course,

- Get aware about current trends in IPR and Govt. steps in fostering IPR.
- Knowledge on Design, Geographical Indication (GI), Plant Variety and Layout Design Protection and their registration aspects.
- They shall get an adequate knowledge on patent and copyright for their innovative works.

**Recommended Text Books**

- Intellectual Property Rights: Protection and Management- Nithyananda, K V. (2019). India, IN: Cengage Learning India Private Limited.
- Intellectual Property Rights. India- Neeraj, P., & Khusdeep, D. (2014), IN: PHI learning Private Limited.

**Recommended Reference Books**

- Law relating to Intellectual Property Rights- Ahuja, V K. (2017). India, IN: LexisNexis.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title:** COMMERCIAL PLANT BREEDING

**Course Code:** AGUBG4101T

**Semester:** IV

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### Objective:

- This course provides the students basics of Intellectual Property Rights, Copy Right Laws Trade Marks and Issues related to Patents. The overall idea of the course is to help and encourage the student for startups and innovations.

### Course Syllabus (Theory)

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.

### Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	<b>Introduction to plant reproduction and hybrid seed production</b> 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.	4
2	<b>Advances in hybrid seed production</b> Principles and techniques of seed production, types of seeds, quality testing in self and cross pollinated crops. 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.	5
3	<b>Tissue culture and biotechnological tools</b> Alternative strategies for the development of the line and cultivars: haploid inducer, tissue culture techniques and biotechnological tools.	4
4	<b>IPR</b> IPR issues in commercial plant breeding: DUS testing and registration of varieties under PPV & FR Act. Variety testing, release and notification systems in India.	3

### Course Outcomes

The students once they complete their course,

- To believe the role of good quality seed in agriculture
- To grasp the significance of basic principles of seed production in crop plants
- To know the registration procedure and registration agency involved in seed production

### Recommended Text Books

- Commercial plant breeding- Singh, Phundan and Bisen Pratibha, Daya Publisher, 1<sup>st</sup> Edition.

### Recommended Reference Books:

- Law relating to Intellectual Property Rights- Ahuja, V K, India, IN: LexisNexis.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title: Commercial Plant Breeding LAB**

**Course Code: AGUCBG4101P**

**Semester: IV**

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### Objective:

- The main aim of this lab is to teach the students self and cross pollinated plant's floral biology.
- To teach the technique for hybrid seed production techniques
- To make aware of seed processing and management techniques.

### Syllabus organised in Unit (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.

### Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
Floral biology in self and cross pollinated species, selfing and crossing techniques	Hand emasculation, Suction methods, alcohol and cold treatment, Use of gemetocides.	2
Techniques of seed production in self and cross pollinated crops using A/B/R and two line system.	Seed Parent (A-Line), Restorer or Male Parent (R-Line), B-line (Maintainer).	2
Learning techniques in hybrid seed production using male-sterility in field crops.	Cytoplasmic male sterility (CMS), Genetic male sterility, Cytoplasmic genetic/genic male sterility, Utilization of CMS.	2
Understanding the difficulties in hybrid seed production, Tools and techniques for optimizing hybrid seed production.	Technical skill, Hybrid seeds have to be produced every year, the characters are segregated and not maintained in the next generation, production cost of hybrid seeds is high.	2
Concept of rouging in seed production plot.	Identifying and removing plants with undesirable characteristics from agricultural fields, to preserve the quality of the crop being grown.	2
Concept of line its multiplication and purification in hybrid seed production.	For maintenance of R-line, the plot should be completely isolated from others. The natural open pollination characteristic of cross-pollinated crop will be helpful for its maintenance.	2
Role of pollinators in hybrid seed production.	Increases yield, quality of fruits and seeds.	2
Hybrid seed production techniques in sorghum, pearl millet, maize, rice, rapeseed-mustard, sunflower, castor, pigeon pea, cotton and vegetable crops.	Cytoplasmic male sterility (CMS), Genetic male sterility, Cytoplasmic genetic/genic male sterility, Utilization of CMS, A/B/R and two line system.	2
Sampling and analytical procedures for purity testing and detection of spurious seed.	Seed testing laboratory, physical purity, seed separation, Germination test, moisture test, measure weight (weight volume).	2
Seed drying and storage structure in quality seed management.	Drying temperature, moisture content, size of bin, depth of seed, spread of seed, rate of air blow, static pressure.	2

