Department of Rural Technology

Janardan Rai Nagar Rajasthan Vidyapeeth University

Udaipur

SYLLABUS

B.Sc. (Agriculture)Hons.

Four Year Degree Programme

Program Structure 2016-20

B.Sc. Agriculture Part I

Semester I

Course Code	Course Title	Course Type	L	P	CU	Max Marks
AGRON-101	Principles Of Agronomy And Agricultural Meteorology	Core Course	2	1	3	100
HORT-102	Production Technology of Fruit Crops	Core Course	2	1	3	100
SCHEM-103	Introductory Soil Science	Core Course	2	1	3	100
PBG-104	Principles Of Genetics	Core Course	2	1	3	100
AH-105	Introductory Animal Husbandry	Core Course	2	1	3	100
ENGH-106	English Language and its Use	Core Course	2	1	3	100
COMP-107	Introduction to Computer Applications	Core Course	2	1	3	100
	Total Credit				21	700

ASSEMSSMENT SCHEME –

The total marks of each course will content 100 marks, divided in to 50 marks for external evaluation / semester exam, 20 marks for mid-term exam and 30 Marks Practical Exam with Assignment.

L	P	Total Credit	Max Marks
2	1	3	100

Semester – 1

AGRON101- PRINCIPLES OF AGRONOMY AND AGRICULTURAL METEOROLOGY

COURSE CONTENTS

UNIT – I (Weightage 25 percent)

Meaning and Scope of Agronomy; National and International Agricultural Research Institutes and Agricultural Universities of India; Agro climatic zones of India and Rajasthan.

UNIT – II (Weightage 25 percent)

Classification of crops; Tillage; Sowings; Planting geometry; Crop stand establishment and its effects on growth and yield; Cropping systems; Harvesting, threshing and winnowing

UNIT – III (Weightage 25 percent)

Agrometeorology, weather and climate, micro-climate, weather elements; Earths'atmosphere: composition and structure; solar radiation: nature, properties, depletion, solar constant and energy balance; Atmospheric temperature: factors affecting, horizontal and vertical distribution variations, global warming; Air pressure: Variations;

UNIT – IV (Weightage 25 percent)

Wind: Factors affecting cyclones and anticyclones and general circulation; Atmospheric humidity: vapor pressure and saturation, process of condensation, formation of dew, fog, mist, snow, rain and hail; Formation and classification of clouds; Introduction to monsoon ; Basics of weather forecasting.

PRACTICAL

Study of tillage implements; Practice of ploughing and puddling; Study of seeding equipments and different methods of sowing; Study of manures, green manure crops; Seed & fertilizers

calculations; Study of inter cultivation equipments and practice; Study of fertilizer application methods and practice; Participation in ongoing field operations at Instructional Farm; Site selection for agromet observatory and installation of instruments; Measurement of Atmospheric and Soil temperature; Measurement of rainfall, evaporation, relative humidity, atmospheric pressure, solar radiation and wind direction and velocity; Study of weather forecasting and synoptic charts.

Reference Books:

- Lal, D.S.2005. Climatology, Sharda Pustak Bhawan, Allahbad
- Sahu, D.D.2003. Agrometeorology and Remote Sensing: Principles and Practices, Agrobios (India), Jodhpur
- Varshneya, M.C. and Balakrishana, Pillai, P.2003. Textbook of Agricultural Meteorology, ICAR, New Delhi
- Balasubramaniyan, P. and Palaniappan, S.P.2001. Principles and Practices of Agronomy, Agrobios (India), Jodhpur
- Reddy, S.R. 2004. Principles of Agronomy, Kalyani Publishers, Ludhiana
- Reddy, S.R.2000. Principles of Crop Production, Kalyani Publishers, Ludhiana

L	P	Total Credit	Max Marks
2	1	3	100

Semester – 1

HORT102-PRODUCTION TECHNOLOGY OF FRUIT CROPS

COURSE CONTENTS

UNIT – I (Weightage 25 percent)

Definition and importance of horticulture. Divisions of horticulture. Climatic zones of horticulture crops. Area and production of different fruit crops.

UNIT – II (Weightage 25 percent)

Selection of site, fencing and wind break planting systems including high density planting), planning and establishment methods.

UNIT – III (Weightage 25 percent)

Propagation methods and use of rootstocks. Methods of training and pruning. Use of growth regulators in fruit production.

UNIT – IV (Weightage 25 percent)

Package of practices for the cultivation of Major fruits – mango, banana, citrus, grape, guava, sapota, apple, litchi, papaya. Minor Fruits – aonla, pineapple, annonaceous fruits, pomegranate, ber, fig, phalsa, jack, pear, plum, peaches and cherry.

PRACTICAL

Study horticulture tools and implements and their uses. Containers, potting mixture, potting, depotting and repotting. Plant propagation – seed propagation, scarification and stratification. Propagation by cutting (soft wood, hard wood and semi-hard wood) layering (simple layering, air layering, stooling in guava). Layout and planting systems (Traditional system and High density planting method), grafting (vineer grafting, cheft and softwood grafting of mango). Methods of pruning and training. Training of ber, grape and pomegranate. Budding (patch budding and 'T' budding in ber, aonla, guava and citrus). Pruning of ber, grape, phalsa, fig, apple, pear, peach. Description and identification of varieties of banana citrus (lime, lemon, sweet orange, mandrin, grape fruit), pomegranate, ber, pear and cherries. Irrigation methods in fruit crops including drip – Micro irrigation methods of establishment of orchard. Methods of Fertiliser application in fruit crops including fertigation technology. Visit to local commercial orchards.

Preparation of growth regulators power, solution and lanolin paste for propagation. Application of growth regulators for improving fruit set, fruit size, quality, delaying repening and hastening ripening.

Reference Books:

- Bal, J.S. 1970. Fruit Production. Kalyani Publishers, New Delhi
- Naik, K.C. 1967. South Indian Fruits and their culture. Naya Prokash, Calcutta
- Bose, T.K. and Mitra S.K. 1990. Fruits of India Tropical and Sub-tropical. Naya Prokash, 206, Bidhan Sarni, Calcutta
- Shanmugavelu, K.G. 1987. Production technology of fruit crops. SBA Publication, 1/1 Meredith Street, Calcutta
- Polhamus, L.G. 1962. Rubber, Longman, London
- Chadha, K.L. 2001. Hand book of horticulture. Indian Council of Agricultural Research, New Delhi

L	P	Total Credit	Max Marks
2	1	3	100

Semester – 1

SCHEM -103 INTRODUCTORY SOIL SCIENCE

COURSE CONTENTS

UNIT – I (Weightage 25 percent)

Soil: Pedological and edaphological concepts. Origin of earth, Earth's crust; Composition, Rocks and minerals. Weathering, Soil formation factors and processes. Components of soils. Soil profile, Soil physical properties, Soil texture,

UNIT – II (Weightage 25 percent)

Textural classes, Particle size analysis, Soil structure, Classification, Soil aggregates, significance, Soil consistency, Soil crusting, Bulk density and particle density of soils and porosity and their significance and manipulation. Soil colour. Soil water, Retention and potentials, Soil moisture constants, Movement of soil water, Infiltration, Percolation, Permeability, Drainage.

UNIT – III (Weightage 25 percent)

Methods of determination of soil moisture. Thermal prosperities of soils, Soil temperature. Soil air, Gaseous exchange, Influence of soil temperature and air on plant growth. Soil colloids : Properties, nature, types and significance; Laayer silicate clays, and sources of charges. Adsorption of ions, Ion exchange, CEC & AEC, Soil reaction and buffering capacity. Factors influencing ion exchange and its Significance.

UNIT – IV (Weightage 25 percent)

Problem soils –acid, salt affected and calcareous soils, characteristics. Reclamation – mechanical, chemical and biological methods. Irrigations water – Quality of irrigation water and its appraisal. Indian standards for water quality. Use of saline water for agriculture.

PRACTICAL

Collection and processing of soil sample. Identification of rocks and minerals. Determination of bulk density and particle density, Soil moisture determination, Soil moisture constraints – Field capacity, permanent wilting point, Water holding capacity, Infiltration rate, Soil texture and mechanical analysis, Soil temperature, Soil analysis for CEC, pH, EC, soluble cations and anions.

L	P	Total Credit	Max Marks
2	1	3	100

Semester – 1

PBG104-PRINCIPLES OF GENETICS

COURSE CONTENTS

UNIT – I (Weightage 20 percent)

History OF Genetics. Ultra structure of cell. Cell organelles and their function. Chromosome structure, function and chemical composition – karyotype and ideogram. Cell division : types and their significance.

UNIT – II (Weightage 20 percent)

DNA and its structure, function, types, mode of replication and repair. RNA and its structure, function and types, transcription, translation, genetic code and protein synthesis.

