1st SEMESTER		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BAGE1-101	Agricultural Meteorology	2	0	0	40	60	100	2
BHUM0 – 107	Communicative English	1	1	0	40	60	100	2
BAGE1- 102	Introductory Agriculture & Principles of Agronomy	2	1	0	40	60	100	3
BHUM0-111/ BHUM0-112	Punjabi*/ Basic Punjabi*	1	0	0	40	60	100	NIL
BAGE1-103	Introduction to Soil Science	2	1	0	40	60	100	3
BBIO0-101/ BMAT0-103	Basic Botany/Mathematics-I**	2	0	0	40	60	100	2
BAGE1-104	Water Management & Micro-Irrigation	2	0	0	40	60	100	2
BAGEI-105	Vegetable Production Technology	2	1	0	40	60	100	3
BAGE1-106	Agricultural Meteorology Lab.	0	0	2	60	40	100	1
BHUM0- 108	Communicative English Lab.	0	0	2	60	40	100	1
BAGE1-107	Introductory Agriculture & Principles of Agronomy Lab.	0	0	2	60	40	100	1
BAGE1-108	Introduction to Soil Science Lab.	0	0	2	60	40	100	1
BBIO0 -102	Basic Botany Lab.	0	0	2	60	40	100	1
BAGE1-109	Water Management & Micro Irrigation Lab.	0	0	2	60	40	100	1
BAGE1-110	Vegetable Production Technology Lab.	0	0	2	60	40	100	1
Total		**14**	**3**	**14**	**740**	**760**	**1500**	**24**

*Those students who had studied Punjabi at matriculation level they will study Punjabi, whereas other students who had not studied Punjabi at matriculation level has to study Basic Punjabi. Students need to qualify the examinations of this non-credit Course.
** Those students who had studied Medical in 10+2 has to take Mathematics, whereas students who had studied Non-Medical in 10+2 has to take Basic Botany.

2nd SEMESTER		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BAGE1-211	Principles of Agricultural Economics	2	0	0	40	60	100	2
BAGE1-212	Plant Pathogens & Principles of Plant Pathology	2	1	0	40	60	100	3
BAGE1-213	Dimensions of Agriculture Extensions	2	1	0	40	60	100	3
BAGE1-214	Agriculture Micro Biology	2	0	0	40	60	100	2
BAGE1-215	Production Technology of Fruit Crops	2	0	0	40	60	100	2
BCAP0-193	Computer Application in Agriculture	2	0	0	40	60	100	2
BAGE1-216	Manures & Fertilizers	2	0	0	40	60	100	2
BMAT0-204	Basic Statistics	2	0	0	40	60	100	2
BBIO0-203 /BMAT0-203	Zoology / Mathematics –II**	2	0	0	40	60	100	2
BAGE1-217	Plant Pathogens & Principles of Plant Pathology Lab.	0	0	2	60	40	100	1
BCAP0-194	Computer Application in Agriculture Lab.	0	0	2	60	40	100	1
BAGE1-218	Agriculture Micro Biology Lab	0	0	2	60	40	100	1
BAGE1-219	Production Technology of Fruit Crops Lab.	0	0	2	60	40	100	1
BAGE1-220	Manures & Fertilizers Practical	0	0	2	60	40	100	1
BBIO0-204	Zoology Lab.	0	0	2	60	40	100	1
Total		**18**	**2**	**12**	**680**	**820**	**1500**	**26**

3rd SEMESTER		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BAGE1-321	Biochemistry	2	0	0	40	60	100	2
BAGE1-322	Plant Physiology	2	0	0	40	60	100	2
BAGE1-323	Principles of Agronomy -I (Kharif Crops)	2	1	0	40	60	100	3
BAGE1-324	Fundamentals of Insect Morphology and Systematic	2	1	0	40	60	100	3
BAGE1-325	Soil Chemistry, Fertility and Nutrient Management	2	1	0	40	60	100	3
BAGE1-326	Fundamental of Soil and Water Conservation Engineering	2	1	0	40	60	100	3
BAGE1-327	Farm Power & Machinery	2	0	0	40	60	100	2
BAGE1-328	Biochemistry Lab.	0	0	2	60	40	100	1
BAGE1-329	Plant Physiology Lab.	0	0	2	60	40	100	1
BAGE1-330	Principles of Agronomy-I Lab.	0	0	2	60	40	100	1
BAGE1-331	Fundamentals of Insect Morphology and Systematic Lab.	0	0	2	60	40	100	1
BAGE1-332	Soil Chemistry, Fertility and Nutrient Management Lab.	0	0	2	60	40	100	1
BAGE1-333	Fundamental of Soil and Water Conservation Engineering Lab.	0	0	2	60	40	100	1
BAGE1-334	Farm Power & Machinery Lab.	0	0	2	60	40	100	1
Total		**14**	**4**	**14**	**700**	**700**	**1400**	**25**

4th SEMESTER		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BAGE1-435	Introduction to Genetics	2	1	0	40	60	100	3
BAGE1-436	Principles of Seed Technology	2	0	0	40	60	100	2
BAGE1-437	Principles of Agronomy-II (Rabi Crops)	2	1	0	40	60	100	3
BAGE1-438	Organic Farming	1	0	0	40	60	100	1
BAGE1-439	Insect Ecology and Pest Management	2	0	0	40	60	100	2
BAGE1-440	Farm Management & Agriculture Finance	2	0	0	40	60	100	2
BAGE1-441	Extension Methodology and Communication Skills	1	1	0	40	60	100	2
BAGE1-442	Livestock Production and Management	2	0	0	40	60	100	2
BAGE1-443	Introduction to Genetics Lab.	0	0	2	60	40	100	1
BAGE1-444	Principles of Seed Technology Lab.	0	0	2	60	40	100	1
BAGE1-445	Principles of Agronomy-II (Lab/Field).	0	0	2	60	40	100	1
BAGE1-446	Organic Farming (Lab./Field)	0	0	2	60	40	100	1
BAGE1-447	Insect Ecology and Pest Management (Lab./Field)	0	0	2	60	40	100	1
BAGE1-448	Farm Management & Agriculture Finance Lab.	0	0	2	60	40	100	1
BAGE1-449	Livestock Production and Management Lab.	0	0	2	60	40	100	1
Total		**14**	**3**	**14**	**740**	**760**	**1500**	**24**

5th SEMESTER		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BAGE1-550	Introduction to Plant Breeding	2	0	0	40	60	100	2
BAGE1-551	Plant Tissue Culture and Genetic Transformation	2	0	0	40	60	100	2
BAGE1-552	Chemistry of Agrochemicals	2	0	0	40	60	100	2
BAGE1-553	Introductory Forestry	1	0	0	40	60	100	1
BAGE1-554	Flower Cultivation and Landscape Gardening	1	1	0	40	60	100	2
BAGE1-555	Diseases of Horticultural Crops and their Management	1	1	0	40	60	100	2
BAGE1-556	Insect Pests of Crops and Stored Grains	2	0	0	40	60	100	2
BAGE1-557	Crop Residue Management	1	0	0	40	60	100	1
BAGE1-558	Agriculture Marketing Trade and Prices	2	0	0	40	60	100	2
BAGE1-559	Introduction to Plant Breeding Lab.	0	0	2	60	40	100	1
BAGE1-560	Plant Tissue Culture and Genetic Transformation Lab.	0	0	2	60	40	100	1
BAGE1-561	Introductory Forestry Lab.	0	0	2	60	40	100	1
BAGE1-562	Flower Cultivation and Landscape Gardening Lab.	0	0	2	60	40	100	1
BAGE1-563	Diseases of Horticultural Crops and their Management Lab.	0	0	2	60	40	100	1
BAGE1-564	Insect Pests of Crops and Stored Grains Lab.	0	0	2	60	40	100	1
BAGE1-565	Practical Crop Production (*Kharif Crops*) Lab.	0	0	2	0	100	100	1
Educational Tour								---
Total		**14**	**2**	**14**	**720**	**880**	**1600**	**23**

6th SEMESTER		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BAGE1-666	Diseases of Field Crops and their Management	2	0	0	40	60	100	2
BAGE1-667	Introduction to Post Harvest Technology	2	0	0	40	60	100	2
BAGE1-668	Breeding of Field and Horticultural Crops	2	0	0	40	60	100	2
BAGE1-669	Protected Cultivation of Horticultural Crops	2	0	0	40	60	100	2
BAGE1-670	Renewable Energy	1	0	0	40	60	100	1
BAGE1-671	Fundamentals of Agribusiness Management and Entrepreneurship Development	2	1	0	40	60	100	2
BAGE1-672	Environmental Science and Disaster Management	3	0	0	40	60	100	3
BAGE1-673	Fundamentals of Rural Sociology and Educational Psychology	2	1	0	40	60	100	3
BAGE1-674	Diseases of Field Crops and their Management Lab.	0	0	2	40	60	100	2
BAGE1-675	Introduction to Post Harvest Technology Lab.	0	0	2	60	40	100	1
BAGE1-676	Breeding of Field and Horticultural Crops Lab.	0	0	2	60	40	100	1
BAGE1-677	Protected Cultivation of Horticultural Crops Lab.	0	0	2	60	40	100	1
BAGE1-678	Renewable Energy Lab.	0	0	2	60	40	100	1
BAGE1-679	Practical Crop Production-II (Rabi Crops)	0	0	2	60	40	100	1
	Total	**16**	**2**	**14**	**660**	**740**	**1400**	**24**

Overall

Semester	Marks	Credits
1st	1500	24
2nd	1500	26
3rd	1400	25
4th	1500	24
5th	1600	23
6th	1400	24
Total	**8900**	**146**

AGRICULTURAL METEOROLOGY

Subject Code: BAGE1-101 **L T P C** **Duration: 25 Hrs.**
2 0 0 2

UNIT–I

Agricultural Meteorology: Definition, Practical Utility and Scope, General Climatology, Structure and Composition of Earth's atmosphere.

UNIT- II

Elements and Factors of Weather and Climate: Temperature, Pressure, Wind, Solar Radiation and Moisture, Impact of Climate on Crops and Livestock Distribution and Production. Agroclimatic Indices: Definitions and Applications in Agriculture.

UNIT- III

Effect of Environmental Factors on Crop Growth, Weather Hazards in Agriculture.

UNIT-IV

Climatic Classifications, Agroclimatic Regions of Punjab and India, Elementary Aspects of Weather forecasting, Effects of climate change on agriculture.

Recommended Books

1. D.R. Bates, 'The Earth and its Atmosphere'.
2. J. D. Yeade, 'General Climatology by Critbbfierd & Hewarda'.
3. H. S. Mavi, 'Agriculture Meteorology'.
4. G.S. Mahi, 'Fundamentals of Agro Meteorology'.
5. S.R. Reddy, 'Agro Meteorology'.

COMMUNICATIVE ENGLISH

Subject Code: BHUM0-107 **L T P C** **Duration: 25 Hrs.**
1 1 0 2

UNIT-I (Reading)

The prescribed reading textbook for students will be S. P. Dhanavel English and Communication Skills for Students of Science and Engineering (with audio CD), Orient Blackswan. They will go through the reading texts themselves with the help of a dictionary or word power as given at the end. As they progress from one reading to another they should learn to read fast with greater degree of understanding of both concrete and abstract topics. While taking up the textbook lessons in the classroom, the teacher shall ensure that students can do the following:

1) Identify the significant points and conclusions as given in the text.
2) Handle large texts (even outside the prescribed book) with overall comprehension of the links between arguments and the finer distinction between stated and implied meanings.
3) Generally, read the stance or the point of view of the writer and present it in the form of a summary
4) Use the vocabulary learnt in the lessons (especially given in „word power") productively in various writing tasks as suggested at the end of each lesson.
5) Profitably use the grammatical items as discussed at the end of each lesson while producing language for communication.

Besides the textbook, the teacher must insist that students extend their reading by taking up additional texts of their own choice.

UNIT-II (Writing)

In addition to the various exercises given at the end of each lesson of Dhanavel's book, the teacher shall use Anne Laws Writing Skills, Orient Blackswan to teach the language and conventions of writing. The students must learn the language that expresses various cognitive

functions that are frequently used in writing. With the help of the teacher who will give them adequate practice, the students should be able to:

1) Convey information on concrete or abstract topics with clarity and precision.
2) Write about objects or events with appropriate detail in both descriptive and narrative form.
3) Explain ideas and build up arguments with adequate support in a convincing manner.
4) Use language with some degree of flexibility in consideration to the reader.
5) Produce effectively such forms of professional writing as business letter, emails, notes, memos, reports summaries etc.

While teaching, the teacher must inculcate in students the habit of revising their writing. The teacher can also use and recommend the relevant sections of the following books for developing writing skills in students.

Recommended Books

1. Vandana R. Singh, 'The Written Word, Oxford University Press', New Delhi.
2. K.K. Ramchandran, et al, 'Business Communication', Macmillan, New Delhi.
3. Swati Samantaray, 'Business Communication and Communicative English', Sultan Chand, New Delhi.
4. S.P. Dhanavel, 'English and Communication Skills for Students of Science and Engineering (with audio CD)'.

INTRODUCTORY AGRICULTURE & PRINCIPLES OF AGRONOMY

Subject Code: BAGE1-102 **L T P C** **Duration: 38 Hrs.**
2 1 0 3

UNIT-I (10 Hrs.)