Screening techniques during seed processing viz., grading and packaging.	Cleaning, drying, seed treatment, packaging and storage, grading: size, shape, weight, surface texture, colour.	<b>4</b>
To visit public private seed production and processing plants.	Exposure visit at public private seed production.	<b>2</b>

#### **Course Outcomes**

- Acquire knowledge on floral biology and selection of proper breeding method.
- Gain expertise on hybrid seed production techniques.
- Grasp the significance of seed quality testing.
- Afford knowledge on various organization involved in seed testing.

## Syllabus for B.Sc. (Hons.) Agriculture

**CourseTitle: BIOPESTICIDES&BIOFERTILIZERS**

**CourseCode: AGUBG4102T**

**Semester: IV**

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**Objective:**

- This course provides the students basics knowledge of biopesticides andbiofertilizers.
- To aware of its application and productiontechniques.

**Course Syllabus (Theory)**

History and concept of biopesticides. Importance, scope and potential of biopesticide. 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 ectomycorrhiza. 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.

**Syllabus organised in Unit (Theory)**

Unit	Content	Hours
1	<b>Biopesticides</b> History and concept of biopesticides. Importance, scope and potential of biopesticide. Definitions, conceptsandclassificationofbiopesticidesviz.pathogen,botanicalpesticides,andbiorationales. Botanicals and their uses. Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes.	4
2	<b>Application and Production of Biopestisides</b> Mass production technology of bio-pesticides. Methods of application of biopesticides. Methods of quality control and Techniques of biopesticides. Impediments and limitation in productionanduse of biopesticide	5
3	<b>Biofertilizers</b> Structureandcharacteristicfeaturesofbacterialbiofertilizers- <i>Azospirillum</i> , <i>Azotobacter</i> , <i>Bacillus</i> , <i>Pseudomonas</i> , <i>Rhizobium</i> and <i>Frankia</i> ; Cynobacterial biofertilizers- <i>Anabaena</i> , <i>Nostoc</i> , Hapalosiphonandfungalbiofertilizers-AMmycorrhizaandectomycorrhiza.Nitrogenfixation-Free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilization and phosphate mobilization, K solubilization.	4
4	<b>Production technology</b> Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertiizers. FCO specifications and quality control of biofertilizers.Application technologyfor seeds, seedlings, tubers, sets etc. Biofertilizers -Storage, shelf life, quality control and marketing. Factors influencing the efficacy of biofertilizers.	3

**Course Outcomes**

The students once complete their course,

- Gather the knowledge of use of biofertilizer over chemicalfertilizers.
- Grasp the significance of basic principles of biofertilizer and biopesticidesproduction.
- Proper awareness during storage, transport and application biofertilizer andbiopesticides.

### **Recommended Text Books**

- Biopesticides and biofertilizer Acharya-Krishnendu: Sen, Surjit and Rai, Manjula(2019)
- Lakshman, H. C. and Channabasava, A (2014) Biopesticides and biofertilizer, PointerPublishers
- Singh and Purohit, 2008.Biofertilizer Technology,Agrobios
- Shalini Suri, Biofertilizers and Biopesticides, 2011. APH PublishingCorporation
- Handbook of Biofertilizers and Biopesticides by RajaramChoyal