UNIT – III (Weightage 20 percent)

Mendel's laws of inheritance. Gene interaction and their types. Multiple alleles and some classical examples. Inheritance of quantitative and qualitative characters and differences between them. Multiple factor hypothesis. Pleiotropism, penetrance and expressivity.

UNIT – IV (Weightage 20 percent)

Cytoplasmic inheritance – its characteristic features and difference between chromosomal and cytoplasmic inheritance. Mechanism of crossing over and cytological proof of crossing over.

UNIT – V (Weightage 20 percent)

Linkage-types and importance. Estimation of linkage. Numerical chromosomal aberrations (polyploidy) and evolution of different crop specises like cotton, wheat, tobacco and brassicas. Structural chromosomal aberrations. Mutationcharacteristics, classification and induction.

PRACTICAL

Introduction to Microscopy - Simple and compound microscope. Study of typical plant cell. Preparation and use of fixatives and stains. Preparation of micro slides and identification of various stage of cell division. Monohybrid ratio and its modification. Dihybrid ratio and its modification. Test of goodness of fit of genetic ratio. Study of different types of gene interactions and modifications of typical dihybrid F2 ratios. Study and detection of linkage in F2 and test cross progeny. Induction of polyploidy using colchicines. Induction of chromosomal aberrations using chemicals.

Reference Books:

- Gupta, P.K. 2004. Cytology, Genetics and evolution. Rastogi Publications,Meerut.(Hindi Edition).
- Kaushik, M.P. 2003. A Text Book of Modern Botany. Prakash Publications, Muzaffarnagar (U.P.).
- Klug, W.W. and Cummings, M.R. 2005. Concepts of genetics Pearson Education (Singapore) Pvt. Ltd., Indian Branch, Pratap Ganj, New Delhi.
- Singh, B.D. 2001. Fundamentals of Genetics, Kalyani Publishers, New Delhi.
- Strickberger, M.W. 2001. Genetics. Prentice Hall of India Pvt. Ltd., New Delhi.

L	P	Total Credit	Max Marks
2	1	3	100

Semester – 1

AH105-INTRODUCTORY ANIMAL HUSBANDRY

COURSE CONTENTS

UNIT-I (Weightage 40 percent)

Statistics and economic importance of farm animal, Classification, habitat, distribution and main characteristics of:

(a) Cattle – Gir, Tharparkar, Rathi, Nagori, Jersey and Holstein; Friesian

(b) Buffalo - Murrah, Surti and Mehsana.

(c) Sheep – Marwari, Sonadi, Malpuri, Chokhla and Magra, Jaisalmeri, Cooriedale, Merino.

(d) Goat – Jamunapuri, Beetle, Seamen, Alpine, Sirohi and Barbary.

(e) Poultry - White Leghorn, Black Austral, Rhode Island Red, White Cornish, White Plymouth Rock.

UNIT-II (Weightage 20 percent)

Care and management of calf at birth and its raising, Care and management of cows and buffaloes during estrus, pregnancy, calving, lactation and dry period, Care and management of bull .

UNIT-III (Weightage 20 percent)

Housing - Selection of site, System of housing and floor plan to house various categories of cattle; Management practices of sheep and goat; Principles of incubation and brooding, housing and equipments of poultry.

UNIT-IV (Weightage 20 percent)

Common diseases of livestock i.e. H.S. (Hemorrhagic Septicemia), F.M.D. (Foot and Mouth Disease), B.Q. (Black Quarter). Common external and internal parasite and their control.

PRACTICAL

1. Familiarity with external body part of cattle, sheep, goat, and poultry 2. Identification of animals 3. Grooming of animals 4. Determination of body weight and age of animals 5. Observation of signs of heat and pregnancy and determination of body temperature, pulse

and respiration rate 6. Judging of poultry 7. Judging of cattle 8. Familiarity with the common medicine and their administration. 9. Visit of commercial farm.

Reference Books:

- Text Book of Animal Husbandry G.C. Bannered (1996) Published by Oxford and IBH.
- Hand Book of Animal Husbandry (1990) I.C.A.R. New Delhi.
- Farm Animal Management and Poultry Production, (1990) C.K. Thomas, N.S.R. Shastri and R.A. Singh, Kalyani Publication, New Delhi.
- Livestock Production Management (2005). N.S.R. Shastri and R.A. Singh, Kalyani Publication, New Delhi.

L	P	Total Credit	Max Marks
2	1	3	100

Semester – 1

COMP106-COMPUTER FUNDAMENTALS

COURSE CONTENTS

UNIT-I (Weightage 40 percent)

Introduction to Computer and Ms Word: Computer components, Block diagram of computer, Characteristics of computer, Hardware & Software Computer storage devices, Introduction to operating system and windows, Booting desktop, Starting with Ms word, Document typing, Creating new files, Searching & replacing text, Formatting text, Spell & Gram Check, Hyper linking, Paragraph & alignment setting, Protecting documents from unauthorized users, Creating macros and mail merge, Creation of table and border, Including all menus.

UNIT-II (Weightage 40 percent)

Introduction to Spread Sheet, Power point and uses of Internet in current scenario: Introduction (Ms-Excel), Entering data in Excel, Applying formulas and functions, Problem solving through **if condition**, Creating graphs, Applying conditional formatting, Protecting documents from unauthorized users, Data: - sorting, filtering, consolidation, validation, some important options, **Introduction ms -Power-point**, Creating slide for presentations, Slide Show, Custom animation slide transition, Viewing slide and other operations related slides.

UNIT-III (Weightage 20 percent)

Concept of Modem and ISP, Internet applications (E- Commerce, Creation of mails, Sending mails, attaching files, etc.), searching and surfing, Introduction to EDUSET and uses of ENCARTA, Copying files from one drive to another

PRACTICAL

1. Creation of resume using ms-word 2. Creation of time table 3. Creation of salary sheet, electricity bills etc. 4. Creation of presentation slides 5. Creation of mail accounts and search different topics,

L	P	Total Credit	Max Marks
2	1	3	100

Semester – 1

ENGH105-ENGLISH LANGUAGE AND ITS USE

COURSE CONTENTS

UNIT-I (Weightage 50 percent)

Basic of English Grammar

a. Parts of Speech b. Determiners c. Tenses d. Verbs and their concord

e. Basic sentence patterns f. Types of sentences and transformation

UNIT-II (Weightage 50 percent)

Composition

b. Arranging jumbled sentences b. Guided composition

c. Paragraph writing d. Letter writing

PRACTICAL

Communication Skills

1. Acquaintance with English Sounds:

a. Speech Organs b. Air-stream mechanism c. Vowel sounds

d. Consonant sounds d. Stress

2. Conversation:

a. Greeting people b. Giving introduction c. Seeking introduction

d. Making polite requests e. Describing things, persons and position

f. Giving information g. Seeking information

Second Semester

Course Code	**Course Title**	**Course Type**	**L**	**P**	**CU**	**Max Marks**
AGECON-201	Principles Of Ag. Economics	Core Course	2	1	3	100
EXTED-202	Dimensions Of Agricultural Extension	Core Course	2	1	3	100
AGRON-203	Weed Management	Core Course	2	1	3	100
AGRON-204	Water Management	Core Course	2	1	3	100
ENVS-205	Environmental Studies	Core Course	2	1	3	100
SCHEM-206	Soil Chemistry And Soil Fertility	Core Course	3	0	3	100
AH-207	Dairy Cattle Management	Core Course	2	1	3	100
	Total Credit		15	6	21	700

L	P	Total Credit	Max Marks
2	1	3	100

Semester – II

AGECON201- PRINCIPLES OF AGRICULTURAL ECONOMICS

COURSE CONTENTS

UNIT-I (Weightage 25 percent)

Economics: Meaning, Definition, Subject matter, Divisions of Economics, Importance of Economics. Agricultural Economics: Meaning, Definition. Basic Concepts: Goods, Service, Utility, Value, Price, Wealth, Welfare. Wants: Meaning, Characteristics, Classification of Wants, Importance.

UNIT-II (Weightage 25 percent)

Theory of Consumption: Indifference curve and their characteristics. Law of Diminishing Marginal utility: Meaning, Definition, Assumptions, Limitations, Importance. Consumer's surplus: Meaning, Definition, Importance.

UNIT-III (Weightage 25 percent)

Demand: Meaning, Definition, Kinds of Demand, Demand schedule, Demand Curve, Law of Demand, Extension and Contraction Vs Increase and Decrease in Demand. Elasticity of Demand: Types of Elasticity of Demand, Degrees of price elasticity of Demand, Methods of Measuring Elasticity, Factors influencing elasticity of Demand, Importance of Elasticity of Demand. Supply: meaning, law of supply.

UNIT-IV (Weightage 25 percent)

National Income: Concepts, Measurement. Public Finance: Meaning, Principles, Services Tax, Classification of Taxes. Cannons of Taxation. Public expenditure: Meaning, Principles. Inflation: Meaning, Definition, Kinds of inflation.