Definition and Importance of Agriculture; Meaning and scope of Agronomy; Plant Growth and Development: Concept and Differences; General Growth Curves, Factors Affecting Crop production, Classification of Crops.

UNIT-II (10 Hrs.)

Meaning and Types of Tillage and Tilth, Soil Fertility and Productivity, Soil Erosion: Nature, Extent and Types; Soil Conservation- Meaning, Agronomic and Common Mechanical Practices; Agro-climatic Zones of Rajasthan and India.

UNIT-III (9 Hrs.)

National, International Agricultural Research Institutes in India and Abroad. Art, science and business of crop production; Agricultural heritage; Chronological agricultural Technology Development in India; Ancient Indian Agriculture in Civilization Era.

UNIT-IV (9 Hrs.)

Conversion of Man from Food Gatherer to Food Producer; Development of Agriculture Through Kautilya`s Work; Tools to Predict Monsoon Rain; Plant Protection in Pncient and Medieval India; Forest Management and Products, History of Some Indigenous Trees.

Recommended Books

1. De, Gopal Chandra, 'Fundamentals of Agronomy', Oxford & IBH Publishing Co., New-Delhi, **1989.**
2. 'ICAR Handbook of Agriculture', Indian Council of Agricultural Research, New-Delhi, **1989.**
3. Y.B. Morachan, 'Crop Production and Management', Oxford & IBH Publishing Co., New-Delhi, **1986.**
4. B.L. Porwal and D.D. Sharma, 'Sashya Vigyan Ke Adhunic Siddhant (Hindi)', Alka Publishers, Ajmer, **1991.**

PUNJABI

Subject Code: BHUM0-111 **LT P C**
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BASIC PUNJABI

Subject Code: BHUM0-112 **LT P C**
1 0 0 0

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INTRODUCTION TO SOIL SCIENCE

Subject Code: BAGE1-103 **L T P C** **Duration: 38 Hrs.**
2 1 0 3

UNIT-I (10 Hrs.)

Concept of land: Soil and Soil Science; Composition of Earth Crust and its Relationship with soils; Rocks and Minerals; Weathering. Soil Forming Factors and Processes; Soil Profile; Soil Colour; Elementary Knowledge of Taxonomic Classification of Soils; Soils of Punjab and India; Soil Physical Properties.

UNIT-II (10 Hrs.)

Soil Texture: Textural Classes; Soil Structure - Classification, Soil Aggregation and Significance, Soil Consistency, Soil Crusting, Bulk Density and Particle Density of Soils and Porosity, Their Significance and Manipulation.

UNIT-III (9 Hrs.)

Soil Water: Retention and Potentials, Soil Moisture Constants, Movement of Soil Water-Infiltration, Percolation, Permeability, Drainage and Methods of Determination of Soil Moisture, Thermal Properties of Soil, Soil Temperature, Soil Air Composition, Gaseous Exchange, Influence of Soil Temperature and air on Plant Growth.

UNIT-IV (9 Hrs.)

Soil Colloids: Properties, Nature, Types and Significance; Sources of Charges in Clay Minerals; Introduction to Salinity and alkalinity, Ion Exchange, CEC; AEC –Factors Affecting and Adsorption of Ions; Soil Organic Matter Decomposition, Mineralization, Humus; Carbon Cycle, C: N Ratio; Soil Organisms and Their Beneficial and Harmful Roles.

Recommended Books

1. J.L. Sehgal, 'Pedology'.
2. Nyle C. Brady & Ray R. Well, 'Nature and Properties of Soil'.
3. T.D. Biswas and S.K. Mukherjee, 'Text Book of Soil Science', Tata McGraw Hill Publishing Co. Ltd, New Delhi, **2006**.
4. D.K. Das, 'Introductory Soil Science', Kalyani Publishers, New Delhi, **2002.**
5. M.M. Rai, 'Principles of Soil Science', Mac Millan India Ltd, New Delhi, **2002.**
6. R.K. Mehra, 'Text Book of Soil Science', ICAR, New Delhi, **2004**.

BASIC BOTANY

Subject Code: BBIO0-101 **L T P C** **Duration: 25 Hrs.**
2 0 0 2

UNIT-I

Classification and Introduction to Different Groups of the Plant Kingdom, A General Outline of the Studies of an Angiosperm, Life Cycle of a Flowering Plant; Annuals, Biennials and Perennials.

UNIT-II

Morphology: Seed Structure of Seeds of: Gram, Castor, Maize, and Process of Germination.
Roots: External Characters and functions, types of root systems and their bearing on agriculture practices. Modifications of Roots and Their Significance.
Stem: External characters and functions, buds and their types, spines and ordinary branches, branching systems; stem as an organ of vegetative propagation, modification of stem.
Leaf: Parts of a typical leaf and their functions; simple and compound leaves and their functions, venation and modifications of leaves; uses of leaves.
Inflorescence: Elementary knowledge of simple and special types of inflorescences.

Flower: Structure and functions of floral parts, modifications, nectaries, floral diagram, floral formulae and vertical section of a flower, structure of the thalamus and insertion of the floral appendages on the thalamus, placentation.

Pollination: Pollination Mechanism, Agencies Responsible (Anemophily and Entomophily) for Pollination, Contrivances for Cross Pollination.

Fertilization: Fertilization and Seed Formation. Structure of Orthotropus, and Anatropous ovule, Embryo in Capsella only.

Reproduction in Plants: Vegetative, and sexual reproduction their merits and demerits. Natural and Artificial methods.

Fruits: Elementary knowledge of Fruits, Dispersal of Seeds and Fruits with Examples from Punjab.

UNIT-III

Anatomy: An Elementary Account of the Various Tissues and their Functions, Internal Structure of a Stem (Dicot and Monocot), Root and Leaf.

UNIT-IV

Classification: Diagnostic Characters (floral), Economic Importance and General Characters of Solanaceae, Malvaceae, Cruciferae, Graminae, Compositae.

Recommended Books

1. L.D. Dutta, 'Text Book of Botany'.
2. I.R.D. Vidyarthi, 'Text Book of Botany Part'.
3. Widge & Bhatia, 'Introduction of Botany'.
4. C. Dutta, 'Text Book of Botany', Oxford University Press- India, **2000**.
5. K.N. Bhatia and R. Widge, 'Introduction of Botany', Truman Publishers, Jalandhar, **2010**.

MATHEMATICS-I

Subject Code: BMAT0-103 **L T P C** **Duration: 25 Hrs.**
2 0 0 2

UNIT-I

Mensuration: Mensuration of Rectangles, Easy Examples of Garden Paths, Cost of Planting Trees and Fencing Gardens, Area of Right Angled Triangles Area and Height of Isosceles and Equilateral Triangles, Area of Triangles in Terms of Sides, Rent of Field. Area of Parallelograms, Rhombus, Quadrilateral and Trapenoid, Volumes of Cubes & Cylinders Regular Polygons with Emphasis on Hexagon and Octagon, Simple Cases of Similar Figures, Circumference and Area of Circles. Circular Rings. Cost of Fencing Circular Fields and Paths,

(N.B. Easy numerical examples bearing on Science of agriculture only to be set. Proofs of formulae not required.)

UNIT-II

Algebra: Solution of Quadratic Equations and of Those Reducible to Quadratic Equation. (One Variable), Theory of Quadratic Equations, Relation between Roots and Co-Efficient,

Algebra: Series: Nth Terms Sum to N Terms of an A. P. and G. P. Nth Term of an H. P. (Excluding Means and Problems On Numbers Etc.). Permutation and Combinations, Simple Problems Only. (Proofs of Formulae Not Required). Binomial Theorem, Statement for any Index: Expansion Particular Term Coefficient of N, Summation of Simple Infinite Series Evaluation Cube Root Etc. Correct to a Certain Place of Decimal.

UNIT-III

Co-ordinate Geometry:

(1) The point-distance and section formulae area of a triangle.
(2) The straight line equation in the following standard forms:

$x = a, y = b, y = mx, y = mx + c$, $\frac{x}{a} + \frac{y}{b} = 1$

$x\cos\theta + y\sin\theta = p$ $y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)$

Reduction of Equation ax+by+c=0: to (a) Slope (b) Intercept Form (c) Perpendicular Form (only method of reduction and not proof); point of intersection and, Concurrence, Angle of Intersection of Lines $y=m_1x+c_1$, $y=m_2x+c_2$, and Equations of line (a) Parallel and (b) Perpendicular to a given line and Passing through a given point.

UNIT-IV (9 Hrs.)

The circle- equation when (i) Centre and Radius given. (ii) Passes through Three Points (iii) Extremities of a Diameter given; the equation $x^2+y^2+2gx+2fy+c=0$ represents circle, center and radius, equations of the tangents and normal at any point of circle (only use formula no proof).

Recommended Books:

1. D.C. Kapoor & Gurbax Singh, 'Algebra'.
2. T.N. Nagpal & K.K. Gupta, 'Algebra'.
3. R.S. Dehiya, 'Comprehensive Calculus'.
4. R.K. Sondhi, 'New Style Co-ordinator Geometry'.
5. Jiwan, 'Trignometry'.

WATER MANAGEMENT AND MICRO IRRIGATION

Subject Code: BAGE1-104 **L T P C** **Duration: 25 Hrs.**
2 0 0 2

UNIT-I

Irrigation: Definition and Objectives; Water Resources and Overtime Irrigation Development in India and Punjab.

UNIT-II

Plant Water Relationships; Water Requirement Major Crops and The Methods of Determination of Water Requirements; Effective Rainfall, Mulching and Criteria of Scheduling Irrigation.

UNIT-III

Methods of Irrigation: Surface, Sprinkler and Drip Irrigation; Irrigation Efficiency Measures; Conjunctive Use of Water; Agricultural Drainage.

UNIT-IV

Water Management in Rice, Wheat, Maize, Cotton, Groundnut, Moongbean, Sugarcane, Mustard, Kinnow, Mango and Main Vegetable Crops-Potato, Tomato and Okra.

Recommended Books:

1. A.M. Michael, 'Irrigation - Theory and Practice', Vikas Publishing House Pvt. Ltd., New-Delhi, **1987.**
2. S.S. Parihar and B.S. Sandhu, 'Irrigation of Field Crops- Principles and Practices', ICAR, New-Delhi, **1978.**
3. D. Lenka, 'Irrigation and Drainage', Kalyani Publishers, New-Delhi, **1999.**
4. G.H. Sankara Reddy and T. Yellamanda Reddi, 'Efficient use of Irrigation Water', Kalyani Publishers, New Delhi, **1995.**
5. S.R. Reddy, 'Principles of Crop Production', Kalyani Publishers, New-Delhi, **2000.**
6. D.K. Majumdar, 'Irrigation Water Management- Principles and Practice', Prentice Hall of India, New-Delhi, **2004.**

VEGETABLE PRODUCTION TECHNOLOGY

Subject Code: BAGE1-105 **L T P C** **Duration: 38 Hrs.**
2 1 0 3

UNIT-I (10 Hrs.)

Importance of Olericulture; Vegetable Gardens; Origin of Vegetables, Classification, area, yield and production and varieties of important vegetable gardens

UNIT-II (10 Hrs.)

Package of Practices of Tomato, Brinjal, Chillies, Okra, Cucurbitaceous Vegetables: Cucumber, Ridge Gourd, Ash Gourd, Snake Gourd, Bottle Gourd, Bitter Gourd and Melons

UNIT-III (9 Hrs.)

Package of practices of Cole crops - Cabbage, Cauliflower, Broccoli and Knol-khol; Bulb crops - Onion and Garlic; Beans and Peas - French beans, Cluster Beans, Dolichos Beans, Peas and Cowpea

UNIT-IV (9 Hrs.)

Package of Practices of Tuber crops - Potato, Sweet Potato, Tapioca, Colocasia; Root Crops - Carrot, Radish, Turnip and Beet root; Leafy vegetables - Palak, Methi, and Lettuce

Recommended Books

1. H.C. and W.C. Kelly, 'Vegetables Crops', Tata McGraw Hill.
2. D.V.S. Chauhan, 'Vegetable Production in India', Ram Prasad & Sons, Agra.
3. T.K. Bose, 'Vegetables', Naya Prokash, Calcutta.
4. S.P. Singh, 'Production Technology of Vegetables Crops', Agril. Res. Communication Centre, Karnal.
5. B. Choudhary, 'Vegetables', NBT, New Delhi.

AGRICULTURAL METEOROLOGY LAB.

Subject Code: BAGE1-106 **L T P C**
0 0 2 1

Site Selection for Agrometeorological Observatory, Project on Setting up, Recording and Maintenance of Instruments in a Meteorological Observatory. Measurement of Temperature, Rainfall, Evaporation, Atmospheric Pressure, Sunshine Duration, Solar Radiation, Wind Direction, Wind Speed and Relative Humidity, Study of Weather Forecasting and Synoptic Chart. Processing, Presentation and Interpretation of Climatic Data in relation to Crops.

COMMUNICATIVE ENGLISH LAB.