### **Recommended Reference Books**

- Alastair Bailey, *et al.* (2012) Biopesticides: Pest Management and Regulation CABI Publishing; Reprint edition (14 November2012)
- Rao, B. N. S. (2019) Biofertilizers in agriculture and forestry, Oxford and IBHPublishing
- Recent Advances in Biopesticides by Jayandra KumarJohnri
- Biopesticides Handbook by Jeo M.L. Nollet and Hamir SinghRathore
- Opendar Koul, G. S. Dhaliwal and S. S.Marwaha. Biopesticide and pest management Fryer. Insect pest of fruitcrops

## Syllabus for B.Sc. (Hons.) Agriculture

Course Title: **BIOPESTICIDES & BIOFERTILIZERS**  
LAB

Course Code: **AGUCBG4102P**

Semester: **IV**

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**0 0 2 1**

### Objective:

- The main aim of this lab is to teach the students isolation and purification of important biopesticides.
- To visit biopesticide laboratory in nearby area, for studying the naturally infected cadavers and entomopathogenic entities in field condition.
- To make aware of Mass multiplication and inoculums production of biofertilizer.

### Syllabus organised in Unit (Practical)

Isolation and purification of important biopesticides: *Trichoderma*, *Pseudomonas*, *Bacillus*, *Metarhizium* 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.

### Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
Isolation and purification of important biopesticides: <i>Trichoderma</i> , <i>Pseudomonas</i> , <i>Bacillus</i> , <i>Metarhizium</i> etc and its production	serial dilution method, Potato dextrose media, petridish, incubation, BOD incubator.	2
Identification of important botanicals	Height, shape, size of leafy part, flowers, fruits, and branching patterns.	2
Visit to biopesticide laboratory in nearby area	Identification, production techniques, handling, transport, storage.	2
Field visit to explore naturally infected cadavers	Research farm, dead bodies, Disease transmission, infectious disease.	2
Identification of entomopathogenic entities in field condition	Nematodes, bacteria, moth, fungi.	2
Quality control of biopesticides	Rearing, culturing, preserving, storage methods, containers, transportation and releasing techniques.	2
Isolation and purification of <i>Azospirillum</i> , <i>Azotobacter</i> , <i>Rhizobium</i> , P-solubilizers and cyanobacteria	Serial dilution method, Potato dextrose media, petridisc, incubation, BOD incubator.	2
Mass multiplication and inoculums production of biofertilizers	Trough or tank method, pit method, field method and nursery cum algal production method.	2
Isolation of AM fungi - Wet sieving method and sucrose gradient method	Wet sieving method : Gerdemann and Nicolson, 1963 sucrose gradient method: Daniel and Skipper, 1982.	2
Mass production of AM inoculants	Substrate based production system, Substrate free production system, In-vitro production system.	2



**Course Outcomes**

- Acquire knowledge on naturally infected cadavers.
- Gain expertise in isolation and purification of important biopesticides.
- Have better understanding on mass multiplication and inoculum production of biofertilizers.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title: AGRIBUSINESS MANAGEMENT**

**Course Code: AGUBG4103T**

**Semester: IV**

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### Objective:

- To introduce importance of agribusiness in the Indian economy.
- To demonstrate organization culture, business plan, program and budget management.
- To study the Consumer behaviour analysis, Project Appraisal and evaluation techniques.

### Course Syllabus (Theory)

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, policies procedures, rules, programs and budget. Components of a business plan, Steps in planning and implementation. Organization staffing, directing and motivation. Ordering, leading, supervision, communications, control. 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.

### Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	<b>Introduction</b> 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.	4
2	<b>Agri-value chain and Business environment</b> 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.	5
3	<b>Business plan and Marketing Management</b> 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.	4
4	<b>Project policy and Management</b> 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.	3

### **Course Outcomes**

Upon completion of this course, students will be able to:

- Identify the agribusiness cluster in the state and nation.
- Apply economic principles to the analysis of agribusiness sector.
- Analyze the potential impacts and interdependencies of the agribusiness sector.