References Books:

1. K. K. Dewett and J. D. Varma, 1986, Elementary Economic Theory, S. Chand & Company, New Delhi.

2. P. A. Samuelson and W. D. Nordhaus, 1987, Economics, McGraw-Hill, Singapore.
3. S. K. Misra and V. K. Puri, 1996, Indian Economy, Himalaya Publishing House, New Delhi.
4. G. B. Jathar and S. G. Beri, 1996, Elementary Principles of Economics, Oxford University Press (10th Edition), Delhi.
5. Berkeley Hill, 1980 An Introduction to Economics for Students of Agriculture, Pergaman Press, Oxford.

L	P	Total Credit	Max Marks
2	1	3	100

Semester-II

EXTED-202 DIMENSIONS OF AGRICULTURAL EXTENSION

COURSE CONTENT

UNIT-I (Weightage 30 Percent)

Education – Meaning, Definition, Types – Formal, Informal and Nonformal education. Extension Education and Agricultural Extension – Meaning, Definition, Concept, Objectives, Principles, Scope and Importance. Development programmes of pre-independence era – Sriniketan, Marthandam, Gurgaon experiment and Gandhian constructive programme with special reference to year of start, objectives and activities.

UNIT-I (Weightage 30 Percent)

Development programmes of post-independence era - Etawah Pilot project, Community Development Programme – Meaning, Definition, Concepts, Principles, Objectives, Difference between Community Development and Extension Education, National Extension service. Panchayati Raj System / Democratic Decentralization / Three tiers System of Panchayati Raj - Concept, Meaning, Organizational setup and Functions.

UNIT-I (Weightage 40 Percent)

Agricultural Development Programmes with reference to year of start, objectives & salient features – Institution Village Linkage Programme (IVLP), National Agricultural Technology Project (NATP), ATMA, ATIC & KVK. Poverty Alleviation Programmes-Integrated Rural Development Programme (IRDP), Swarna Jayanti Gram Swarojgar Yojana (SGSY), Prime Minister Employment Yojana (PMEY). Reorganized Extension System (T&V System) – Concept & Methodology.

Practical: Visit to KVK to study their functioning. Visit to Pnchayat Raj Institutions to study the functioning of Gram Panchayat (GP) & Other Institutions. Visit and study the District Rural Development Agency (DRDA). Visit to a village to study the self help groups (SHGS). Visit to a voluntary organization to study the developmental activities. Organizing PRA techniques in a village to identify the agricultural problems.

Suggested Readings:

1) Dhama, O.P. and Bhatanagar, O.P. 1985. Education and Communication for Development, Oxford & IBH Publishing Co., New Delhi.

2) Kelsey, L.D. and Hearne, C.C. 1963. Cooperative Extension Work, Cornell University Press, New York, USA.

3) Ray, G.L. 2003. Extension Communication and Management, Naya Prakash, 206 Bidhan Sarni, Calcutta-6.

4) Reddy, A.A. 1993. Extension Education, Shri Laxmi Press, Baptala.

L	P	Total Credit	Max Marks
1	1	2	100

Semester-II

AGRON203-WEED MANAGEMENT

COURSE CONTENT

UNIT-I (Weightage 50 Percent)

Weeds: Introduction, harmful and beneficial effects, classification, propagation, dissemination and persistence; Weed biology and ecology: crop weed association, crop weed competition and allelopathy; Concepts of weed prevention, control and eradication; Methods of weed control: physical, cultural, chemical and biological; integrated weed management;

UNIT-II (Weightage 50 Percent)

Herbicides: advantages and limitations of herbicide use in India; Classes of herbicides, formulations, methods of application; Introduction to Adjutants and their use in herbicides; Introduction to selectivity of herbicides; Weed management in major cereals, pulses, oilseeds, fibre and forage crops; Problematic weeds and their control *viz.Parthenium hysterophorus, Cynodon dactylon, Orobanche* and *Striga* .

PRACTICAL

Identification of weeds; Survey of weeds in crop fields and other habitats; Preparation of weed herbarium; Determination of weed density and intensity; Physical weed control; Calculations on weed control efficiency and weed index; Herbicide label information; Computation of herbicide doses; Study of herbicide application equipment and calibration; Demonstration of methods of herbicide application; Preparation of list of commonly available herbicides; Study of phytotoxicity symptoms of herbicides in different crops and weeds; Biology of weeds; economics of weed control practices; Tours and visits of problem areas.

Suggested Readings:

1. Gupta, O.P.2005. Weed Management: Principles and Practices (2nd Ed.), Agribios (India), Jodhpur.

2. Gupta, O.P.2002. Modern Weed Management, Agribios (India), Jodhpur.

3. Rao, V.S. 2000. Principals of Weed Science (2nd Ed.), Oxford and IBH Publishing Co., New Delhi.

4. Saraswat, V.N., Bhan, V.M. and Yaduraju, N.T.2003. Weed Management, ICAR, New Delhi.

L	P	Total Credit	Max Marks
2	1	3	100

Semester-II

AGRON 204- WATER MANAGEMENT

COURSE CONTENT

UNIT-I (Weightage 50 Percent)

Importance of water in plants; Irrigation: definition and objectives; Water resources and irrigation development in India and Rajasthan; Forms of soil water and soil moisture constants; Methods of soil moisture determination, evapotranspiration and crop water requirement;

UNIT-II (Weightage 50 Percent)

Scheduling of irrigation; Methods of irrigation: surface, sprinkler and drip irrigation; Irrigation efficiency and water use efficiency; Irrigation water quality and its management; Conjunctive use of water; Water management of different crops *viz.* rice, wheat, maize, sugarcane, and important pulses and oilseed crops; Agricultural drainage.

PRACTICAL

Determination of bulk density by field method; Determination of soil moisture content by gravimetric method, tensiometer, electrical resistance block and neutron moisture meter; Determination of field capacity by field method; Determination of permanent wilting point; Measurement of irrigation water through flumes and weirs; Calculation of irrigation water requirement (Problems); Demonstration of irrigation methods *viz.* surface, sprinkler and drip methods; Calculation of irrigation efficiency; Acquaintance and upkeep of sprinkler and drip irrigation systems; Visit to farmers field and cost estimation of drip irrigation system; Determination of EC, pH, and $Ca^{++} + Mg^{++}$ of irrigation water

Suggested Readings:

1. Lenka, D.1999. Irrigation and Drainage. Kalyani Publishers, L.D.H., New Delhi.
2. Michael, A.M.1987. Irrigation: Theory and Practice, Vikas Publishing House, New Delhi.
3. Mishra, R.D. and Ahmed, M. 1987. Manual on Irrigation Agronomy, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Parihar, S.S., and Sandhu B.S.1987. Irrigation of Field Crops – Principles and Practices, ICAR, New Delhi.
5. Reddy, S.R. 2000. Principles of Crop Production, Kalyani Pub. , New Delhi.

L	P	Total Credit	Max Marks
2	1	3	100

Semester-II

ENVS205-ENVIRONMENTAL STUDIES

COURSE CONTENT

UNIT-I (Weightage 20 Percent)

The Multidisciplinary nature of Environmental Studies: Definition, Scope and need for public awareness. **Natural Resources :** Renewable and Non-renewable resources , Role of an individual in conservation of natural resources, Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources.

UNIT-II (Weightage 20 Percent)

Ecosystem : Concept, Structure, function., Producers, Consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food Chains, Food webs and ecological pyramids, Type of Ecosystem : Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystem.

UNIT-III (Weightage 20 Percent)

Biodiversity and its conservation : Introduction and Definition, Genetic, Species and Ecosystem diversity, Biogeographical classification of India, Value of biodiversity : Consumptive, Productive, Social, Ethical, Aesthetic and Option values Threats to biodiversity : Habitat loss, poaching of wildlife: Man –wildlife conflicts, endangered and endemic species of India .

UNIT-IV (Weightage 20 Percent)

Environmental Pollution : Definition, Causes, Effects and control measures, Role of an individual in preventation of pollution. Type of pollution **:**Air pollution , Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards

UNIT-V (Weightage 20 Percent)

Social Issues and the Environment: Urban Problems related to energy **Resettlement and rehabilitation of people:** Its problems and concerns, Case studies **Environmental ethics:** Climate change, Global Warming, Acid rain .**Environment Protection Act.**

PRACTICAL

Field work – Visit to river, Forest hill, Mountain, Local polluted plant, Pond ecosystem.

Suggested Readings:

1. Agarwal K.C ,Environmental Biology ,Nidi publication ,Bikaner ,2001
2. Chaudhary , B.L. and Jitendra Pandey :Environmental Studies , Apex Publishing House ,Udaipur 2005
3. Sharma , B .K ,Environmental Chemistry ,Global Publishing House ,Meerut
4. Sinh Pratap , N.S Rathore and A.N Mathure : Environmental Studies ,Himanshu Publications 2004.