Subject Code: BHUM0 -108 **L T P C**
0 0 2 1

Listening Comprehension: Listening to Short Talks, Lectures, Speeches (Scientific, Commercial and General in Nature) Practical: Listening to at Least Two Tape, Recorded Conversations Aimed at Testing the Listening Comprehension of Students; Communication: Spoken English, Oral Communication, Importance Stress and Intonation. Practical: Spoken English Practice by Using Audio-visual Aids, The Essentials of Good Conversations, Oral Exercises in Conversation Practice; Oral Presentation of Reports: Seminars and Conferences, Features of Oral Presentation, Regulating Speech, Physical Appearance, Body Language Posture, Eye Contact, Voice, Audience, Preparation of Visual Aids. Practical: One Presentation by Individual on The Given Topic Related to Agriculture, Developing New Technologies in Agriculture Practice of Presentation by using Power Point and LCD Projector; Conducting Mock Interviews – Testing Initiative, Team Spirit, Leadership,

Intellectual Ability – Potential for Development, Memory, Motivation, Objectives, Aptitude Etc., Group Discussions and Debates on Current Topics.

INTRODUCTORY AGRICULTURE & PRINCIPLES OF AGRONOMY LAB.

Subject Code: BAGE1-107 **L T P C**
0 0 2 1

Identification of Crop Seeds and Plants; Identification of Fertilizers and Manures; Acquaintance with Farm Tools and Implements; Methods of Ploughing and Sowing; Preparation of Seed Beds of Crops; Calculation on Plant Population; Calculation of Soil and Water Losses from Runoff Plots, Identification of Grasses, Legumes and Trees for Soil Conservation.

INTRODUCTION TO SOIL SCIENCE LAB.

Subject Code: BAGE1-108 **L T P C**
0 0 2 1

Determination of Bulk Density and Particle Density. Aggregate Size Analysis. Soil Moisture Determination. Soil Moisture Constant: Field Capacity, Infiltration Rate, Water Holding Capacity, Soil Mechanical Analysis. Analytical Chemistry - Basic Concepts, Techniques and Calculations, Collection and Processing of Soil Samples for Analysis of Organic Carbon, pH, EC, Available N, P, K and S. Study of a Soil Profile. Identification of Rocks and minerals.

BASIC BOTANY LAB.

Subject Code: BBIO0-102 **L T P C**
0 0 2 1

Form and Function of Root, Stem & Leaf and Modifications. Different Types of Inflorescence. Representative of Families Included in Theory

WATER MANAGEMENT AND MICRO IRRIGATION LAB.

Subject Code: BAGE1-109 **L T P C**
0 0 2 1

Determination of Bulk Density and Field Capacity by Field Methods; Determination of Permanent Wilting Point; Measurement of Irrigation Water Through Flumes and Weirs; Calculation of Irrigation Water Requirement; Demonstration of Furrow, Check Basin and Basin Methods of Irrigation; Cost Estimation of Drip Irrigation System; Demonstration of Filter Cleaning, Fertigation, Injection and Flushing of Laterals; Erection and Operation of Sprinkler Irrigation System. Measurement of Emitter Discharge Rate, Wetted Diameter and Calculation of Emitter Discharge Variability; Visit to Farmers' Fields for Demonstration of Conventional and Water Saving Irrigation Systems.

VEGETABLE PRODUCTION TECHNOLOGY LAB.

Subject Code: BAGE1-110 **L T P C**
0 0 2 1

Planning and Layout of Kitchen Garden. Identification of Important Vegetable Seeds and Plants. Raising of Vegetable Nurseries. Transplanting of Vegetable Seedlings in main field. Layout of Kitchen Garden and its Maintenance. Seed Extraction in Tomato and Brinjal. Visit

to Commercial Vegetable Farms. Intercultural Operations in Vegetable Plots. Sowing of Potato, Solanaceous Fruit Crops, Root Crops and Cucurbitaceous Vegetables. Seed Production in Vegetable Crops. Harvesting Indices of Different Vegetable Crops. Grading and Packing of Vegetables.

PRINCIPLES OF AGRICULTURE ECONOMICS

Subject Code: BAGE1-211 **L T P C** **Duration: 25 Hrs.**
2 0 0 2

UNIT – I

Economics: Meaning, Definition, Subject Matter, Basic Concepts: Want, Utility, Satisfaction, Income, Wealth, Welfare etc.; Theory of Consumption: Marginal Utility Analysis, Indifference Curves; Consumer's Surplus

UNIT – II

Demand: Meaning, Definition, Kinds of Demand, Law of Demand, Change in Demand. Elasticity of Demand Types, Degrees, Methods of Measurement, Importance and Factors Influencing Elasticity of Demand; Supply, Elasticity of Supply, Factors Affecting Supply

UNIT – III

Definition and Characteristics of Perfect Competition, Pure Competition, Monopolistic Competition, Oligopoly and Monopoly; Price Determination Under Different Market Situations; Marginal Productivity Theory of Distribution

UNIT – IV

National Income: Concepts, Measurement, Meaning, Definition and Importance; Classical and Keynesian Approaches, Effective Demand, Multiplier, Accelerator. National Income - Concepts and Measurement; Inflation – Meaning, Definition, Kinds of Inflation

Recommended Books

1. K.K. Dewett and J.D. Verma, 'Elementary Economic Theory', S. Chand & Company, New Delhi, **1986.**
2. P.A. Samuelson & W.D. Nordhaus, 'Economics', McGraw Hill, Singapore, **1987.**
3. S.K. Mishra and V.K. Puri, 'Indian Economy', Himalaya Publishing House, New Delhi, **1996.**
4. G.B. Jathar and S.G. Beri, 'Elementary Principles of Economics', 10th Edn., Oxford University Press Delhi, **1996.**
5. Berkeley Hill, 'An Introduction to Economics for Students of Agriculture', Pergaman Press, Oxford, **1980.**

PLANT PATHOGENS & PRINCIPLES OF PLANT PATHOLOGY

Subject Code: BAGE1-212 **L T P C** **Duration: 38 Hrs.**
2 1 0 3

UNIT – I (10 Hrs.)

Introduction, Important Plant Pathogenic Organisms, Different Groups, Fungi, Bacteria, Fastidious Vesicular Bacteria, Phytoplasmas, Spiroplasmas, Viruses, Viriods, Algae, Protozoa and Phanerogamic Parasites with Examples of Diseases Caused by Them. General Characters of Fungi, Definition of Fungus, Somatic Structures, Types of Fungal Thalli, Fungal Tissues, Modifications of Thallus, Reproduction in Fungi (Asexual and Sexual). Nomenclature, Binomial System of Nomenclature, Rules of Nomenclature, Classification of Fungi. Key to Divisions and Sub-Divisions.

UNIT – II (9 Hrs.)

Introduction: Definition and Objectives of Plant Pathology. History of Plant Pathology. Terms and Concepts in Plant Pathology. Survival and Dispersal of Plant Pathogens. Phenomenon of Infection – Pre-Penetration, Penetration and Post Penetration. Pathogenesis – Role of Enzymes, Toxins, Growth Regulators and Polysaccharides. Defense Mechanism in Plants – Structural and Bio-chemical (Pre and Post- Infection). Plant Disease Epidemiology. Plant Disease Forecasting.

UNIT – III (10 Hrs.)

General Principles of Plant Diseases Management – Importance, General Principles – Avoidance, Exclusion, Protection – Plant Quarantine and Inspection. Cultural Methods: Rougeing, Eradication of Alternate and Collateral Hosts, Crop Rotation, Manure and Fertilizer Management, Mixed Cropping, Sanitation, Hot Weather Ploughing, Soil Amendments, Time of Sowing, Seed Rate and Plant Density, Irrigation and Drainage. Role and Mechanisms of Biological Control and PGPR.

UNIT - IV (9 Hrs.)

Physical Methods: Heat and Chemical Methods, Methods of Application of Fungicides, Host Plant Resistance – Application of Biotechnology in Plant Disease Management: Development of Disease Resistant Transgenic Plants Through Gene Cloning. Integrated Plant Disease Management (IDM): Concept, Advantages and Importance.

Recommended Books

1. R S. Singh, 'Plant Diseases', 8th Edn., Oxford and IBH Publishing Co. Pvt. Ltd. India. **2007.**
2. A.A. Cook, 'Diseases of Tropical and Sub-Tropical Field Fiber and Oil Plants', Mac Millan Publishing Co. New York, **1981.**
3. V.K. Gupta and Y.S. Paul, 'Diseases of Field Crops', Indus Publishing Co. India, **2002.**
4. R.S. Mehrotra and A. Aggarwal, 'Plant Pathology', 2nd Edn., Tata McGraw-Hill Publishing Co Ltd. India, **2007.**
5. A. Mishra, A. Bohra and A. Mishra, 'Plant Pathology', Agrobios. Jodhpur (India), **2005.**
6. G. Rangaswamy and A. Mahadevan, 'Diseases of Crop Plants in India', Prentice Hall of India Pvt. Ltd., **2001.**

DIMENSIONS OF AGRICULTURAL EXTENSION

Subject Code: BAGE1-213 **L T P C** **Duration: 38 Hrs.**

2 1 0 3

UNIT – I (10 Hrs.)

Education: Meaning and Types. Extension Education and Agricultural Extension: Meaning, Objectives, Principles and Philosophy.

UNIT – II (10 Hrs.)

Importance and Problems of Rural Development. Agricultural and Rural Development Programmes of Pre and Post-Independence Era.

UNIT – III (9 Hrs.)

Powers, Functions and Organizational Set-Up of Three-Tier Panchayati Raj System.

UNIT – IV (9 Hrs.)

New Trends in Extension Education and Privatization of Extension. Women Development Programmes. Emergence of Broad Based Extension

Recommended Books

1. S. Mondal and G.L. Ray, 'A Text book of Rural Development', Kalyani Publishers, Chennai, **2007**.

2. O.P. Dharma and O.P. Bhatnagar, 'Education and Communication for Development', Oxford, IBH, New Delhi, **2003.**
3. A.R. Desai, 'Rural Sociology in India', Popular Prakashan, Bombay, **2003.**
4. R.B. Samanta, 'Agricultural Extension in Changing World Perspective', UDH Publishing, New Delhi, **1991.**
5. G.L. Ray, 'Extension Communication and Management', Kalyani Publishers, Chennai, **2007.**

AGRICULTURAL MICROBIOLOGY

Subject Code: BAGE1-214 **L T P C** **Duration: 25 Hrs.**
2 0 0 2

UNIT – I

History of Microbiology – Its Applied Areas. Discovery of Microorganisms and Their role in Fermentation. Germ Theory of Disease and Mechanisms of Protection Against Them. Structure of Eukaryotic and Prokaryotic Cell. Major Groups of Eukaryotes: Fungi, Algae and Protozoa.

UNIT – II

Major Groups of Prokaryotes: Actinomycetes, Cyanobacteria, Arhaebacteria, Rickettsias and Chlamydia. Bacterial Growth. Metabolism in Bacteria – ATP Generation. Chemoautotrophy, Photoautotrophy, Respiration, Fermentation. Bacteriophages: Structure and Properties, Lytic and Lysogenic Cycles, Viriods, Prions. Genetic Recombinations. Microbial Groups in Soil.

UNIT – III

Microbial Transformation of Carbon, Nitrogen, Phosphorus and Sulphur. Biological Nitrogen Fixation. Microbes in Composting. Microbiology of Water and Food. Beneficial Microorganisms in Agriculture – Biofertilizers, Microbial Pesticides.

UNIT –IV

Biodegradation. Biogas Production. Plant–Microbe Interactions. Introduction to Mushrooms and Mushroom Growing. Edible and Poisonous Mushrooms. Cultivation Technology of Mushrooms.

Recommended Books:

1. N. Mukherjee and T. Ghosh, 'Agricultural Microbiology', Kalyani Publishers, New Delhi., **1998.**
2. Jr. Pelczar, J. Michel, E.C.S. Chan and Noel R. Krieg, 'Microbiology', Tata McGraw - Hill Edition, India, **1993.**
3. G. Rangaswami and D.J. Bagyaraj, 'Agricultural Microbiology', Prentice Hall of India Pvt. Limited, New Delhi, **1993.**
4. N.S. Rao, 'Soil Microbiology', Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, **2000.**
5. K. Vishunavat and S.J. Kolte, 'Essentials of Phytopathological Techniques', Kalyani Publishers, New Delhi, **2005.**

PRODUCTION TECHNOLOGY OF FRUIT

Subject Code: BAGE1-215 **L T P C** **Duration: 25 Hrs.**
2 0 0 2

UNIT–I

Definition, Importance and Divisions of Horticulture. Climatic Zones, Area and Production of Different Fruit Crops Selection of Site, Fencing and Wind Break. Planting Systems, High Density Planting, Planning and Establishment.

UNIT-II

Propagation Methods: Conventional and Non-Conventional Methods of Training and Pruning. Use of Growth Regulators in Fruit Production.

UNIT–III

Fundamentals for Cultivation of Horticultural Crops, Package of Practices for the Cultivation of Major Fruits: Mango, Citrus, Grapes, Guava, Apple, Litchi and Papaya.

UNIT–IV

Package of Practices for the Cultivation of Minor fruits: Pineapple, Pomegranate, Ber, Fig, Loquat, Banana, Phalsa, Pear, Plum, Peaches.