### **Recommended Text Books**

- Agri Business Co-operative Management- Sarkar A.N. Everest Publishing House, Everest Lane, 536, Shaniwar Peth, Appa Balwant Chowk, Pune – 411030.
- Co-operation and Co-operative Management- Umesh C.Patnaik and Ananta K.Roy, Kalyani Publishers, Ludhiana-141008.
- Co-operative Movement in India- G.R.Madan, Mittal Publications, Daryaganj, New Delhi 110002.

### **Recommended Reference Books**

- Essentials of Farm Financial Management- Joshi, S.S and Charles V. Moore, Today and Tomorrow's printed and Publishers-22 B-5, Original Road, Karol Bagh, New Delhi -110005.
- Rural credit and Co-operative Development- S.B.Verma, G.P.Sah, S.C.Pathak. Deep & Deep Publications Pvt.Ltd.F-159, Rajouri Garden, New Delhi-110027.
- Co-operative Management- Dr.V.D.Varkey, V.G.Vartak. Pragati Books Pvt.Ltd.119, Budhwar Peth, Jogeshwari Mandir Lane, Pune-411002.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title: AGRIBUSINESS MANAGEMENT LAB**

**Course Code: AGUCBG4101P**

**Semester: IV**

**Objective:**

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- The main aim of this lab is to teach the students about agri-input markets.
- To aware of financing institutions and their role in agriculture.
- To study Appraisal/evaluation techniques of identifying viable project.

**Syllabus organised in Unit (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.

**Syllabus organised in Unit (Practical)**

Topics	Description with Practical Applications	Hours
To study the of financing institutions	Depository, non depository, Cooperative, state and central cooperative bank, Commercial bank, CRR, RRB, NABARD	2
Preparation of project and feasibility report agribusiness entrepreneur, appraisal/evaluation nondiscounting technique	Market analysis, financial assessment, marketing assessment, financial plan, feasibility report, appraisal techniques, traditional method, morden methods	2
To study of agri input market: seed, fertilizers, pesticides	Introduction, objectives, marketing inputs and outputs, classification of agri inputs	2
Study of output markets: grains, fruits, vegetables, flowers.	Labor, capital, and land, produce products exchanged	2
Study of product markets, retails trade commodity trading, and value added products.	Determinethepurposeofyourstudy. Therearemanyreasons why businesses might conduct market research, Look at your industry's outlook, Pinpoint target customers, Compare your competition, Gather additional data, Analyze your findings and Put your analysis into action. The buying and selling of rawmaterials	2
Case study of agro-based industries	Any activity involved in cultivation, under controlled conditions of agricultural and horticultural crops, including floriculture and cultivation of vegetables and post-harvest operation on all fruits and vegetables.	2
Trend and growth rate of prices of agricultural commodities.	Tension of supply-demand relationship, promotion of production cost and circulation cost, and speculation of Refugee Capital (Hot Money).	2
Net present worth technique for selection of viable project.	It is widely used in capital budgeting to establishwhich projects are likely to turn the greatest profit.	2
Internal rate of return	The rate of interest that makes the sum of all cash flows zero and is useful to compare one investment to another.	2

**Course Outcomes**

Upon completion of this course, students will be able to:

- Know about various financial institutions and theirrole.
- Preparation of project and feasibility report agribusinessentrepreneur.

- Understand agri input - output market, agro-based industries.
- Apply economic principles to the analysis of agribusiness sector.

## Syllabus for B.Sc. (Hons.) Agriculture

**CourseTitle: FOODSAFETYISSUES**

**CourseCode: AGUBG4104T**

**Semester: IV**

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### Objective:

- To discuss how contamination of food can occur in a food service establishment.
- To differentiate between cleaning and sanitizing.
- To identify the types of cleaning agents and sanitizers that may be used safely in a food handling operation.
- To define the local legislation dealing with safety at work.

### Course Syllabus (Theory)

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, 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.

### Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	<b>Food Safety</b> 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.	4
2	<b>Hygiene and Sanitation in Food Service Establishments</b> Introduction. Sources of contamination and their control. Waste Disposal. Pest and Rodent Control. Personnel Hygiene. Food Safety Measures.	5
3	<b>Food Safety Management Tools</b> 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, FSSAI. Global Scenario CAC. Other laws and standards related to food.	4
4	<b>Recent concerns- New and Emerging Pathogens</b> 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.	3

### Course Outcomes

The students once complete their course, they will

- Aware of food safety, its scope and its factor affecting, types of hazards and its managements.
- Understand and resent the rules of personal hygiene and the importance of adhering to food safety rules and regulations.
- Knowledge of new and emerging concern for pathogens.

**Recommended Text Books**

- Food safety- Carol E, Mellin; D. and Barbara A C., Food Research Institute, University of Wisconsin-Madison. Marcel Dekker Inc. New York.
- The Food Safety and Standards Act along with Rules & Regulations. Commercial Law Publishers (India) Pvt. Ltd.
- Handbook of Foods and Nutrition- Swaminathan, Ganesh and Co. Pvt. Ltd.

**Recommended Reference Books**

- Food Science- Swaminathan M. 1990, Chemistry and Experimental Foods. BAPPC.
- Food Safety Handbook- Ronald H. Schmidt and Gary E. Rodrick, John Wiley & Sons, Inc., Hoboken. New Jersey, USA.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title: FOOD SAFETY ISSUES LAB**

**Course Code: AGUCBG4104P**

**Semester: IV**

**L T P C**  
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### Objective:

This course is designed to:

- Introduce the causes and prevention of food poisoning and to introduce the requirements of safety in the workplace.
- Introduce local legislation relating to the food service industry
- Present the rules of personal hygiene and the importance of adhering to safety rules and regulations.

### Syllabus organised in Unit (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 foodborne pathogens. Preparation of plans for Implementation of FSMS-HACCP, ISO:22000.

### Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
Determination of Chemical Oxygen Demand in Waste Water Sample	Amount of dichromate is determined by direct titration using Ferrous Ammonium Sulfate (FAS) as the titrant and ferroin (1, 10 phenanthroline ferrous sulfate) as the indicator	2
Determination of Dissolved Oxygen in Waste Water Sample	Two methods are commonly used to determine DO concentration: (1) The iodometric method which is a titration-based method and depends on oxidizing property of DO and (2) The membrane electrode procedure, which works based on the rate of diffusion of molecular oxygen across a membrane.	2
Determination of Total Dissolved Solids in Waste Water Sample	To measure total suspended and dissolved solids, a sample of water is placed in a drying oven to evaporate the water, leaving the solids.	2
Analysis of Total Hardness of Waste Water Sample	The hardness of a water is governed by the content of calcium and magnesium salts, largely combined with bicarbonate and carbonate. Hardness can be measured by calculation from the concentration of calcium and magnesium ions in the sample	2
Analysis of Waste Water/Sludge for Heavy Metals	Metal analysis can be done by various techniques like Atomic Absorption Spectrophotometer or flame photometer.	2
Preparation of different types of media.	Liquid, semi solid, solid, selective, differential, assay, Potato dextrose agar, Czapek's media, Richards solution, corn meal, malt extract, oat meal extract	2
Microbiological Examination of different food samples	Indicator Organisms, direct examination, cultural techniques, enumeration methods, plate count, alternative methods, dye reduction test, electric methods, ATP determination, rapid methods immunological, DNA/RNA methods	2
Assessment of surface sanitation by swab/rinse method.	Bunsen burner, wide mouth test tubes, sterile petri plates, nutrient agar, non-absorbent cotton, thread, glass rod, pipettes, Preparation of Ringer's solution,	2
Assessment of personal hygiene.	Examining a patient's clothing, skin, mouth, hair, and nails.	2
Biochemical tests for identification of bacteria.	Catalase Test, Mannitol Salt Agar (MSA), Blood Agar Plates (BAP) Streak-stab technique, Taxos P (optochin sensitivity	2