L	P	Total Credit	Max Marks
1	1	2	100

Semester-II

SCHEM 206 - SOIL CHEMISTRY AND SOIL FERTILITY AND NUTRIENT MANAGEMENT

COURSE CONTENT

UNIT-I (Weightage 40 Percent)

Essential and beneficial elements, criteria of essentiality, forms of nutrients in soil, mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants. Measures to overcome deficiencies and toxicities, nutrient availability to plants in acid, salt affected and calcareous soils:

UNIT-III (Weightage 30 Percent)

Concept of soil fertility, different approaches/ methods for soil fertility evaluation-Biological method. Plant analysis method: DRIS methods, critical levels in plants. Rapid tissue tests. Indicator plants.

UNIT-III (Weightage 30 Percent)

Soil analysis methods: critical levels of different nutrients in soil. Soil test based fertilizer recommendations to crops. Factors influencing nutrient use efficiency (NUE) in respect of N, P, K, S, Fe and Zn fertilizers. Integrated nutrient management.

PRACTICAL

Analytical chemistry – Basic concepts, techniques and calculations, Principles of analytical instruments and their calibration and applications, Estimation of available N, P, K, S, Zn and Fe in soil, Estimation of N, P and K in plants.

L	P	Total Credit	Max Marks
2	1	3	100

Semester-II

AH207-DAIRY CATTLE MANAGEMENT

COURSE CONTENT

UNIT-I (Weightage 40 Percent)

Dairy Farming and its Scope, Type of Dairy Farming systems, Selection of Dairy animals, Systems of breeding-improvement in productivity by cross breeding, Breeding problems of Dairy animals, Factors affecting fertility in livestock, Reproductive behavior like estrus, parturition etc, Infertility and sterility- their causes and prevention.

UNIT-I (Weightage 40 Percent)

Milk secretion, milking of animals and factors affecting milk yield and composition, Artificial Insemination-Merits and demerits, Selection, Purchasing and insurance, Feeding Stuffs, their classification and nutritive value, use of non- conventional feeds and agro industrial by-products in ration, Improvement of low grade roughages, Care and Management of new born heifers, pregnant and lactating animals, Major and minor nutrients and their functions, sources and deficiency symptoms.

UNIT-I (Weightage 40 Percent)

Nutrients requirement and feeding of dairy animals (young calves growing and milking animals, dry and breeding stock), Preservation of forages (hay & silage making), Housing of various classes of Dairy animals, Common diseases H.S. (Hemorrhagic Septicemia), F.M.D. (Foot and Mouth Disease), B.Q. (Black Quarter), and their control measures, sanitation and care, economical units of cattle, buffalo, sheep and goat.

PRACTICAL

1. Familiarity with routine dairy farm operation,
2. External body part of cattle.

3. Maintenance of dairy farm records.
4. Computation of balanced ration
5. Economics of dairy Farming
6. Visit of Artificial Insemination Center
7. Identification, disbudding and castration

Suggested Readings:

1. Hand Book of Animal Husbandry (1994). ICAR, New Delhi.
2. A text Book of Animal Husbandry (1996). G.C. Banerjee Vii Ed. Oxford / IBH, New Delhi.
3. Animal Nutrition and feeding practices in India (1989). S.K. Ranjhan, 2nd Ed. Vikas Pub. House Pvt. Ltd New Delhi.

Third Semester

Course Code	**Course Title**	**Course Type**	**L**	**P**	**CU**	**Max Marks**
AGECON 301	AGRICULTURAL FINANCE AND CO-OPERATIVES	Core Course	2	0	2	100
AGRON 302	FIELD CROPS I (KHARIF CROPS)	Core Course	2	1	3	100
ENTO 303	INSECT MORPHOLOGY	Core Course	2	1	3	100
HORT 304	PRODUCTION TECHNOLOGY OF VEGETABLE AND FLOWERS	Core Course	2	1	3	100
PPHY 305	CROP PHYSIOLOGY	Core Course	2	1	3	100
SCHEM 306	MANURES AND FERTILIZERS	Core Course	1	1	2	100
PBG 307	PRINCIPLES OF PLANT BREEDING	Core Course	2	1	3	100
	Total Credit		13	6	19	700

L	P	Total Credit	Max Marks
2	0	2	100

Semester-III

AGECON 301 -AGRICULTURE FINANCE AND COOPERATIVES

COURSE CONTENT

UNIT-I (Weightage 30 Percent)

Meaning, Nature and Scope of Agricultural Finance, Meaning, Definition, Need of Agricultural Credit, Assessment of repaying capacity. Nationalization of Commercial Banks, Lead Bank Scheme, Regional Rural Banks.

UNIT-II (Weightage 30 Percent)

Need for micro saving services, Micro insurance, Micro credit and self-help group. Overview of micro Financing agencies in India and role of RBI, NABARD, World Bank, Commercial Bank in providing financial support for small scale projects related to agribusiness and rural development.

UNIT-III (Weightage 40 Percent)

Cooperatives; System of governance, Membership, Operating system, Socio-political and economic conditions under which they function. Cooperative credit structure, tribal cooperatives. Rajasthan Coop. Society Act, History of Cooperative movement in India and present status of cooperatives.

Assignment: Visit to financial institution to assess working and system of Financing

Suggested Readings:

1. Pandey, U.K. 1990 An introduction to Agricultural Finance, Kalyani Publishers, New Delhi.
2. Singh, J.P., 1988, Agricultural Finance Theory and Practices, Ashish Publishing House, New Delhi.
3. Nelson and Murray, 1988 Agricultural Finance, Kalyani Publishers, New Delhi.
4. Kamat G.S., 1988, New Dimension of Cooperative Management, Himalayan Publishing House, Mumbai.
5. Krishna swami, O.R.,1978, Fundamentals of cooperation, S. Chand & Company Ltd., New Delhi.
6. Srivastave, P.K., 2008, Banking Theory and Practice IInd Edition, Himalayan Publishing House, Mumbai.

L	P	Total Credit	Max Marks
2	1	3	100

Semester-III

AGRON302-FIELD CROPS-I (*KHARIF*)

COURSE CONTENT

UNIT-I (Weightage 60 Percent)

Study of following crops with reference to their importance; Origin; Geographic distribution and production in Rajasthan and India; Soil and climatic requirements; varieties; Cultural practices *viz* .Seed and sowing; Intercultural operations; Fertilizer, water and weed management; Plant protection measures; Harvesting and yield. Pearl millet, Sorghum, Maize, Rice, Groundnut, Soybean, Pigeonpea and Cotton.

UNIT-II (Weightage 40 Percent)

Study of package of practices of the following crops: Minor millets, Urdbean, Mothbean, Cowpea, Mungbean, Clusterbean, Sunflower, Sunnhemp, Castor, Sesame and Napier; Bio energy crops *viz*. Jatropha and Jojoba.

PRACTICAL

Identification of seeds and crops of *kharif* season & others inputs; Seed bed preparation and sowing of *kharif crops* ; Calculations on seed rate; Effect of seed size on germination and seedling vigour of soybean/ groundnut; Preparation of seed material for sowing; Fertilizer application in various crops and study of Fertilizer experiments; Plant protection measures; Irrigation operation in various crops; Weed control in *kharif* crop and study of weed control experiments; Judging physiological maturity of various crops; Study of yield attributing characters and yield calculations in *kharif* crops; Crop harvesting and processing; Working out cost of production of two crops; Calculation of harvest index; Study of crop varieties and important agronomic experiments; Study of forage experiments.

Suggested Readings:

1. Singh, Chhidda, Singh, Prem and Singh, Rajbir.2003. Modern Techniques of Raising Field Crops, Oxford & IBH Publishing Co., New Delhi.
2. Singh, S.S.1998. Crop Management Under Irrigated and Rainfed Conditions. Kalyani Publishers, New Delhi.
3. Singh, S.S.1993. Principles and Practices of Agronomy, Kalyani Publishers, New Delhi. Kalyani Publishers, New Delhi.
4. Rathore, P.S. 2000. Techniques and Management of Field Crop Production, Agrobios (India), Jodhpur.
5. Prasad, Rajendra 2002. Text Book of Field Crop Production, ICAR, New Delhi.
6. ICAR. Handbook of Agriculture 2006. IC AR, New Delhi

L	P	Total Credit	Max Marks
2	1	3	100

Semester-III

ENTO303-INSECT MORPHOLOGY AND SYSTEMATICS

COURSE CONTENT

UNIT-I (Weightage 60 Percent)

History of entomology in India; classification of phylum Arthropoda; relationship of class Insecta with other classes of Arthropoda; insect dominance in nature.