Recommended Books:

1. T.K. Bose, J. Kabir, P. Das and P.P. Joy, 'Tropical Horticulture', Naya Prokash, Calcutta, **2000.**
2. Amar Singh, 'Fruit Physiology and Production', Kalyani Publishers, New Delhi, **1986.**
3. S.P. Singh, 'Commercial Fruits', Kalyani Publishers, New Delhi, **1997.**
4. S.K. Mitra, T.K. Bose and D.S. Rathore, 'Temperate Fruits', Horticulture & Allied Publishers, Calcutta, **1991.**
5. V.A. Parthasvathy, P.K. Chattopadhyay and T.K. Bose, 'Plantation Crpos', Naya Prokash, Kolkatta, **2006.**
6. J.S. Bal, Fruit Growing', Kalyani Publishers, New Delhi, **1997.**
7. Atul Chandra and Anju Chandra, 'Production and Post-Harvest Technology of Fruits', NBS Publisher & Distributers, Bikaner.

COMPUTER APPLICATIONS IN AGRICULTURE

Subject Code: BCAP0-193 **L T P C** **Duration: 27 Hrs.**
2 0 0 2

UNIT – I (7 Hrs.)

Introduction: Characteristics of a Computers; Evolution and Classification of Computer; Limitations of Computer; Application of Computer in Agriculture and Related Fields; Computer Hardware and Software; Input and Output Devices; Memory and Storage Devices, Typical Specifications of a Computer.

UNIT – II (7 Hrs.)

Operating System: Types and Functions; Classification of Programming Languages; Language Translators; Computer Viruses.

UNIT – III (7 Hrs.)

Microsoft Windows: Microsoft World, Power Point, Spreadsheet Applications in Agriculture, Database Application in Agriculture, Expert Systems in Agriculture, Analysis and Forecasting with Examples.

UNIT – IV (6 Hrs.)

Internet: World Wide Web (WWW), Web Browsing, Electronic mail and Bluetooth.

Recommended Books

1. P.K. Sinha, 'Fundamentals of Computers'.
2. V. Rajaraman, 'Fundamentals of Computers'.
3. Satish Jain, 'Information Technology'.

MANURES AND FERTILIZERS

Subject Code: BAGE1-216 **L T P C** **Duration: 25 Hrs.**
2 0 0 2

UNIT – I

Fertilizers: Classification, Manufacturing Processes and Properties of Major Nitrogenous (Ammonium Sulphate, Urea, Calcium Ammonium Nitrate, Ammonium Nitrate, Ammonium Sulphate Nitrate), Phosphatic (Single Super Phosphate, Enriched Super Phosphate, Diammonium Phosphate, Ammonium Poly Phosphate), Potassic and Complex Fertilizers

UNIT – II

Fate and Reactions of Various Types of Fertilizers in the Soil

UNIT –III

Secondary and Micronutrient Fertilizers and Amendments; Adulteration in Fertilizers; Fertilizer Control Order; Fertilizer Storage

UNIT – IV

Bio-Fertilizers and Their Advantages; Manures: Bulky and Concentrated, Farm Yard and Poultry Manures; Composting: Different Methods, Mechanical Compost Plants, Vermin-Composting, Green Manuring, Oil Cakes. Sewage and Sludge: Biogas Plant Slurry, Plant and Animal Refuges.

Recommended Books:

1. K.S. Yawalkar and J.P. Agarwal, 'Manure and fertilizers', Agriculture- Horticulture Publishing House, Nagpur, **1992.**
2. S.L. Tisdale and W.L. Nelson, 'Soil Fertility and fertilizers', McMillan Pub. Co. N.Y. **1990.**
3. V.K. Sanchalli, 'Chemistry and Technology of Fertilizers', Reinhebl Publishing Corporation, New York, USA, **1960.**
4. S.L. Chopra and J.S. Kanwar, 'Analytical Agriculture, Chemistry', Kalyani Publishers, New Delhi, **1991.**
5. H.L.S. Tandon, 'Soil Water and Fertilizers Analysis', Fertilizer Development and Consultant Organization, New Delhi.

BASIC STATISTICS

Subject Code: BMAT0-204 **L T P C** **Duration: 25 Hrs.**
2 0 0 2

UNIT – I

Statistics: Definition, Applications and Limitations, Frequency Distribution and Frequency Curves; Measures of Central Tendency: Arithmetic Mean, Geometric Mean, Harmonic Mean, Median, Mode, Weighted Mean; Measures of Dispersion: Mean Deviation, Standard Deviation, Coefficient of Variation; Basic Applications of Probability Theory; Normal Distribution and its Properties

UNIT – II

Introduction to Sampling, Tests of Significance, Standard Normal Deviate Test for Means, Student's T-test for Single Sample, Two Samples and Paired T-test, F-test, Chi-square test in 2*2 Contingency Tables; Yates Correction for Continuity

UNIT – III

Correlation; Computation of Correlation Coefficient and its Testing; Linear Regression of Y upon X and X upon Y; Interrelation between Correlation and Regression Coefficients

UNIT – IV

Experimental Designs, Layout and Analysis of Completely Randomized Design; Randomized

Block Design, Latin Square Design and Factorial Design

Recommended Books

1. V.G. Panse, F.J. Shaw and P.V. Sukhatme, 'Statistical Methods for Agricultural Workers', Indian Council of Agricultural Research.
2. S.P. Gupta, 'Statistical Methods', Sultan Chand & Sons, New Delhi, **2002**.
3. S. Singh, T.P. Singh, M.L. Babsal and R. Kumar, 'Statistical Method for Research Workers', Kalyani Publishers, Ludhiana, **2004.**

ZOOLOGY

Subject Code: BBIO0 - 203 **L T P C** **Duration: 27 Hrs.**
2 0 0 2

UNIT – I (7 Hrs.)

Introduction to Zoology, Description of Typical Animal Cell, Difference Between Plant and Animal Cell. Zoological Nomenclature and Principles of Classification. General Survey of Animal Kingdom up to Phylum in In–Vertebrates and up to Class in Vertebrates.

UNIT –II (7 Hrs.)

Economic Significance and Importance of Amoeba, Entamoeba, Sycon, Plasmodium, Fasciola, Tapeworm, Ascaris, Hirudo, Pharitema, Grasshopper, Locust, Silkworm, Beetle, Red Cotton, Honey Bee, Bug, Mosquito, Rohu, Frog, Snake, Owl, Woodpecker, Hoope, Parrot, Horse, Sheep, Rat, Mongoose and Monkey.

UNIT – III (7 Hrs.)

Animals of Economic Importance in Agriculture. Comparison of Digestive and Reproductive System of Horse, Ox and Sheep.

UNIT – IV (6 Hrs.)

Physiology of Respiration Composition of Blood and its function Reproduction, Locomotion in Animals Structure of skin and Heat Regulation General account of Aves.

MATHEMATICS-II

Subject Code: BMAT0 - 203 **L T P C** **Duration: 27 Hrs.**
2 0 0 2

UNIT–I (7 Hrs.)

Definition of function; Limit and continuity; The Limit of a Function, Calculating Limits Using the Limit Laws, Limits at Infinity; Horizontal Asymptotes' Derivatives and Rates of Change; The Derivative of a Function

UNIT–II (7 Hrs.)

Differentiation, successive differentiation, geometrical interpretation of derivative, applications of differentiation

UNIT–III (6 Hrs.)

Indefinite integration, integration by substitution

UNIT–IV (7 Hrs.)

Partial fractions and their use in integration; Integration by parts

Recommended Books:

1. N. Piskunov, 'Differential and Integral Calculus', Vol. II.
2. G.K.P., 'Differential and Integral Calculus' - Vol. 1.

PLANT PATHOGENS & PRINCIPLES OF PLANT PATHOLOGY LAB.

Subject Code: BAGE1 - 217 **L T P C**
0 0 2 1

Acquaintance to Plant Pathology Laboratory Equipment, Preparation of Culture Media for Fungi and Bacteria, Isolation Techniques and Preservation of Plant Disease Samples, Study of Important Plant Pathogenic Genera, Demonstration of Koch's Postulates. Study of Different Groups of Fungicides and Antibiotics, Bio-Control of Plant Pathogens; Visit to Remote Sensing Laboratory and Experimental Area.

COMPUTER APPLICATIONS IN AGRICULTURE LAB.

Subject Code - BCAP0-194 **L T P C**
0 0 2 1

Applications- MS WORD- Word Processing and Units of Document, Features of Word Processing Packages; Creating, Editing, Formatting and Saving a Document in MS WORD; Prepare Own Bio Data, Writing Mathematical Equations involving Sub/Super Scripts, Splitting a Paragraph in Columns
MS EXCEL: Electronic Spreadsheets; Concept; Packages; Creating, Editing and Saving a Spreadsheet; Diagrammatic Presentations and Use of Data Analysis Tools- Correlation and Regression, T-Test for Two-Samples with One-Way Classification. Creating Diagrams and other Statistical Functions
MS ACCESS: Concept of Database; Units of Database; Creating Database: Illustration through Examples
MS POWER POINT: Prepare Agriculture based Presentation with Special f\Features (with Photographs, Charts, Bullet Points etc.) of Power Point Package

AGRICULTURE MICROBIOLOGY LAB.

Subject Code - BAGE1 - 218 **L T P C**
0 0 2 1

Familiarization with Instruments and other Materials used in a Microbiology Laboratory, Preparation of Aseptic Methods on Nutrient Broth, Slants and Agar Plate, Methods of Sterilization and Preparation of Media and Glassware, Sterilization of Nutrient Broth by Filtration, Plating Methods for Isolation and Purification of Bacteria; Identification of Bacteria by Staining Methods; Enumeration of Bacteria by Staining, Pour Plate and Spread Plate Methods; Cultivation Technology of Mushrooms; Tissue Culture Preparation and Maintenance of Edible Fungi, Spawn Production

PRODUCTION TECHNOLOGY OF FRUIT CROPS LAB.

Subject Code: BAGE1 - 219 **L T P C**
0 0 2 1

Horticultural Tools and Their Uses, Containers and Potting Mixtures, Plant and Seed Propagation, Scarification and Stratification, Layout and Planting Systems, Methods of Pruning and Training, Training of Ber, Grape and Pomegranate, Pruning of Ber, Grape, Phalsa, Fig, Apple, Pear, Peach. Identification of Important Species and Varieties of Fruits, Irrigation Methods Including Drip and Micro Irrigation, Methods of Fertilizer Application, Preparation of Growth Regulators, Powder, Solution and Lanolin Paste for Propagation.

Application of Growth Regulators for Improving Fruit Set, Fruit Size, Quality, Delaying and Hastening Ripening. Visit to Local Commercial Orchards.

MANURES & FERTILIZERS LAB.

Subject Code: BCAP0 - 220 **L T P C**
0 0 2 1

Total Nitrogen and Phosphorus in Manures / Composts – Ammonical and Nitrate Nitrogen – Water Soluble P_2O_5, Potassium, Calcium, Sulphur and Zinc Contents of Fertilizers Chemical Oxygen Demand in Organic Wastes – Adulteration in Fertilizer – Compatibility of Fertilizers with Pesticides.

ZOOLOGY LAB.

Subject Code: BBIO0 - 204 **L T P C**
0 0 2 1

Study of Cell Structure and Cell Division; Microscopic Study of Histological Preparations of Simple and Compound Tissues; Anatomy of a Mammal; Slides of Frog Development; General Survey of Animal Kingdom up to Classes.

BIOCHEMISTRY

Subject Code: BAGE1-321 **L T P C** **Duration: 25 Hrs.**
2 0 0 2

Unit–I

Importance of Plant cell. Biomolecules-structure, function and properties. Amino acids, proteins and their quality.

Unit–II

Enzymes – classification, factors affecting activity, immobilization and other industrial applications. Vitamins, & minerals and hormones Lipids – their industrial applications. Biodiesel. Carbohydrates and nucleic acids.

Unit–III

Bioenergetics. Metabolism – basic concepts, Glycolysis, Citric acid cycle, pentose phosphate pathway, oxidative phosphorylation and fatty acid oxidation. General reactions of amino acid degradation. Biosynthesis- carbohydrates, lipids, proteins and nucleic acids.

Unit–IV

Metabolic regulation. Secondary metabolites – terpenoids, alkaloids, phenolics and their applications in food and pharmaceutical industries.

Recommended Books

1. E.E. Conn & P.K. Stumpf, ‘Outlines of Bio-Chemistry’.
2. S. Merits, ‘Elementary Biochemistry’.
3. Fairly & Kilgour, ‘Essentials of Biological Chemistry’.

PLANT PHYSIOLOGY

Subject Code: BAGE1-322 **L T P C** **Duration: 25 Hrs.**
2 0 0 2

Unit – I

Introduction and importance of plant physiology in agriculture.

Unit–II

Seed structure; Morpho-physiological and biochemical changes during seed development; Physiological and harvestable maturity; Seed germination and seed dormancy.

Unit–III

Growth and development; Crop water relations; Transpiration and its significance in relation to crop productivity; Water use efficiency; Significance of C3, C4 and CAM pathways; Photorespiration; Photosynthesis and crop productivity; Translocation of assimilates. Source-sink relationship; its types and significance.

Unit–IV

Mineral nutrition; physiology of nutrient uptake, deficiency and toxicity symptoms and hydroponics; Photoperiodism and vernalization; Plant growth regulators- occurrence, biosynthesis, mode of action and commercial applications; Senescence and abscission; Fruit ripening and its hormonal regulation.