	testing), Taxos A (bacitracin sensitivity testing), CAMP Test, Bile Esculin Agar, Nitrate Broth.	
Scheme for the detection of food borne pathogens	Polymerase chain reaction (PCR), routine pathogen testing in food laboratories, immunological methods, both of ELISA and lateral flow immunoassay	<b>4</b>
Preparation of plans for Implementation of FSMS - HACCP, ISO: 22000.	Interactive communication, System Management, Prerequisite Program, HACCP Principle	<b>4</b>

### Course Outcomes

Upon completion of the topic the student will be able to:

- Identify the factors that influence the growth of micro-organisms.
- Analysed the physio chemical and microbiological methods for water quality analysis.
- Describe the preparation processes that are involved in selected foods.
- Create a basic flow diagram/description of selected preparation and serving processes.

## Syllabus for B.Sc. (Hons.) Agriculture

**Course Title:** PROFESSIONAL PROFICIENCY (B.Sc.Ag)- IV

**Course Code:** PTSPPBG20T

**Semester:** IV

<b>Objective:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
Students should be able to read and write correct English, attain reasonable fluency in the Language and should also be exposed to introductory lessons of Aptitude Building.	4	0	0	2

### Course Syllabus (Theory)

Hard skill includes Basic Grammar, Close Test, Conjunction, Preposition, Construction of Sentences and Reading Comprehension, Error spotting, Sentence Improvement, Cloze test, Rearrangement of sentences, Antonyms phrase, Idioms. Communication & Writing Skill Efforts should be made to overcome the expertize in speaking and writing of English Essay hence improve their fluency in English & writing skills on different aspects. Suggested topic include: Each student should speak and write essay on selected topic from Economic sphere, Agriculture, Industry, Trade, National & International events, Natural calamities, Earthquake, Drought, Dengue, Landslides, National Development Programmes & Projects.

### Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	<b>Hard Skills</b> Hard skill includes Basic Grammar, Close Test, Conjunction, Preposition, Construction of Sentences, Reading Comprehensions, Para Jumbles, Para Completion, Vocabulary.	10
2	<b>Communication &amp; Writing Skill</b> Efforts should be made to overcome the expertize in speaking and writing of English Essay hence improve their fluency in English & writing skills on different aspects. Suggested topic include: Each student should speak and write essay on selected topic from Literature and Social Sphere, Political sphere, Science, Environment & Technology.	25
3	<b>Aptitude Building</b> <b>Quantitative Aptitude</b> <ul style="list-style-type: none"> <li>Problems based on trains</li> <li>Percentages</li> <li>Partnership</li> <li>Clocks</li> <li>Permutation and Combinations</li> <li>Probability</li> <li>Profit, Loss and Discount</li> <li>Elements of Algebra</li> <li>Quadratic Equations</li> <li>Verification of truth of the statement</li> </ul> <b>Logical Reasoning</b> <ul style="list-style-type: none"> <li>Alphanumeric series</li> <li>Inequalities</li> <li>Tabulation</li> <li>Analogy and classification</li> <li>Clocks and Calendar</li> <li>Non- Verbal Reasoning</li> <li>Logical Deduction :- Logic,</li> <li>Statement – Arguments and Conclusions,</li> <li>Deriving Conclusions From Passages,</li> <li>Theme Detection,</li> <li>Cause and Effect Reasoning</li> <li>Missing Characters</li> <li>Sequential Output Training</li> <li>Word Sequence</li> </ul>	10

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### Course Outcomes

- Better representation of himself/herself in terms of communication & writing skills, overall personality development and aptitude building required for Government sector jobs.
- This program will help students employable and ready for Banking services, UPSC, UPPSC and other state level Competitive examination/ Agro-Industries /NGO's and other Public and Private Sector jobs