UNIT-II (Weightage 50 Percent)

Morphology: Structure and function of insect cuticle, moulting process; body segmentation, structure of head, thorax and abdomen; structure and modifications of insect antennae, mouth parts and legs; wing venation, modifications and wing coupling apparatus; structure of male and female genitalia; sensory organs; metamorphosis, diapause, hibernation and aestivation; types of larvae and pupae; structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretory and reproductive systems in insects; types of reproduction of insects.

UNIT-II (Weightage 50 Percent)

Systematics: Taxonomy – importance, history and development; binomial nomenclature; definitions of biotype, sub-species, species, genus, family and order; classification of class Insecta to Orders; distinguishing characters of families: Orthoptera–Acrididae; Dictyoptera–Mantidae; Odonata; Isoptera–Termitidae; Thysanoptera– Thripidae.; Hemiptera–Pentatomidae, Coreidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Aleyrodidae, Pseudococcidae; Neuroptera-Chrysopidae; Lepidoptera–Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae; Coleoptera-Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera-Tenthridinidae, Apidae, Trichogrammatidae, Ichneumonidae, Braconidae; Diptera–Cecidomyiidae, Trypetidae, Tachinidae, Agromyziidae.

PRACTICAL

Methods of collection and preservation of insects including immature stages; external features of grasshopper; study of modifications of insect antennae, mouthparts and legs; wing venation, types of wings and wing coupling apparatus; types of insect larvae and pupae; dissection of digestive system in insects (grasshopper); dissection of male and female reproductive systems in insects (grasshopper); study of characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera and families of agricultural importance as in theory.

Suggested Readings:

1. Chapman, R.F. 1974. Insect Structure and Function, ELBS Publishers, New Delhi.
2. Gullan, P.J. and Cranston, P.S. 2005. Insects: an outline of entomology, III edition Chapman & Hall publication.
3. Nayar, K.K., Ananthakrishnan, T.N. and David. B.V. 1976. General and Applied Entomology. McGraw Hill Publishing Co. Ltd., New Delhi.
4. Pant, N.C. and Ghai, S., 1981. Insect Physiology and Anatomy, ICAR.
5. Richards O.W. and Davies, R.G. 1977. Imm's General Text Book of Entomology, Vol. I & II. Chapman and Hall, London.

L	P	Total Credit	Max Marks
2	1	3	100

Semester-III

HORT304- PRODUCTION TECHNOLOGY OF VEGETABLES AND FLOWERS

COURSE CONTENT

UNIT-I (Weightage 40 Percent)

Importance of Olericulture, vegetable gardens, vegetable classification. Origin, area, production, varieties, package of practices of fruit vegetables- tomato, brinjal, chillies and okra; Cucurbitaceous vegetables cucumber, ridge gourd, ash gourd, snake gourd, bottle gourd, bitter gourd and melons, Cole crops – cabbage, cauliflower and knoll-khol. Bulb crops – onion and garlic.

UNIT-II (Weightage 30 Percent)

Beans and peas- French beans, cluster beans, dolichos beans, peas and cowpea. Tuber crops - potato, sweet potato, tapica, colocasia, yams; Root crops – carrot, radish, turnip and beet root; Leafy vegetables – amaranthus, palak; Perennial vegetables -drumstick, coccinia and curry leaf. Importance of ornamental gardens. Planning of ornamental gardens.

UNIT-III (Weightage 30 Percent)

Types and styles of ornamental gardens. Use of trees, shrubs, climbers, palms, houseplants and seasonal flowers in the gardens. Package of practices for rose, jasmine, chrysanthemum, marigold, tuberose, gladiolus and gaillardia. Introduction to protected cultivation practices of important vegetable (Cucumber, Capsicum and Tomato) flower crops (Rose, Gerbera and Carnation).

PRACTICAL

Planning and layout of kitchen garden. Identification of important vegetable seeds and plants; Raising of vegetable nurseries; Identification of ornamental plants trees, shrubs, climbers, house plants, palms etc. and development of garden features; transplanting of vegetable seedling in main field; Layout of lawns and maintenance; Seed extraction in tomato and brinjal; Depotting, repotting and maintenance of house plants; Visit to commercial vegetable farms; Training and pruning of rose standards, hybrid ‘T’ roses cented roses and chrysanthemum pinching and disbudding; Planning and layout of gardens and garden designs for public and private areas; Intercultural operations in vegetable crops; Grading and packing of vegetables; Prolonging the shelf life of cut flowers.

Suggested Readings:

1. Choudhary, B. 1985. Vegetables. National Book Trust India, New Delhi
2. Chouhan, D.V.S. 1965. Vegetable Production of India. Kalyani Publisher, Agra (UP)
3. Singh, S.P. 1989. Production Technology of Vegetable Crops. Agricultural Research Communication Centre, Karnal

4. Katyal, S.L. and Chadha, K.L. 1985. Vegetable growing in India. Oxford and IBH Publishing Co., New Delhi
5. Arora, J.S. 1998. Introductory Ornamental Horticulture. Kalyani Publishers, Ludhiana
6. Bose, T.K. and Yadav, L.A. 1988. Commercial Flowers. Naya Prokash, Calcutta
7. Randhawa G.S. and Mukhopadhya, A. 1984. Floriculture in India. Allied Publishers, New Delhi
8. Swaroop V.S. 1984. Flowers. National Book Trust, India
9. Prakash, J. and Bhandari K.R. 1994. Floriculture Technology, Traders & Trends. Oxford and IBH Publishing Co. Pvt. Ltd.

L	P	Total Credit	Max Marks
2	1	3	100

Semester-III

PPHY305-PLANT PHYSIOLOGY

COURSE CONTENT

UNIT-I (Weightage 50 Percent)

An introduction to plant physiology, plant cell- an introduction, laws of thermodynamics, diffusion and osmosis, the concept of water potential, cell water relation, absorption of water, Transpiration, stomata physiology, Ascent of sap.

UNIT-II (Weightage 50 Percent)

Ion uptake and metabolic utilization of mineral ions, deficiency of mineral ions in plants. Photosynthesis, Respiration, Fat metabolism, Physiology of growth and development, Growth regulators, Physiological parameters influencing the productivity of major crops.

PRACTICAL

Cell structure, process of diffusion, osmosis and plasmolysis, structure and distribution of stomata in monocot and dicot leaves, process of transpiration with the help of cobalt chloride paper and other methods, process of root pressure by exudation method and other manometer. Detection of certain essential micro and macro-mineral elements in crop plants. Demonstration of the measurement of photosynthetic rates by infra-red gas analyzer, factors affecting the process of photosynthesis, separation of photosynthetic pigments by paper chromatography. Detection of certain essential micro and macro-mineral elements in crop plants, Process of aerobic respiration in germinated seed and alcoholic fermentation, tropism and movement.

Suggested Readings:

- S.N. Pandey & B.K. Sinha (2004). Plant Physiology. Vikas Publisher.
- Sushila M. Das (2004). The latest portfolio of theory & practical in plant physiology.
- Arvind Kumar and S.S. Purohit (2005). Plant Physiology, Fundamental and application, 2nd Ed. AgroBotanical Publisher, BIKANER.
- Narendra K.Gupta & Sunita Gupta(2005). Plant Physiology, Oxford IBH Publishing Co.

L	P	Total Credit	Max Marks
1	1	2	100

Semester-III

SCHEM 306 -MANURES AND FERTILIZERS

COURSE CONTENT

UNIT-I (Weightage 40 Percent)

Soil organic matter, composition, decomposability, C: N ratio. Soil biology, Biomass, Soil organisms and their beneficial and harmful roles. Raw materials – Manures – Bulky and concentrated - FYM, Composts - Different methods, mechanical compost plants, Vermicomposting, Green manures, Oil cakes, Sewage and sludge – Biogas plant slurry, Plant and animal refuges.

UNIT-II (Weightage 60 Percent)

Fertilizers – classifications, Chemistry of manufacturing 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, their fate and reactions in the soil, Secondary and micronutrients fertilizers, amendments, Fertilizer Control Order, Fertilizer storage; Important Biofertilizers and their advantage.

PRACTICAL

Determination of organic carbon and microbial biomass C, N and P. Total nitrogen and phosphorus in manures / composts – Ammoniacal and nitrate nitrogen – Water soluble P_2O_5, potassium, calcium, sulphur and zinc contents of fertilizers, Adulteration in fertilizer.

L	P	Total Credit	Max Marks
2	1	3	100

Semester-III

PBG 307- PRINCIPLES OF PLANT BREEDING

COURSE CONTENT

UNIT-I (Weightage 40 Percent)

Introduction to ecological and taxonomical classification of plants. Historical development, nature and role of plant breeding. Modes of reproduction (sexual, asexual and vegetative) and their relation with plant breeding.

UNIT-II (Weightage 40 Percent)

Fertility regulatory mechanisms (incompatibility, male sterility and apomixis), their classification and importance in plant breeding. Inheritance of qualitative and quantitative characters and heritability. Pure line theory and genetic basis of selection.