Recommended Books

1. William G. Hopkins and Norman P.A. Huner, 'Introduction to Plant Physiology'.

PRINCIPLES OF AGRONOMY-I (KHARIF CROPS)

Subject Code: BAGE1-323 **L T P C** **Duration: 37 Hrs.**

2 1 0 3

Unit–I

Meaning and scope of Agronomy; tillage and crop stand establishment. Planting geometry and its effect on growth and yield; Cropping systems- origin, geographic distribution, economic importance, soil and climatic requirements of major crops.

Unit II

Varieties, cultural practices and yield of *kharif* cereal crops- rice, maize, sorghum, pearl millet.

Unit–III

Varieties, cultural practices and yield of *kharif* pulses- pigeonpea, mungbean, urdbean and oilseeds - groundnut, sesame, soybean.

Unit–IV

Varieties, cultural practices and yield of *kharif* fibre crops- cotton, jute, sunhemp and forage crops -sorghum, maize, cowpea, cluster bean and napier.

Recommended Books

1. 'Handbook of Agriculture', ICAR.
2. 'Package of Practices for Kharif Crops', PAU.
3. 'Text Book of Field Crops Production-Food Grain Crops', ICAR.
4. 'Text Book of Field Crops Production- Commercial Crops', ICAR.

FUNDAMENTALS OF INSECT MORPHOLOGY AND SYSTEMATIC

Subject Code: BAGE1-324 **L T P C** **Duration: 37 Hrs.**

2 1 0 3

Unit–I

Entomology: Definition and its history; importance and scope; Factors affecting insect abundance.

Unit–II

Integument, body regions and segmentation; Modification and function of mouth parts, antennae, legs and wings; wing venation and wing coupling apparatus; Sense organs; metamorphosis and diapauses; Types of reproduction.

Unit–III

Morphology and anatomy of Grasshopper.

Unit–IV

Taxonomy- its importance, history, development and binomial nomenclature; Classification of class Insecta up to orders, suborders and important families with special emphasis on distinguishing morphological characters.

Recommended Books

1. A.D. Imms, 'A General Text Book of Entomology'.
2. R.E. Snodgrass, 'Principles of Insect Morphology'.
3. R.F. Chapman, 'The Insects: Structure and Function'.
4. H.S. Pruthi, 'Text Book of Agricultural Entomology'.
5. M.S. Mani, 'General Entomology'.
6. P.M. Srivastava and Ashok Kumar, 'Text Book of Agricultural Entomology'.

SOIL CHEMISTRY, FERTILITY AND NUTRIENT MANAGEMENT

Subject Code: BAGE1-325 **L T P C** **2 1 0 3** **Duration: 37 Hrs.**

Unit–I

Soil as a source of plant nutrients. Essential and beneficial elements- criteria of essentiality, forms of nutrients in soil, mechanisms of nutrient transport to plants. Factors affecting nutrient availability to plants.

Unit–II

Measures to overcome deficiencies and toxicities. Problem soils- acid, salt affected and calcareous soils, characteristics, nutrient availabilities, Reclamation- mechanical, chemical and biological methods.

Unit–III

Fertilizer and insecticides and their effect on soil, water and air. Irrigation water- quality of irrigation water and its appraisal. Soil fertility- approaches for soil fertility evaluation. Methods of soil testing. Critical levels of different nutrients in soil. Plant analysis- DRIS approach, critical levels in plants. Rapid tissue tests.

Unit–IV

Indicator plants. Biological methods of soil fertility evaluation. Soil test based fertilizer recommendations to crops. Factors influencing nutrient use efficiency (NUE) in respect of N, P, K, S, Fe and Zn fertilizers. Source, method and scheduling of nutrients for different soils and crops grown under rain fed and irrigated conditions.

Recommended Books

1. N.C. Brady and Ray R. Well, 'The Nature and Properties of Soils'.
2. S.S. Singh, 'Soil Fertility & Nutrient Management'.

FUNDAMENTALS OF SOIL AND WATER CONSERVATION ENGINEERING

Subject Code: BAGE1-326 **L T P C** **2 1 0 3** **Duration: 37 Hrs.**

Unit-I

Surveying: Survey equipment, chain survey. Plotting procedure. Calculations of area of regular and irregular fields. Levelling- terminology, equipment, methods of calculation; types of levelling and contouring.

Unit-II

Irrigation- classification of projects, flow irrigation and lift irrigation. Water sources. Water lifting devices; pumps, their capacity and power calculations.

Unit-III

Irrigation water measurement- weirs, flumes and orifices, Water conveyance systems- open channel and underground pipeline. Surface, drip and sprinkler irrigation methods.

Unit-IV

Soil and water conservation, soil erosion, types and control measures

Recommended Books

1. 'Agriculture Engineering Land Surveying', Tata McGraw Hill Publishing Co.
2. Irshad Ali, 'Agriculture Machinery and Land Surveying'.

FARM POWER & MACHINERY

Subject Code: BAGE1-327 **L T P C** **Duration: 25 Hrs.**

2 0 0 2

Unit–I

Historical perspective of farm power development in India, socio-economic implications of farm mechanization in India, internal combustion (IC) engines and terminology; working principles of two stroke and four stroke engines.

Unit–II

Different systems of tractors- types and selection.

Unit–III

Primary and secondary tillage implements; implements for agricultural operations; seed drills, paddy translators- their calibrations.

Unit–IV

Plant protection equipment; harvesting and threshing equipment; cost of operation of tractor and other farm machinery.

Recommended Books

1. 'Farm Machinery and Equipment', Tata McGraw Hill Publishing Co.
2. 'Farm Power and Machinery', Kitab Mahal.
3. S.C. Jain and C.R. Rai, 'Tractor Engine'.

BIOCHEMISTRY LAB.

Subject Code: BAGE1-328 **L T P C**

0 0 2 1

Quantitative tests for carbohydrates, lipids. proteins and amino acids. Paper electrophoresis. Chromatography-paper, TLC, GLC. Extraction of oil from oil seeds. Acid value, Iodine value, Saponification value. Quantitative determination of phenols, sugars, proteins, nucleic acids and enzyme activity (amylase).

PLANT PHYSIOLOGY LAB.

Subject Code: BAGE1-329 **L T P C**

0 0 2 1

Seed structure, germination and seed dormancy. Growth analysis. Calculation of growth parameters. Methods of measuring water status in roots, stems and leaves. Measurement of water potential. Absorption spectrum of chloroplastic pigments. Transpiration.

Photosynthesis and respiration. Stomatal frequency and index. Deficiency symptoms of nutrients. Leaf anatomy of C3 and C4 plants.

PRINCIPLES OF AGRONOMY-I LAB.

Subject Code: BAGE1-330 **L T P C**
0 0 2 1

Study of tillage implements. Practice of ploughing and puddling. Seed bed preparation, sowing, fertilizer application, nursery raising and transplanting of Kharif crops. Calculations of seed rate. Effect of seed size and sowing depth on germination. Identification of weeds of Kharif crops; Study of yield components; Study of kharif crops and their important agronomic practices.

FUNDAMENTALS OF INSECT MORPHOLOGY AND SYSTEMATIC LAB.

Subject Code: BAGE1-331 **L T P C**
0 0 2 1

Collection and preservation of insects including immature stages; Morphology and anatomy of grasshopper; different types of antennae, mouth parts, legs and wings; Wing venation and wing coupling apparatus; Types of larvae and pupae; Study of characters of orders - Odonata, Orthoptera, Dictyoptera, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance.

SOIL CHEMISTRY FERTILITY AND NUTRIENT MANAGEMENT LAB.

Subject Code: BAGE1-332 **L T P C**
0 0 2 1

Principles of analytical instruments and their calibration and applications, Colorimetry and flame photometry. Estimation of available N, P, K, S and Zn in soils. pH, Electrical Conductivity, carbonates, bicarbonates, Ca^{++} and Mg^{++} in soil and water. Lime requirement and gypsum requirement of problem soils. Estimation of N, P and K in plants.

FUNDAMENTALS OF SOIL AND WATER CONSERVATION ENGINEERING LAB.

Subject Code: BAGE1-333 **L T P C**
0 0 2 1

Acquaintance with chain survey equipment. Ranging and measurement of offsets. Chain triangulation and plotting. Levelling equipment. Differential levelling. Profile levelling. Contour survey and plotting. Study of centrifugal pumping system and irrigation water measuring devices. Surface irrigation methods. Study of different components of sprinkler and drip irrigation systems. Uniformity of water application in drip and sprinkler systems. Study of soil and water conservation measures.

FARM POWER & MACHINERY LAB.

Subject Code: BAGE1-334 **L T P C**
0 0 2 1

Study of different IC engines; Working of two stroke and four stroke engines; various systems of tractor, disc plough, seed-cum-fertilizer drills, furrow openers, metering

mechanism and calibration; study of different types of farm machinery and equipment, repair, adjustment and operation of sprayers and dusters; registration procedures.

INTRODUCTION TO GENETICS

Subject Code: BAGE1-435 **L T P C** **Duration: 37 Hrs.**
2 1 0 3

Unit-1

Structure of cell and cell organelles and their functions: mitosis and meiosis, significance and differences between them; Study of chromosome structure, morphology, number and types; Karyotype and idiogram; Mechanism of crossing over and cytological proof of crossing over; Numerical and structural chromosomal aberrations.

Unit-II

Mendel's laws of inheritance and exceptions to the laws, Cytoplasmic inheritance, its characteristic features and difference between chromosomal and cytoplasmic inheritance; Types of gene action, Multiple alleles, Pleiotropism, Penetrance and expressivity; Qualitative and Quantitative traits and differences between them; Multiple factor hypothesis.

Unit-III

DNA and its structure, function, types, modes of replication and repair, RNA and its structure, function and types; Transcription and Translation; Genetic code and outline of protein synthesis; Linkage, types of linkage and its estimation; Mutation and its characteristic features; Methods of inducing mutations and detection of sex linked and autosomal mutations (CLB technique etc.).

Unit-IV

Evolution of different crop species like cotton, wheat, gram, triticale and Brassicas.

Recommended Books

1. B.D. Singh, ‘Fundamentals of Genetics’.
2. P.K. Gupta, ‘Genetics’.
3. E.J. Gardner and M.J. Simmons, ‘Principles of Genetics’.

PRINCIPLES OF SEED TECHNOLOGY

Subject Code: BAGE1-436 **L T P C** **Duration: 25 Hrs.**
2 0 0 2

Unit-I

Introduction to seed production; seed policy; deterioration of crop varieties; maintenance of genetic purity during seed production; seed quality

Unit-II

Different classes of seed; Nucleus, Breeder, Foundation and certified seed production of varieties and hybrids of field and vegetable crops

Unit-III

Seed certification, phases of certification, procedure for seed certification, field inspection and field counts etc.; constitution and role of central seed committee, central seed certification board, state seed certification agency, central and state seed testing laboratories; duties and powers of seed inspectors, offences and penalties; seed control order; Seed Act; other issues related to WTO, IPRs, Patenting, Plant Breeder’s Rights; varietal identification through grow-out test and electrophoresis; seed drying; establishment of seed processing plant; establishing a seed testing laboratory

Unit-IV

Seed testing procedures for quality assessment, seed treatment, importance of seed treatment, types of seed treatment, seed packing and seed storage, stages of seed storage, factors affecting seed longevity during storage and conditions required for good storage, general principles of seed storage, measures for pest and disease control, temperature control, seed marketing, factors affecting seed marketing.

Recommended Books

1. R.L Agrawal, 'Seed Technology'.
2. P.K. Agarwal, 'Principles of Seed Technology'.
3. Khare and Bhale, 'Seed Technology'.

PRINCIPLES OF AGRONOMY-II (RABI CROPS)

Subject Code: BAGE1-437 **L T P C** **2 1 0 3** **Duration: 37 Hrs.**

Unit-I

Origin, geographic distribution, area, yield and production of *rabi* crops in different states of India; Causes of variation in their productivity under different agro-ecologies of the country; National and International Agricultural Research Institutes and their mandate and role in Indian agriculture.

Unit-II

Economic importance, soil and climatic requirements, varieties, cultural practices and production techniques of rabi season cereal crops

Unit-III

Economic importance, soil and climatic requirements, varieties, cultural practices and production techniques of rabi pulses -chickpea, lentil, field pea, French bean and oilseeds rapeseed and mustard, sunflower, safflower, linseed

Unit-IV

Economic importance, soil and climatic requirements, varieties, cultural practices and production techniques of other important rabi crops such as sugarcane, sugar beet, potato, tobacco and forage crops- berseem, Lucerne and oats

Recommended Books

1. Chidda Singh, 'Modern Techniques of Raising Field Crops'.
2. 'Package of Practices for Rabi Crops', PAU.
3. S.R. Reddy, 'Agronomy of Field Crops'.
4. 'Hand Book of Agriculture', Indian Council of Agricultural Research.
5. Rajendra Prasad, 'Text Book of Field Crop'.

ORGANIC FARMING

Subject Code: BAGE1-438 **L T P C** **1 0 0 1** **Duration: 12 Hrs.**

Unit-I

Organic farming: introduction, concept, relevance in the present context; Merits and demerits. Organic production requirements; Biological intensive nutrient management, Bio-farming.