UNIT-III (Weightage 40 Percent)

Hardy-Weinberg law, heterosis and theories of heterosis and inbreeding depression. Germplasm resources and center of diversity. Domestication, introduction and acclimatization in relation to plant improvement.

UNIT-IV (Weightage 40 Percent)

Improved genotypes of different crop plants- variety, inbred line, different hybrids, synthetic, composite, multiline, clone etc. Different breeding methods of their development. Polyploidy in relation to plant breeding.

UNIT-V (Weightage 40 Percent)

Mutation breeding- types, role and method of mutation breeding. Use of biotechnology in plant breeding. Procedure for release of new varieties.

PRACTICAL

Identification of plants of different ecological groups. Floral biology of different crop plants. T.S. of overy. Mounting of different types of ovules. Study of microsporogenesis and megasporogenesis. Study of pollen viability. Study of pollen size. Emasculation and hybridization techniques in important self and cross pollinated crops. Study of male sterility in sorghum. Calculation of mean, range, variance and standard deviation.

Suggested Readings:

1. Alard, R.W. 2000. Principles of Plant Breeding. John Willey & Sons, New York.
2. Chahel, G.S. and S.S. Gosal. 2002. Principles and Procedures of Plant Breeding, Biotechnological and Conventional Approaches. Narosa Publishing House, New Delhi.
3. Singh, B.D. 2005. Plant Breeding. Kalyani Publishers, New Delhi.
4. Singh, P. 2001. Essentials of Plant Breeding - Principles and Methods. Kalyani Publishers, New Delhi.

Fourth Semester

Course Code	**Course Title**	**Course Type**	**L**	**P**	**CU**	**Max Marks**
AGECON 401	AGRICULTURAL MARKETING,TRADE AND PRICES	Core Course	1	1	2	100
AGRON 402	FIELD CROPS II(RABI CROPS)	Core Course	2	1	3	100
ENTO 403	INSECT ECOLOGY AND IPM	Core Course	2	1	3	100
HORT 404	PRODUCTION TECHNOLGY OF SPICES, MEDICINAL AND AROMATIC PLANTS	Core Course	2	1	3	100
SCHEM 405	SOIL SURVEY AND LAND USE PLANNING	Core Course	1	1	2	100
PBG 406	BREEDING OF FIELD CROPS	Core Course	2	1	3	100
AGRON 407	ORGANIC FARMING	Core Course	2	1	3	100
	Total Credit		12	7	19	700

L	P	Total Credit	Max Marks
1	1	2	100

Semester-IV

AGECON401- AGRICULTURAL MARKETING, TRADE AND PRICES

COURSE CONTENT

UNIT-I (Weightage 60 Percent)

Agricultural Marketing: Meaning, Definition, Scope and Subject Matter. Market: Meaning, Definition, Components of a market, Classification. Marketing Agencies, Marketable surplus and Marketed surplus. Factors Affecting Marketable Surplus. Marketing Channels: Meaning, Definition. Market integration: Meaning, Definition, Types of Market Integration. Marketing Efficiency: Meaning, Definition. Marketing costs, Margins and Price Spread, Factors affecting the Cost of Marketing.

UNIT-II (Weightage 40 Percent)

Meaning of International Trade, Domestic Trade, Free trade, GATT, WTO and EXIM-policy. Introduction to Cooperative Marketing. State Trading. Central and State Warehousing Corporation; AGMARK. Price: Meaning, Types, Role and Functions. Agricultural Price Policy: Meaning, Objectives and Need. Futures trading. Contract farming.

PRACTICAL

Identification of Marketing Channels; Study of regulated markets and unregulated markets; Study of Vegetable market. Price spread analysis; Visit/ study of SWC/ Cold storage unit; Analysis of information on daily price; Marketed and marketable surplus of different commodities.

References :

1. Acharya, S.S. and Agarwal, N.L., 1994, Agricultural Price Analysis and Price Policy, Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
2. Acharya, S.S. and Agarwal, N.L., 2004, Agricultural Marketing in India, Oxford and IBH Publishing Co. New Delhi.
3. Mamoria, C.B and Joshi, R.L., 1971, Principles and Practice of Marketing in India, Kitabmahal, Allahabad.
4. Kahlon, A.S. and George, M.V., 1985, Agricultural Marketing and Price Policy, Allied Publication Pvt. Ltd., New Delhi.
6. अग्रवाल, एन. एल., 1996, भारतीय कृषि का अर्थतन्त्र, राजस्थान हिन्दी ग्रन्थ अकादमी, जयपुर A
5. Kohls, Richard L. and Uhl, Joseph N., 1980, Marketing of Agricultural Products, Macmillan Publishing Co., Inc. New York

L	P	Total Credit	Max Marks
2	1	3	100

Semester-IV

AGRON402-FIELD CROPS-II (RABI CROPS)

COURSE CONTENT

UNIT-I (Weightage 60 Percent)

Study of following crops with reference to their importance; Origin; Geographic distribution and production in Rajasthan and India; Soil and climatic requirements; varieties; Cultural practices *viz* .Seed and sowing; Intercultural operations; Fertilizer, water and weed management; Plant protection measures; Harvesting and yield: Wheat, Barely, Rapeseed and mustard, Chickpea, Sugarcane, Potato and Berseem, Lucerne.

UNIT-I (Weightage 40 Percent)

Study of package of practices of the following crops: Linseed, Safflower, Sugarbeet, Lentil, Frenchbean, and Oats. An introduction to the importance and cultivation of Medicinal & aromatic plants *viz.* Isabgol, Opium poppy, *Mentha*, Lemon grass, Citronella and Palma rosa.

PRACTICAL

Identification of seeds and crops of *rab*i season; Seed bed preparation and sowing of *rab*i crops; Calculations on seed rate; Preparation of seed material for sowing; Fertilizer application in crops and study of fertilizer experiments; Irrigation and plant protection measures; Weed flora and there control measure and study of weed control experiment; Judging physiological maturity of various crops; morphological characteristics of wheat, sugarcane, chickpea and mustard; Judging sugarcane maturity and quality test; Crop harvesting and processing; Calculation of harvest index, Working out cost of production of two crops; Crop distribution in the state and region, Important Agronomic experiments of *rabi* crops; Visit to research stations related to *rabi* crops.

Suggested Readings:

1. Singh, Chhidda, Singh, Prem and Singh, Rajbir 2003. Modern Techniques of Raising Field Crops. Oxford & IBH Publishing Co., New Delhi.
2. Singh, S.S.1998. Crop Management Under irrigated and Rainfed Conditions Kalyani Publishers, New Delhi
3. Singh, S.S., 1993. Principles and Practices of Agronomy, Kalyani Publishers, New Delhi.
4. Rathore, P.S. 2000.Techniques and Management of Field Crop Production, Agrobios (India), Jodhpur.
5. Prasad, Rajendra 2002. Text Book of Field Crop Production, ICAR, New Delhi.

6. Prajapati, N.D., Purohit, S.S., Sharma, A.K. and Kumar, T. 2003. A Handbook of Medicinal Plants: A Complete Source Book, Agrobios (India), Jodhpur
7. ICAR, 2006 & 1980. Handbook of Agriculture, Indian Council of Agricultural Research, New Delhi.

L	P	Total Credit	Max Marks
2	1	3	100

Semester-IV

ENTO403-INSECT ECOLOGY AND INTEGRATED PEST MANAGEMENT

COURSE CONTENT

UNIT-I (Weightage 40 Percent)

Insect ecology: Introduction, environment and its components; effect of abiotic factors – temperature, moisture, humidity, rainfall, light, atmospheric pressure and air currents; effect of biotic factors – food, competition, natural and environmental resistance; concepts of balance of life in nature, biotic potential, environmental resistance and causes of pest outbreaks in agro-ecosystems; pest surveillance and forecasting.

UNIT-II (Weightage 40 Percent)

IPM: introduction, importance, concepts and tools of IPM – host plant resistance, cultural, mechanical, physical, legislative, biological (parasites, predators and pathogens such as bacteria, fungi and viruses), chemical methods of control; chemical control–importance, hazards and limitations; botanical insecticides–*neem* based products; classification of insecticides, formulations and their examples; other methods of pest control – repellents, antifeedants, hormones, attractants, gamma radiation and genetic control; practices, scope and limitations of IPM; Insecticides Act 1968 – important provisions; introduction to pesticide application; phytotoxicity of insecticides; symptoms of poisoning, first aid and antidotes.

UNIT-III (Weightage 20 Percent)

Bio-agents: Parasitoids and predators used in pest management and their mass multiplication techniques; important groups of microorganisms – bacteria, viruses and fungi used in pest management and their mass production; major pollinators, weed killers and scavengers – their importance.

PRACTICAL

Visit to meteorological observatory/automatic weather reporting station; study of terrestrial and pond ecosystems of insects; studies on insect behaviour and orientation (repellency, stimulation, deterrence); study of distribution patterns of insects, sampling techniques for the estimation of insect population and damage; pest surveillance through light traps, pheromones traps and field incidence; practicable IPM techniques – mechanical and physical methods, cultural and biological, chemical – insecticides and their formulations; calculation of doses/ concentrations of insecticides.

Suggested Readings:

1. Dhaliwal, G.S. and Ramesh Arora 2001. Integrated Pest Management: concepts and approaches. Kalyani Publishers, New Delhi.
2. Metcalf, R.L. and Luckman, W.H. 1982. Introduction to Insect Pest Management. Wiley Inter Science Publishing, New York.
3. Pedigo, Larry P. 2002. Entomology and Pest Management [IV Edition]. Prentice-Hall of India, New Delhi.
4. Yazdani, G.S. and Agarwal, M.L. 1979. Elements of Insect Ecology. Naroji Publishing House, New Delhi.

L	P	Total Credit	Max Marks
2	1	3	100

Semester-IV

HORT404-PRODUCTION TECHNOLOGY OF SPICES, AROMATIC MEDICINAL AND PLANTATION CROPS

COURSE CONTENT

UNIT-I (Weightage 25 Percent)

Importance and cultivation technology of Spices – ginger, turmeric, pepper, cardamom, coriander, cumin, fenugreek, fennel.

UNIT-II (Weightage 25 Percent)

Aromatic crops – lemon grass, citronella, palmrose, vetiver, geranium, dawana, Mentha, Damask rose.

UNIT-III (Weightage 25 Percent)

Plantation crops – coconut, arecanut, betevine, cashew, cocoa, coffee, oilpalm.

UNIT-IV (Weightage 25 Percent)

Medicinal Plants – diascoria, rauvolfia, opium, ocimum, perwinkle, aloe, guggul, belladonna, nuxvomica, *Solanum khasiamum*, senna, plantago, stevia, coleus and lawsonia.

PRACTICAL

Botanical description and identification of aromatic plants; Identification of varieties in spices and plantation crops; Identification of medicinal plants; Propagation techniques in aromatic and spice crops; Selection of mother palm and seed nuts in coconut and oil palm; Study of identification of aromatic plants; Distillation procedures for aromatic crops; Propagation methods in plantation crops; Propagation and planting methods in turmeric; Propagation and planting techniques in ginger, preparation of field and sowing of seed spices. Harvesting and grading of seed spices; Harvesting procedures in aromatic plants; Processing and curing of spices (ginger, turmeric and black pepper); Training methods in betel vine; Products – byproducts of spices and plantation crops; Procedures for oleoresin extraction; Visit to local commercial plantations, Aromatic & medicinal plant nurseries and seed spices field.

Suggested Readings:

1. Child, R. 1966. Coconuts. Longmans, London
2. Hearer, A.E. 1971. Coffee growing. Oxford University Press, London
3. Menon, K.P.V. and Pandlai, K.H. 1957. The coconut palms. Indian Central Coconut Committee, Emarkulam, Kerala
4. Nair, M.N.C; Rao Bhaskara; Nambisans, K.K.N. and Nambisan, M.C. 1979. Cashew – A Monograph, CPCRI, Kassargod
5. Polhamus, L.G. 1962. Rubber, Longman, London
6. Chadha, K.L. 2001. Handbook of horticulture. Indian Council of Agricultural Research, New Delhi
7. Purthi, J.S. 2001. Major Spices. Indian Council of Agriculture Research, New Delhi
8. Sen, N.L., Dashora, L.K. and Dashora, A. 2003. Ropen Phaslein, Masalein, Sughandit avem Aushadhyia Poudhay. Alka Publication, Ajmer (Raj.)

L	P	Total Credit	Max Marks
1	1	2	100

Semester-IV

SCHEM405-SOIL SURVEY, LAND USE PLANNING AND REMOTE SENSING

COURSE CONTENT

UNIT-I (Weightage 30 Percent)

Soil profile development, soil survey: Significance and purpose of soil survey, methods of soil survey mapping. Types of soil surveys: Detailed, Reconnaissance, and Detailed – reconnaissance soil survey.

UNIT-II (Weightage 30 Percent)

Land use planning: Land capability classification, Soil mapping units, Soil survey interpretations and soil survey report. Major soil groups of India with special reference to Rajasthan.

UNIT-III (Weightage 40 Percent)

Soil taxonomy – a comprehensive US system of soil classification. Remote sensing: concept of remote sensing, Aerial photography, Aerial and satellite sensor imaginary, image processing and interpretations.

PRACTICAL

Examinations and description of typical soil profile. Interpretation of topographic map and delineation of physiographic boundaries based on important characters, typifying pedon excavation, examination and classification, interpretation of the identified soil characteristics and their evaluation for land use planning. Preparation of the soil survey report, interpretation of remote sensing information.

L	P	Total Credit	Max Marks
2	1	3	100

Semester-IV

PBG406-BREEDING OF FIELD AND HORTICULTURAL CROPS

COURSE CONTENT

UNIT-I (Weightage 50 Percent)

Botany and taxonomy, chromosome number, center of origin, species relationship, floral iology, breeding objectives and constraints, disease and pest resistance and quality (physical, chemical, nutritional and marketing) improvement, conventional and non-conventional breeding methods.

UNIT-II (Weightage 50 Percent)

Important varieties and future thrust area in crops like wheat, rice, maize, pearlmillet, soybean, groundnut, mustard, cotton, sugarcane, potato, tomato, rose, marigold, mango, papaya and amla.

PRACTICAL

Study of floral biology, hybridization technique, germplasm and segregating populations. Layout of breeding experiments. Observation recording, analysis and interpretation of breeding trials. Calculation of variability parameters, heterosis and inbreeding depression. Salient features of varieties recommended for the region for the crops viz., rice, wheat, maize, sorghum, groundnut, cotton, potato, tomato, sugarcane, rose, marigold, mango and papaya (available at the time of semester).

Suggested Readings:

1. Chaddha, K.L. and Rajendra Gupta. 1995. Advances in Horticulture Vol. II Medicinal and Aromatic Plant. Malhotra Publishing House, New Delhi.
2. Chopra, V.L. 2000. Breeding of Field Crops (Edt.). Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
3. Mandal, A.K., P.K. Ganguli and S.P. Banerjee. 1991. Advances in Plant Breeding Vol. I and II. CBS Publishers and Distributors, New Delhi.
4. Manjit S. Kang 2004. Crop Improvement: Challenges in the Twenti-First Century (Edt). Internatinal Book Distributing Co.Lucknow.
5. Poehlman, J.M. 1987. Breeding of Field Crops. AVI Publishing Co.. INC, East Port, Conneacticut, USA.
6. Ram, H.H. and H.G. Singh. 1994. Crop Breeding and Genetics. Kalyani Publishers, New Delhi.
7. Sharma, A.K. 2005. Breeding Technology of Crop Plants (Edt.). Yash Publishing House, Bikaner.

L	P	Total Credit	Max Marks
2	1	3	100

Semester-IV

AGRON407-ORGANIC FARMING

COURSE CONTENT

UNIT-I (Weightage 40 Percent)

Meaning, definition, scope and concept of organic farming, need and importance in present context and future prospects; organic farming development- efforts by government and private sector; organic production requirement; principles, objectives and components of organic farming, practices of organic farming, approaches of organic farming, biodynamic agriculture, home farming, natural farming.

UNIT-II (Weightage 30 Percent)

Bio-logical, Integrated nutrient management – organic manure – FYM compost, Vermicompost , green manuring their need and production process; Bio - fertilizers – *Rhizobium*, *Azotobactor* Phosphate solublizing Bacteria (PSB)and VAM. Recycling of organic residues; Integrated disease and pest management.

UNIT-III (Weightage 30 Percent)

Use of bio-control agent, bio-pesticides, pheromone trap, bird perches; weed management. Quality consideration, certification, labelling and accreditation processors, marketing and exports.

PRACTICAL

Techniques for preparation of various types of organic manures like compost, super compost, Vermicompost, NADEP compost, Techniques of treating crop seeds with *Rhizobium* culture, *Azotobactor*, *Azospirillum* and PBS culture in field crops. Visit to Vermicompost Units.