Unit-II

Recycling and *in situ* management of organic residues; site selection, Soil improvement and amendments; integrated diseases and pest management

Unit-III

Use of bio-control agents; bio-pesticides; pheromones, trap crops and bird perches, biological weed management.

Unit-IV

Quality considerations- certification, labelling and accreditation processors, marketing and export requirements for organic products.

Recommended Books

1. Anil Chavan and Sandeep Raskar, 'Text Book of Organic Agriculture'.
2. D. Kumara Manimuthu Veeral, 'Text Book of Organic Farming'.

INSECT ECOLOGY AND PEST MANAGEMENT

Subject Code: BAGE1-439 **L T P C** **Duration: 25 Hrs.**
2 0 0 2

Unit-I

Insect Ecology: Introduction, environment and its components, effect of abiotic and biotic factors. Biotic potential, environmental resistance and causes of pest outbreaks in agro-ecosystem. Pest and its categories, Crop Losses. Beneficial insects: important pollinators, weed killers and scavengers; their importance. Important non-insect pests: mites, rodents and birds.

Unit-II

Chemical Control: importance, hazards and limitations. Natural Control. Host plant resistance. Physical, Mechanical and Cultural Control. Biological Control: parasitoids, predators and microbes. Legislative Control. Insecticide Act 1968.

Unit-III

Classification, toxicity and formulations of insecticides. Study of important insecticides: botanicals, organochlorines, organophosphates, carbamates, synthetic pyrethroids. Rodenticides, Acaricides and Fumigants. Biorational and other innovative approaches in pest management: insect growth regulators (Hormones), semiochemicals, Synergism, Pheromones, Repellents, antifeedants, chemosterilants, genetic control etc.

Unit-IV

Pest surveillance, monitoring and forecasting. Economic threshold and Economic injury levels. Integrated pest management (IPM): need; its tools and limitations. IPM in important vegetables: brinjal, okra, cauliflower and cucurbits.

Recommended Books

1. A.S. Atwal and G.S. Dhaliwal, 'Agricultural Pests of South Asia and their Management', Kalyani Publishers, Ludhiana.
2. G.S. Dhaliwal and Ramesh Arora, 'Principles of Insect Pest Management', National Agricultural Technology Information Centre, Ludhiana.
3. R.C. Saxena and R.C. Srivastava, 'Entomology at a Glance', Agrotech Publishing Academy, Udaipur.
4. S.S. Bains and A.S. Atwal, 'Applied Animal Ecology', Kalyani Publishers, Ludhiana.
5. G.S. Dhaliwal, Ram Singh and B.S. Chillar, 'Essentials of Agriculture Entomolgy', Kalyani Publishers, Ludhiana.
6. G.S. Dhaliwal and K.P. Srivastava, 'A Text Book of Applied Entomology', Vol. -I and II, Kalyani Publishers, Ludhiana.

FARM MANAGEMENT AND AGRICULTURAL FINANCE

Subject Code: BAGE1-440 **L T P C** **Duration: 25 Hrs.**
2 0 0 2

Unit-I

Farm Management: meaning, definition and Importance; Economic principles applicable to the organizations of farm business. Agricultural Production Economics: definition, nature and scope; Laws of returns; Factor- product Relationships; determination of optimum input and output.

Unit-II

Types and Systems of Farming: Farm planning and budgeting; Risk and uncertainty; Farm record keeping- need and importance.

Unit-III

Agricultural Finance: nature and scope, compounding and discounting. Agricultural credit: meaning, definition, need and classification; Credit appraisal; History of financing agriculture in India. Agricultural Financial Institutions, indebtedness problems.

Unit-IV

Assessment of Crop Losses: Determination of compensation; Crop insurance; Agricultural Cooperatives- philosophy and principles; History of Indian Cooperative Movement; Reorganization of cooperative credit structure.

Recommended Books

1. Joginder Singh, 'Farm Business Accounting', R.S.G. Publishers.
2. Singh and Lekhi, 'Agricultural Economics', Kalyani Publishers.
3. Johl and Kapoor, 'Fundamental of Farm Management', Kalyani Publishers.

EXTENSION METHODOLOGIES AND COMMUNICATION SKILLS

Subject Code: BAGE1-441 **L T P C** **Duration: 25 Hrs.**
1 1 0 2

Unit-I

Meaning, nature, importance, models and barriers in communication; Extension programme planning; Principles and steps in programme development process; Monitoring and evaluation of extension programmes

Unit-II

Extension teaching methods and factors influencing their selection and use; Combination (Media Mix) of teaching methods; Innovative information sources; Audio- visual aids; Meaning, scope and importance of agricultural journalism.

Unit-III

Diffusion and adoption of innovations; Models of adoption process. Factors influencing adoption process.

Unit-IV

Capacity building of extension personnel and farmers, Communication skills for effective transfer of technology; Organizing Field days, exhibitions; seminars and conferences

Recommended Books:

1. G.L Ray, 'Extension Communication and Management'.
2. O.P. Dharma and O.P. Bhatnagar, 'Education and Communication for Development'.
3. Ranjit Singh, 'Extension Education'.

LIVESTOCK PRODUCTION AND MANAGEMENT

Subject Code: BAGE1-442 **L T P C** **Duration: 27 Hrs.**
2 0 0 2

Unit-I

Place of livestock in the national economy, Livestock development programmes. Exotic and Indian breeds of cattle, buffalo, sheep, goat and swine. Reproductive behaviour; oestrous cycle. Artificial Insemination. Pregnancy and parturition in various livestock species. Care of pregnant animal and new born young one. Measures and factors affecting fertility in livestock.

Unit-II

Physiology of milk secretion and different milking methods. Factors affecting milk yield and composition. Selection procedure and various systems of breeding in livestock.

Unit-III

Feeding and management of calves, heifers, pregnant and milch animals sheep, goat and swine. Housing principles for livestock. Vaccination and prevention of important diseases of livestock and poultry.

Unit-IV

Important breeds of poultry, egg formation, abnormal eggs and factors affecting egg size. Moulting, incubation, hatching and brooding. Housing, breeding, feeding and management of poultry. Biotechnological interventions in animal production and reproduction.

Recommended Books

1. G.C. Banerjee, 'A Textbook of Animal Husbandry', Oxford IBH Publications.
2. C.K. Thomas and N.S.R. Shastr, 'Dairy Bovine Production', Kalyani Publications.
3. C.K. Thomas and N.S.R. Shastry, 'Livestock Production Management', Kalyani Publications.
4. 'Handbook of Animal Husbandry', ICAR Publication.
5. R.A. Singh 'Poultry Production Management', Kalyani Publications.

INTRODUCTION TO GENETICS LAB.

Subject Code: BAGE1-443 **L T P C**
0 0 2 1

Microscopy (Light microscopes and electron microscopes; Preparation and use of fixatives and stains for light microscopy; Preparation of micro slides and identification of mitosis and meiosis; Monohybrid, Dihybrid and Trihybrid ratios and their modifications; Chi- square analysis; Interaction of factors; Epistatic factors, Supplementary factors and Duplicate factors; Complementary factors, Additive factors and Inhibitory factors; Linkage - Two point test cross; Linkage - Three point test cross; Induction of polyploidy using colchicine; Induction of chromosomal aberrations using chemicals.

PRINCIPLES OF SEED TECHNOLOGY LAB.

Subject Code: BAGE1-444 **L T P C**
0 0 2 1

Seed sampling principles and procedures; physical purity analysis of field crops; germination analysis of field crops; moisture tests of field crops; viability test of field crops; seed health test of field crops; seed dormancy and breaking methods; grow out tests for varietal

identification; visit to seed production plots; visit to seed processing plants; visit to seed testing laboratories; planting ratios, isolation distance and rouging, etc.

PRINCIPLES OF AGRONOMY-II LAB./FIELD

Subject Code: BAGE1-445 **L T P C**
0 0 2 1

Study of manures, fertilizers and green manure crops; Study of intercultural implements; Methods of fertilizer application; Seed bed preparation and sowing of wheat, sugarcane and sunflower; Calculations of seed rate; Identification of weeds in wheat and grain legumes; Morphological characteristics of wheat, sugarcane, chickpea and mustard; Yield components of wheat and sugarcane.

ORGANIC FARMING LAB./FIELD

Subject Code: BAGE1-446 **L T P C**
0 0 2 1

Raising of vegetable crops through organic sources. Diseases and pest management; Vermi-composting; Vegetable and ornamental nursery raising; Macro quality analysis; Grading, packaging and post-harvest management.

INSECT ECOLOGY AND PEST MANAGEMENT LAB./FIELD

Subject Code: BAGE1-447 **L T P C**
0 0 2 1

Study of terrestrial and pond ecosystem, behaviour, orientation, distribution patterns of insects. Sampling techniques for the estimation of insect population and damage. Pest surveillance through light and pheromone traps. Practicable IPM practices. Insecticides and their formulations; calculation of doses of insecticides. Compatibility of pesticides. Identification of common insect-pests, phytophagous mites, rodent, bird pests and their damage, other beneficial insect-pollinators, weed killers and scavengers.

FARM MANAGEMENT AND AGRICULTURAL FINANCE LAB.

Subject Code: BAGE1-448 **L T P C**
0 0 2 1

Filling of farm record book, analysis of farm records and possible improvements, Methods of depreciation. Preparation of farm plans and budgets, profit and loss account. Break-even analysis. Economic analysis of different crop and livestock enterprises. Compounding and discounting the cost and return. Preparation of balance sheet, income statement and cash flow analysis. Estimation of credit needs. Determination of unit costs. Preparations and analysis of loan proposals.

LIVESTOCK PRODUCTION AND MANAGEMENT LAB./FARM

Subject Code: BAGE1-449 **L T P C**
0 0 2 1

Visit to livestock farms and breed identification. Study of external body parts. Handling and restraining of animals. Judging of animals. Milking methods. Feeding and ration formulation.

Record keeping. Study of reproductive organs and Artificial Insemination. Physiological norms in cattle and buffaloes. Hatching, housing and management of poultry.

INTRODUCTION TO PLANT BREEDING

Subject Code: BAGE1-550 **L T P C** **Duration: 25 Hrs.**
2 0 0 2

Unit-I

Floral biology, emasculation and pollination techniques in cereals (wheat, rice and maize), millets (bajra and sorghum), pulses (chickpea, pigeon pea and moong bean), oilseeds (Brassica and sunflower), cash crops (cotton and sugarcane). Modes of reproduction- sexual and asexual.

Unit-II

Plant Breeding- aims and objectives. Modes of pollination, its genetic consequences and significance in plant breeding. Methods of breeding in self- and cross-pollinated crops. Introduction and Domestication; Johannsen's pure-line theory and its genetic basis; mass selection and pure line selection. Hybridization- aims and objectives, types of hybridization. Methods of handling segregating generations- pedigree method, bulk method, back cross method.

Unit-III

Self-incompatibility and male sterility and their utilization in crop improvement. Heterosis, inbreeding depression, various theories of heterosis, exploitation of hybrid vigour, development of inbred lines, single-cross and double cross hybrids; population improvement methods, progeny selection, mass selection, recurrent selection; synthetics and composites; multiline varieties.

Unit-IV

Mutation breeding; ploidy breeding; Apomixis- its types and significance; wide hybridization and its role in crop improvement.

Recommended Books

1. G.S. Chahal and S.S. Gosal, 'Principles and Procedure of Plant Breeding', Narosa Publishing House.
2. B.D. Singh, 'Plant Breeding: Principles and Methods', Kalyani Publishers.
3. V.L. Chopra, 'Plant Breeding: Theory and Practice', Oxford & IBH Publishing Co. Pvt. Ltd.
4. V.L. Chopra, 'Breeding Field Crops: Theory and Practice', Oxford & IBH Publishing Co. Pvt. Ltd.
5. Hari Har Ram, 'Crop Breeding and Biotechnology', Kalyani Publishers.

PLANT TISSUE CULTURE AND GENETIC TRANSFORMATION

Subject Code: BAGE1-551 **L T P C** **Duration: 25 Hrs.**
2 0 0 2

Unit-I

Tissue culture- concepts and history; various aspects of plant tissue culture; somatic cell cultures. somatic embryogenesis; meristem culture; *In vitro* grafting; micropropagation; somaclonal variations.

Unit-II

Anther and pollen culture; embryo/ovule/ovary culture. Production of secondary metabolites through tissue culture.

Unit-III

Protoplast culture and somatic hybridization; cryopreservation of germplasm.

Unit-IV

Methods of genetic transformation; testing and commercialization of transgenic crops.

Recommended Books

1. H.S. Chawla, 'Introduction to Plant Biotechnology', Science Publishers.
2. T.A. Brown, 'Gene Cloning and DNA Analysis', Wiley-Blackwell.
3. Jayabalan, 'Plant Biotechnology'.
4. U. Kumar, 'Methods in Plant Tissue Culture'.
5. M.K. Razdan, 'Introduction to Plant Tissue Culture'.

CHEMISTRY OF AGROCHEMICALS

Subject Code: BAGE1-552 **L T P C** **Duration: 25 Hrs.**

2 0 0 2

Unit-I

Organic chemistry as prelude to agrochemicals. Diverse types of agrochemicals.

Unit-II

Synthetic organic insecticides, major classes, chemistry and use of Carbamates (Carbaryl, carbofuran, thiodicarb, Triazamate), Organophophates (Acephate, Chloropyriphos methyl, Quinalphos, Dimethoate), phenylpyrazoles (Fipronil, Ethiprole), Neonicotinoids (Imidacloprid, Acetamiprid), Metaflumizone, Indoxacarb, fenoxycarb.

Unit-III

Herbicides-major classes, chemistry and use of Phenoxy, Triazine, Triazinone, Benzothiadiazole, Amide, Organophosphorus, Pyrazolone, bipridylium, and Thiocarbamate. Fungicides - major classes, Chemistry and use of carbendazim, carboxin, captan, tridemorph, copper oxychloride Mancozeb, Tricyclazole, Carbendazim, Hexaconazole, Metalaxyl.

Unit-IV

Botanical insecticides (neem), pyrethrum and synthetic pyrethroids. Plant growth regulators.

Recommended Books

1. A.S. Atwal and G.S. Dhaliwal 'Agricultural Pests of South Asia and their Management'.
2. V.S. Walia, 'Weed Management'.
3. O.P. Gupta, 'Modern Weed Management'.
4. R.P. Singh, 'Plant Pathology'.
5. T.V. Sathe, 'Agro-chemicals and Pest Management'.
6. N.K. Roy, 'Chemistry of Pesticides'.
7. D.S. Reddy, 'Pesticides'.
8. T.K. Das, 'Weed Science Basic and Application'.

INTRODUCTORY FORESTRY

Subject Code: BAGE1-553 **L T P C** **Duration: 14 Hrs.**

1 0 0 1

Unit-I

Forestry: definition, scope and important terminology. Status and role of forests in India. History of forestry development in India. National and international forestry organizations. Forest types, distribution of forests and their classification.

Unit-II

Silviculture & its objectives; tending operations. Locality factors: climatic, edaphic, topographical and biotic. Agroforestry, farm forestry and social forestry - definition, objectives and need. Role of trees in rural economy.

Unit-III

Choice of species w.r.t. site/economic uses and constraints of tree growing. Tree propagation and planting methods.

Unit-IV

Deforestation: Forms, causes and remedial measures. Forest management: growing stock, normal forest, sustained yield, increment and rotation. Forest utilization, major and minor forest products. Forest policies and legislations.

Recommended Books

1. K.M. & S. Prabhu, 'Indian Forestry', IFS.
2. A.J. Raj & S. B Lal, 'Forestry: Principles & Applications'.
3. A.P. Dwivedi, 'Text Book of Silviculture'.
4. Manikandan, 'Indian Forestry'.

FLOWER CULTIVATION AND LANDSCAPE GARDENING

Subject Code: BAGE1-554 **L T P C** **Duration: 27 Hrs.**

1 1 0 2

Unit-I

Introduction to floriculture and landscaping. Package of practices for rose, chrysanthemum, gladiolus, marigold and tuberose.

Unit-II

Planning of gardens. Landscape-art principles, formal, informal, free and wild styles of gardens. Nursery production of ornamentals.

Unit-III

Maintenance and uses of trees, shrubs, climbers, cactus and succulents and shade loving plants.

Unit-IV

Annual flowering plants and their uses. Making and maintenance of lawns.

Recommended Books

1. J.S. Arora, 'Introductory Ornamental Horticulture'.
2. Swarup, 'Garden Flowers'.
3. 'Package of Practices of Flower Crop', PAU Ludhiana.
4. Desh Raj, 'Floriculture at a Glance'.
5. ICAR, 'Handbook of Horticulture'.
6. M.S. Randhawa, 'Floriculture in India'.

DISEASES OF HORTICULTURAL CROPS AND THEIR MANAGEMENT

Subject Code: BAGE1-555 **L T P C** **Duration: 27 Hrs.**

1 1 0 2

Unit-I

Economic importance, symptoms, causal organism, epidemiology, disease cycle and integrated management of diseases of citrus, mango, banana, grapevine, pomegranate and papaya.

Unit-II

Economic importance, symptoms, causal organism, epidemiology, disease cycle and integrated management of diseases of guava, sapota, ber, pear, peach, plum and apple.

Unit-III

Economic importance, symptoms, causal organism, epidemiology, disease cycle and integrated management of diseases of chilli, brinjal, okra, potato, crucifers, cucurbits, tomato, pea, beans, onion and garlic.

Unit-IV

Economic importance, symptoms, causal organism, epidemiology, disease cycle and integrated management of diseases of rose, chrysanthemum, gladiolus, marigold and jasmine.

Recommended Books

1. G.P. Jagtap, 'Diseases of Horticulture Crops & their Management'.
2. P. Parvatha Reddy, 'Fungal Diseases & their Management in Horticulture Crops'.
3. 'Field Problems of Crops', PAU Ludhiana.
4. D.P. Tripathi, 'Introductory Plant Pathology'.
5. 'Handbook of Horticulture', ICAR.

INSECT PESTS OF CROPS AND STORED GRAINS

Subject Code: BAGE1-556 **L T P C** **Duration: 27 Hrs.**

2 0 0 2

Unit-I

Distribution, biology, symptoms of damage and management strategies of insect pests of rice, sorghum, maize, cotton, groundnut, sugarcane, ragi (*Eleucine coracana*), wheat, sunhemp, pulses, castor, safflower, sunflower and mustard.

Unit-II

Distribution, biology, symptoms of damage and management strategies of insect pests of brinjal, bhindi, tomato, cruciferous and cucurbitaceous vegetables, potato, sweet potato, chillies, turmeric, onion, coriander, garlic and ginger.

Unit-III

Distribution, biology, symptoms of damage and management strategies of insect pests of mango, citrus, grapevine, cashew, banana, pomegranate, guava, sapota, ber, apple and coconut.

Unit-IV

Distribution, biology, symptoms of damage and management strategies of insect pests of tobacco, coffee, tea, ornamental plants and stored grain insect pests.

Recommended Books

1. A.S. Atwal and G.S. Dhaliwal, 'Agricultural Pests of South Asia and their Management'.
2. K.P Srivastva and G.S. Dhaliwal, 'A Text Book of Applied Entomology'.
3. Vikaspedia, 'Stored Grain Pests and their Control'.
4. 'Integrated Pest Management', FAO of United Nation.

CROP RESIDUE MANAGEMENT

Subject Code: BAGE1-557 **L T P C** **Duration: 14 Hrs.**

1 0 0 1

Unit-I

Significance of crop residue management in Indian agriculture. Challenges for diversified uses of crop residue in high cropping intensity areas.

Unit-II

Crop residue management in relation to agricultural ecosystems and conservation agriculture. On-site and off-site management of crop residues and soil health indicators.

Unit-III

Effects of crop residue management on soil health, crop yields, social and environmental concerns.

Unit-IV

Recent technologies for residue management in conservation agriculture based systems. Policy options for efficient residue management in Punjab.

Recommended Books:

1. Rajendra Prasad, 'Text Book of Plant Nutrient Management', Indian Society of Agronomy.
2. M.L. Dotaniya, 'Crop Residue Management in Rice-Wheat Cropping System', Lambard Academic Publishing.
3. Verlon K. Vrana, 'Crop Residue Management for Conservation'.
4. J.L. Hatfield & A. Stewart, 'Crop Residue Management'.
5. Paul W. Unger, 'Managing Agricultural Residues'.
6. S.K. Sharma, 'Crop Residue Management: for Soil Health, Crop Productivity, & Environmental Quality'.
7. Rashad Hegazy, 'Residue Management Devices for No- till Drills'.
8. LPea Kai, 'Agricultural Residue Management in Developing Countries'.

AGRICULTURAL MARKETING, TRADE AND PRICES

Subject Code: BAGE1-558 **L T P C** **Duration: 27 Hrs.**
2 0 0 2

Unit-I

Agricultural Marketing: Concept, definition, scope, components of market, classification of markets, Market structure, conduct and performance; Market functionaries. Producer's surplus: meaning, types, marketable surplus and marketed surplus. Marketing efficiency: meaning, marketing costs, margins and price spreads.

Unit-II

Trade: domestic trade, free trade, international trade, GATT, WTO, implications of AOA, market access, domestic support, export subsidies, WTO ministerial conferences, EXIM policy of India.

Unit-III

Market Integration: definition, types; co-operative marketing; state trading. Ware Housing Corporation: objectives, functions and advantages. Food Corporation of India: objectives and functions.

Unit-IV

Quality Control: agricultural products, AGMARK, meaning and need for agricultural marketing policy. Risk in marketing: meaning, importance and types of risks; speculations and hedging. Futures trading, contract farming, e-marketing.

Recommended Books

1. S.S. Acharya, 'Agricultural Marketing in India'.
2. Joginder Singh & R.K. Lekhi, 'Agricultural Marketing, Trade and Prices: An Indian Perspective', Kalyani Publishers, **2018**.
3. C.B. Mamoria & R.L. Joshi, 'Principles and Practices of Marketing in India'.
4. F.L. Thomson, 'Agricultural Marketing'.

INTRODUCTION TO PLANT BREEDING LAB.

Subject Code: BAGE1-559 **L T P C**
0 0 2 1

Botanical description and floral biology; study of megasporogenesis and microsporogenesis. Fertilization and life cycle of an angiospermic plant. Plant Breeder's kit: hybridization techniques and precautions to be taken while attempting crosses; floral morphology, selfing, emasculation and crossing techniques in different self and cross pollinated species. Study of male sterility and incompatibility.

PLANT TISSUE CULTURE AND GENETIC TRANSFORMATION LAB.

Subject Code: BAGE1-560 **L T P C**
0 0 2 1

Medium preparation. Surface sterilization of explants. Establishment of callus/cell suspension cultures. Induction of plant regeneration. Hardening and transfer to soil. Micropropagtaion. Embryo culture. Anther and pollen culture. Particle gun bombardment.

FLOWER CULTIVATION AND LANDSCAPE GARDENING LAB.

Subject Code: BAGE1-561 **L T P C**
0 0 2 1

Identification of trees, shrubs, climbers, houseplants, seasonal flowers; layout of lawns and maintenance. Potting, repotting and maintenance of houseplants. Training and pruning of rose. Pinching and disbudding chrysanthemum. Planning of gardens and development of garden features. Post-harvest handling of cut flowers.

DISEASES OF HORTICULTURAL CROPS AND THEIR MANAGEMENT LAB.

Subject Code: BAGE1-562 **L T P C**
0 0 2 1

Study of symptoms and host-parasite relationships of important diseases of horticultural crops; Field visits at appropriate time during the semester.

INTRODUCTORY FORESTRY LAB.

Subject Code: BAGE1-563 **L T P C**
0 0 2 1

Identification of trees. Measurement of tree height, diameter, girth, bark thickness, increment, age and volume. Nursery raising and silvicultural practices of some economic forest trees viz., safeda, poplar, shisham, mulberry, kikar, sagwan, dek, bamboo and subabul.

INSECT PESTS OF CROPS AND STORED GRAINS LAB.

Subject Code: BAGE1-564 **L T P C**
0 0 2 1

Identification of insect pests and their damage symptoms of rice, sorghum, maize, wheat, sugarcane, cotton, pulses, oil seeds crops and store gains; important vegetables and fruits crops in the Punjab.

PRACTICAL CROPS PRODUCTION (*KHARIF* CROPS) LAB.

Subject Code: BAGE1-565 **L T P C**
0 0 2 1

Crop planning, raising filed corps in multiple cropping systems using improved agronomic practices. Field preparation, seed treatment, sowing, fertigation, water management and weed management. Disease and insect pest management in the crop. Harvesting, threshing, drying, winnowing, storage and marketing of the produce. Preparation of balance sheet including cost of cultivation. [These operations shall be conducted by students themselves under the supervision of teacher(s)].

DISEASE OF FIELD CROPS & THEIR MANAGEMENT

Subject Code: BAGE1-666 **L T P C** **Duration: 27 Hrs.**
2 0 0 2

Unit-I

Symptoms, economic importance, causal organism, etiology, disease cycle and management of major diseases of Rice: blast, brown leaf spot, bacterial leaf blight, False smut, Foot rot, khaira, false smut, sheath rot Maize: bacterial stalk rots and downy mildew.
Symptoms, economic importance, causal organism, etiology, disease cycle and management of major diseases Sorghum: seed rot and seedling mortality. Bajra: downy mildew/ green ear disease, and ergot. Groundnut: Tikka/cercospora leaf spot, collar and seed rot.

Unit-II

Symptoms, economic importance, causal organism, etiology, disease cycle and management of major diseases Mungbean: Yellow bean mosaic disease, cercospora leaf spot, root rot and rhizoctonia blight.
Symptoms, economic importance, causal organism, etiology, disease cycle and management of major diseases of Cotton: cotton leaf curl, wilt, angular leaf spot and root rot of cotton

Unit-III

Symptoms, economic importance, causal organism, etiology, disease cycle and management of major diseases of wheat crops: rusts, loose smut, karnal bunt, flag smut and ear cockle.
Symptoms, economic importance, causal organism, etiology, disease cycle and management of major diseases of Sugarcane: red rot, smut, pineapple disease, red stripe of sugarcane.
Symptoms, economic importance, causal organism, etiology, disease cycle and management of major diseases of following diseases of Mustard: alternaria blight, white rust, downy mildew, phyllody.

Unit-IV

Symptoms, economic importance, causal organism, etiology, disease cycle and management of major diseases of following diseases of Potato: early and late blight, black scurf, leaf curl, and potato scab
Symptoms, economic importance, causal organism, etiology, disease cycle and management of major diseases of Barseem: stem rot

Recommended Books:

1. Chattopadhyaya, ‘Introductory Mycology’.
2. SB, ‘Fungi and Plant Diseases’.
3. R.S. Singh, ‘Plant Diseases’.
4. R.P. Singh, ‘Plant Pathology’.
5. G.L. Chopra, ‘Fungi’.
6. B.P. Pandey, ‘Plant Pathology’.
7. Package of Practices for Crops of Punjab Rabi and Kharif Crops PAU.

INTRODUCTION TO POST HARVEST TECHNOLOGY

Subject Code: BAGE1-667 **L T P C** **Duration: 27 Hrs.**
2 0 0 2

Unit-1

Food production and consumption trends in India; Causes of food spoilage; importance of Post-Harvest Technology, status of food industry in India; Food safety, adulteration and food laws.

Unit-2

Maturity indices, harvesting and post-harvest handling, Maturity and ripening process- Factors affecting ripening and deterioration of fruits and vegetables, Chemicals used for delaying and hastening, ripening. Methods of storage and low cost storage structures.

Unit-3

Methods and types of cleaning, grading, storage, packing, packaging, cushioning materials; transport, type of containers, post-harvest technology for export of horticultural crops with specific reference to SPS standards. Cost estimation and economic analysis; Winnowing; Groundnut decorticators. Maize and castor shellers.

Unit-4

Value Addition Concept: Principles and method of preservation of fruits and vegetables. Drying / dehydration of fruits and vegetables - concept and methods, osmotic drying.

Recommended Books:

1. S. Saraswathy, 'Post-Harvest Management of Horticulture Crops'.
2. K.P. Sudeer, 'Post-Harvest Technology of Horticulture Crops'.
3. 'Prevention of Post-Harvest Losses, Fruits, Vegetables and Root Crops', FAO.
4. Kallia, Manoranjan and Sood Sangeeta, 'Food Preservation and Processing'.
5. Sadhana Pandey and P.H. Pandey, 'Post-Harvest Management and Horticulture Crops'.
6. P.H. Pandey, 'Principles and Practices of Post-Harvest Technology'.
7. 'Vegetable Products', 2nd Edn., Tata McGraw Hill Publishing Co. Ltd., New Delhi.
8. P.H. Pandey, 'Principles & Practices of Post-Harvest Technology'.

BREEDING OF FIELD AND HORTICULTURAL CROPS

Subject Code: BAGE1-668 **L T P C** **Duration: 27 Hrs.**
2 0 0 2

Unit-I

Breeding objectives and concepts of breeding self-pollinated, cross-pollinated and vegetative propagated crops; Origin of crops and distribution of species, wild relatives and forms, Cereals, (rice, wheat, maize and millets); Pulses (red gram, green gram, black gram, soybean); Oilseeds (groundnut, sesame, sunflower, brassicas) etc, Fibres (Cotton) etc, Vegetables (tomato, potato, onion, okra); Flower crops (chrysanthemum, rose, gaillardia and marigold); Fruits (citrus, amla, guava, mango, papaya)

Unit-II

Hardy-Weinberg Law; Biometrical genetics- definition and concept; Variability types & method of assessment, gene effects i.e. additive, dominance and epistasis; Genotype x Environment interaction and its significance in crop improvement

Unit-III

Breeding methods for development of varieties/hybrids in various crops; Ideotype concept in crop improvement; Plant genetic resources their conservation and utilization in crop improvement; IPR and its related issues.

Unit-IV

Variability in pathogen and pests; Mechanisms of resistance in plants to pathogens and pests; Genetic basis of adaptability to unfavourable environments; Breeding for resistance to biotic and abiotic stresses.

Recommended Books:

1. G.S. Chahal and S.S. Gosal, 'Principles and Procedures of Plant Breeding'.
2. Walter R. Fehr, 'Principles of Cultivar Development: Theory and Technique', Vol.-1.
3. B.D. Singh, 'Plant Breeding Principles and Methods'.
4. S.S. Singh, 'Handbook of Agriculture Compiled', Kalyani Publishers, New Delhi.
5. Hari Har Ram, 'Vegetable Breeding-Principles and Practices'.
6. P.K. Ray, 'Breeding Tropical and Subtropical Fruits'.

PROTECTED CULTIVATION OF HORTICULTURAL CROPS

Subject Code: BAGE1-669 **L T P C** **Duration: 27 Hrs.**

2 0 0 2

Unit-I

Protected cultivation introduction, objectives, importance and scope of protected cultivation, planning, design and types of protected structures nursery raising techniques.

Unit-II

Environmental factors affecting the protected cultivation of horticultural crops. Different growing media irrigation and fertigation. Sustainable land use system maximising land use efficiency in protected structure. Materials of construction for traditional and low cost green houses. Different irrigation system used in green houses.

Unit-III

Criteria for selection of crop under the protected cultivation. Problems of growing horticulture crops in protected structures. Different soil sterilization techniques in protected cultivation, nutrient film technique (NFT)/ hydroponics.

Unit-IV

Pest management in green house crops. Varieties suitable for protected cultivation. Specific technology for raising tomato, sweet pepper, cucumber, rose, lillium, chrysanthemum, carnation.

Recommended Books:

1. Adikant Pardan, 'Protected Cultivation'.
2. Brahma Singh & Balraj Singh, 'Advances in Protected Cultivation'.
3. D.K. Singh, 'Protected Cultivation of Horticultural Crops'.
4. Balraj Singh, 'Protected Cultivation of Vegetables'.

RENEWABLE ENERGY

Subject Code: BAGE1-670 **L T P C** **Duration: 14 Hrs.**

1 0 0 1

UNIT-I

Energy sources- Introduction and classification. Types of biogas plants and utilization of biogas. Agricultural wastes.

UNIT-II

Principles of combustion, pyrolysis and gasification. Types of gasifiers. Producer gas and its utilization. Briquettes- briquetting machine, uses of briquettes.

UNIT-III

Solar energy- solar flat plate and focusing plate collectors. Introduction to solar air heaters, cookers, water heating systems, grain dryers, refrigeration system, ponds, lantern, street lights, fencing and pumping systems.

UNIT-IV

Wind energy- types and application of wind mills. Liquid bio fuels- biodiesel and ethanol from agricultural produce and its uses.

Recommended Books:

1. Kothari, 'Renewable Energy Sources & Emerging Technology'.
2. Solanki, 'Renewable Energy Technologies- A Practical Guide for Beginners'.
3. Boyle, 'Renewable Energy- Power for Suitable Future'.

FUNDAMENTALS OF AGRI-BUSINESS MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT

Subject Code: BAGE1-671 **L T P C** **Duration: 40 Hrs.**

2 1 0 3

Unit-I

Agri-business- meaning, definition, features and structure of agri-business (input, farm and processing sectors); Role of entrepreneurship in business, Importance of agri-business in the Indian economy; Management- definitions, importance and functions.

Unit-II

Planning- meaning, definition and process; Types of plans and characteristics of a sound plan; Introduction to organizing, staffing, directing and controlling. Introduction to marketing management, Components of marketing mix.

Unit-III

Project definitions; Project cycle- identification, formulation, appraisal, implementation, monitoring and evaluation. Entrepreneurship development; Concept of Entrepreneurship development, Entrepreneurship and Managerial Characteristics.

Unit-IV

Overview of Indian social, political and economic systems and implications for decision making by individual entrepreneurs; Procedure and constraints in setting up agro-based industries in India.

Recommended Books:

1. Joginder Singh and R.K. Lekhi, 'Agricultural Marketing, Trade and Prices', Kalyani Publishers, Ludhiana.
2. S.R Panigrahy, 'Objective Agribusiness Management', Amazon India.
3. Shoji Lal Bairwa, 'Fundamentals of Agribusiness Management', Kalyani Publishers.
4. Jay T. Akridge, Freddie Barnard, Frank J. Dooley, 'Agribusiness Management'.

ENVIRONMENTAL SCIENCE AND DISASTER MANAGEMENT

Subject Code: BAGE1-672 **L T P C** **Duration: 40 Hrs.**

3 0 0 3

Unit-I

Environment: Basic concepts scope and importance. Natural Resources - renewable and non-renewable resources and their sustainable utilization. Ecosystem concepts - types, structure and functions of ecosystem. Pollution of water, air, soil, noise, thermal and nuclear hazard. Types, causes, methods of measurement, standards and management.

Unit-II

Solid and liquid waste management - treatment and disposal. Vulnerability, adaptability and sustainable development; International conventions and treaties. Biodiversity and conservation - value, utilization and threats.

Unit-III

Threatened/endangered species and hotspots. Human population and environment - environment and human health. Environment management laws and conservation projects of Government of India. Climate change - history and future projections, greenhouse gases, effects and mitigation strategies.

Unit-IV

Natural Disasters: Causes, phenomenon and impacts; Global and national events for disaster management; Agricultural Disaster phenomenon, events and their management; Acts and policies in India.

Recommended Books:

1. Menakashi Verma, 'Environmental Studies'.
2. D.K. Asthana, Meena Asthana, 'Text Book of Environmental Studies', S. Chand.
3. Mukesh Kapoor, 'Disaster Management'.

FUNDAMENTALS OF RURAL SOCIOLOGY AND EDUCATIONAL PSYCHOLOGY

Subject Code: BAGE1-673 **L T P C** **2 1 0 3** **Duration: 40 Hrs.**

Unit-1

Introduction and importance of rural sociology in agricultural extension; Social characteristics of Indian social groups; Factors in formation and organization of groups; Motivation in group formation and role of social groups in agricultural extension process

Unit-2

Social stratification: class, caste systems, culture, custom, folk ways, mores, taboos, rituals, traditions, social values and attributes; their meaning and role in agriculture development.

Unit-3

Various rural institutions- their functioning and role in the social set-up, Social control, social change and associated parameters

Unit-4

Leadership- different methods of identification of leaders and their training needs, Scope and importance of educational psychology; intelligence and personality; Teaching-learning process, principles of learning and their importance in teaching

Recommended Books:

1. Guha Krishna, 'Principals of Sociology', Kalyani Publishers.
2. R. Velusamy, 'Rural Sociology and Educational Psychology', Amazon India.
3. T.C. Aggarwal, 'Fundamental of Psychological and Philosophical Sociology', Amazon India.

DISEASES OF FIELD CROPS AND THEIR MANAGEMENT LAB.

Subject Code: BAGE1-674 **L T P C** **0 0 2 1** **Duration: 27 Hrs.**

Identification and study of symptoms of important diseases of field crops in laboratory covered in theory. Field visit for the diagnosis of field problems. Collection and preservation of plant diseased specimens for herbarium.

INTRODUCTION TO POST HARVEST TECHNOLOGY LAB.

Subject Code: BAGE1-675 **L T P C** **Duration: 27 Hrs.**
0 0 2 1

Judging maturity and physical parameters, machinery use for preservation, storage, drying etc; quality assessment of value added product; precooling of Horticultural crops, effect of ethylene on ripening of fruits; visit to local market, cold storage, packing houses and processing unit of milk. Study of winnowers, groundnut decorticator and maize shellers.

BREEDING OF FIELD AND HORTICULTURAL CROPS LAB.

Subject Code: BAGE1-676 **L T P C** **Duration: 27 Hrs.**
0 0 2 1

Handling of segregating generations-pedigree method, bulk method, back cross methods; Field layout of experiments; Field trials; Estimation of heterosis and inbreeding depression; Estimation of heritability; GCA and SCA; Estimation of variability parameters; Problems on Hardy-Weinberg Law; Study of quality characters; Sources of donors for different characters; Visit to research stations and seed production and certification plots

PROTECTED CULTIVATION OF HORTICULTURAL CROPS LAB.

Subject Code: BAGE1-677 **L T P C** **Duration: 27 Hrs.**
0 0 2 1

Study of different types of greenhouses; Preparation of the Layout of green houses. Basis crop cultivation/ package of practices for cucumber, capsicum, tomato and roses. To get acquainted with the fertilizer application methods in green house. To calculate dosage of water soluble fertilizers in ppm. To study environment factors affecting cultivation of crops in green house. Study of covering material in green house. Visit to commercial green houses. Study about Growing media - their preparation and pasteurization/sterilization.

RENEWABLE ENERGY LAB.

Subject Code: BAGE1-678 **L T P C** **Duration: 27 Hrs.**
0 0 2 1

Constructional details of biogas plants; Constructional details of different types of gasifiers; To study and find the efficiency of solar cooker, dryers, domestic water heater; Performance of wind mills; Field visit to biogas plants and wind mills; Bio-diesel preparation

PRACTICAL CROP PRODUCTION-II LAB.

Subject Code: BAGE1-679 **L T P C** **Duration: 27 Hrs.**
0 0 2 1

Crop planning; Raising field crops in multiple cropping systems using improved agronomic practices; Field preparation, seed treatment, nursery raising, sowing, nutrient management, water management, weed management and management of insect pests and diseases of crops. Harvesting, threshing, drying, winnowing, storage and marketing of produce; Preparation of balance sheet including cost of cultivation, net returns per student.