Suggested Readings:

1. Dhama, A.K. 1999. Organic Farming, Agro Botanica, Bikaner.
2. Sharma, Arun K. 2002 A Handbook of Organic Farming, Agrobios (India), Jodhpur.
3. Palaniappan, S.P. and Anandurai, K.1999. Organic Farming – Theory and Practice, Scientific Pub. Jodhpur.
4. Thapa, U and Tripathy, P. 2006. Organic Farming in India: Problems and Prospects, Agrotech, Publising Academy, Udaipur.
5. भार्मा, अरूण के. 2005. जैविक खेती – सिद्धान्त, तकनीक व उपयोगिता, एग्रोबायोस (इण्डिया). जोधपुर।

Fifth Semester

Course Code	**Course Title**	**Course Type**	**L**	**P**	**CU**	**Max Marks**
AGECON 501	AGRI-BUSINESS MANAGEMENT	Core Course	2	1	3	100
EXTED 502	FUNDAMENTAL OF RURAL SOCIOLOGY AND PSYCHOLOGY	Core Course	3	0	3	100
AGRON 503	PRACTICAL CROP PRODUCTION I(KHARIF CROPS)	Core Course	0	1	1	100
AGRON 504	FARMING SYSTEM AND SUSTAINABLE AGRICULTURE	Core Course	1	1	2	100
ENTO 505	PESTS OF CROPS,STORED GRAINS AND THEIR MANAGEMENT	Core Course	2	1	3	100
HORT 506	POST HARVEST MANAGEMENT AND VALUE ADDITION OF FRUIT AND VEGETABLES	Core Course	1	1	2	100
MBB 507	INTRODUCTORY BIO-CHEMISTRY	Core Course	2	1	3	100
	Total Credit		11	6	17	700

L	P	Total Credit	Max Marks
1	1	2	100

Semester-V

AGECON501-FUNDAMENTALS OF AGRI-BUSINESS MANAGEMENT

COURSE CONTENT

UNIT-I (Weightage 25 Percent)

Agribusiness: Meaning, Definition, Structure of Agribusiness (Input, Farm, Product Sectors). Importance of Agribusiness in the Indian Economy. Agribusiness Management: Distinctive features, Importance, Definition of Management, Management Function.

UNIT-II (Weightage 25 Percent)

Planning: Meaning, Definition, Type of plans (Purpose or Mission, Goals or Objectives, Strategies, Policies, Procedures, Rules, Programmes, Budget). Financial Management of Agribusiness: Importance of Financial Statements, Balance Sheet, Profit and Loss Statement, Analysis of Financial Statements.

UNIT-III (Weightage 25 Percent)

Agro-based Industries: Importance, Need, Classification of Industries. Marketing Management: Meaning, Definition. Marketing Mix: Basic of marketing mix, 4Ps of Marketing Mix, Market segmentation. Product life cycle.

UNIT-IV (Weightage 25 Percent)

Pricing policy: Meaning and Pricing Method. Project: Definition, Project cycle- Identification, Formulation, Appraisal, Implementation, Monitoring and Evaluation. Appraisal and Evaluation techniques, viz.: NPW, BCR, IRR.

PRACTICAL

Analysis of Financial Statements: Balance Sheet, Profit and Loss Statements; Study/Visit of Financing Institutions-Cooperatives/ Commercial Banks/ RRBs. Preparation of Projects; Feasibility reports; Project appraisal techniques: Computation of NPV, BCR, and IRR, Case Study of Agro-Based Industries. Enlisting of Agro-Based Industries.

Reference :

1. Bhatia, K. L. and Kewal Khanna, Export Management, Raj Publishing House, 44 Parnami Mandir, Govind Marg, Jaipur.
2. Adrian Buckley, Essential of International Money, Prentice Hall, New Delhi – 110 001.
3. Tink Findle, The Economist Guide to Management Ideas, Profile Books Limited, 58, Hatton Garden, London.

L	P	Total Credit	Max Marks
2	0	2	100

Semester-V

EXTED- 502 FUNDAMENTALS OF RURAL SOCIOLOGY AND EDUCATIONAL PSYCHOLOGY

COURSE CONTENT

UNIT-I (Weightage 30 Percent)

Sociology and Rural Sociology - Meaning, Definition, Scope, Importance of Rural Sociology in Agricultural Extension and Interrelationship between Rural Sociology & Agricultural Extension. Indian Rural Society, Important characteristics, Differences and Relationship between Rural and Urban societies. Social Groups: Meaning, Definition, Classification, Factors considered in formation and organization of groups. Social Stratification – Meaning, Definition, Functions, Forms of Social stratification.

UNIT-II (Weightage 30 Percent)

Cultural concepts – Culture, Customs, Folkways, Mores, Taboos, Rituals and Traditions – Meaning, Definition and their Role in Agricultural Extension. Social Values and Attitudes – Meaning, Definition, Types and Role of Social Values and Attitudes in Agricultural Extension. Social Institutions – Meaning, Definition, Major institutions in Rural society, Functions. Social Control – Meaning, Definition, Need and Means of Social control. Social change – Meaning, Definition, Nature of Social change and factors of social change.

UNIT-III (Weightage 40 Percent)

Leadership- Meaning, Definition, Classification, Roles of Leader, Methods of selection of leaders. Psychology and Educational psychology – Meaning, Definition, Scope and Importance of Education Psychology in Agricultural Extension. Intelligence – Meaning, Definition, Types, Factors affecting intelligence. Personality – Meaning, Definition, Types, Factors influencing the Personality and Role of personality in Agricultural Extension. Teaching – Learning process – Meaning and Definition of Teaching, Learning, Learning experience and Learning situation, Elements of learning situation and its characteristics.

Suggested Readings:

1. Bhatia, H.R. 1965. A Text Book of Educational Psychology, Asia Publishing House, New Delhi.
2. Chitamber, J.B. 1990. Introductory Rural Sociology, Wiley Easter Ltd., New Delhi.
3. Desai, A.R. 1953. Rural Sociology in India, Vora & Co. Publisher Pvt.Ltd., Bombay.
4. Dhama, O.P. and Bhatanagar, O.P. 1985. Education & Communication for Development, Oxford & IBH Publishing Co., New Delhi.
5. Pujari, D. 2002. Educational Psychology in Agriculture, Agrotech Publishing Academy, Udaipur(Raj.)-313001.

L	P	Total Credit	Max Marks
0	1	1	100

Semester-V

AGRON503-PRACTICAL CROP PRODUCTION-II (*KHARIF* CROPS)

COURSE CONTENT

PRACTICAL

Crop planning; Raising field crops in multiple cropping systems: field preparation, seed treatment, sowing, Nutrient, water and weed management; Management of insect, pest and diseases of crops; Harvesting, threshing, drying, winnowing,storage and marketing of produce; Preparation of balance sheet including cost of cultivation, net return per student as well as per team of a group of student.

Suggested Readings:

1. Yawalkar, K.S., Agarwal, J.P. and Bokde, S. 1992. Manures and Fertilizers, Agri-Horticultural Pub. House, Nagpur.
2. Balasubramaniyan, P. and Palaniappan, S. P.2001. Principles and Practices of Agronomy, Agrobios (India), Jodhpur.
3. Reddy, S. R., 2004. Principles of Agronomy, Kalyani Publishers, Ludhiana.
4. Singh, S.S., 1993. Principles and Practices of Agronomy, Kalyani Publishers, Ludhiana.

L	P	Total Credit	Max Marks
1	1	2	100

Semester-V

AGRON504-FARMING SYSTEMS AND SUSTAINABLE AGRICULTURE

COURSE CONTENT

UNIT-I (Weightage 40 Percent)

Farming systems: definition, principles, scope and components; IFS models for wetland, irrigated, and dryland situations; Components of Farming systems; Interactions among components of different enterprises; Resource management under constrained situations.

UNIT-II (Weightage 30 Percent)

Low cost and non monetary inputs particularly for wasteland and problematic soils. Sustainable agriculture: Introduction, definition, goal and current concepts; Indices of sustainability; Emerging issues for present day technologies; Factors affecting ecological balance.

UNIT-III (Weightage 30 Percent)

Ameliorative measures and management practices for sustainable agriculture *viz.* soil, water sources, rain water and integrated pest management; Land degradation and conservation of natural resources; LEISA, LEIA & HEIA; Irrigation problems, waste lands and their development.

PRACTICAL

Preparation of cropping scheme for irrigated situations; Preparation of cropping scheme for dryland situations; Study of existing farming systems in nearby villages; Preparation of integrated farming system model for wetlands; Preparation of integrated farming system model for drylands; Preparation of enriched Farm Yard Manure; Preparation of Vermicompost; Visit to urban waste recycling unit; Study of profitable utilization of agricultural wastes; Visit to poultry and dairy units to study resource allocation, utilization and economics; Visit to an organic farm to study various components and utilization; Study of degraded lands.

Suggested Readings:

1. Panda, S.C.2004. Cropping Systems and Farming Systems, Agrobios (India), Jodhpur
2. Sharma, Arun K. 2002. A Handbook of Organic Farming, Agrobios (India) Ltd., Jodhpur
3. Balasubramaniyan, P. and Palaniappan, S.P. 2004. Principles and Practices of Agronomy, Agrobios (India), Jodhpur.
4. Shukla, Rajeev K. 2004. Sustainable Agriculture, Surbhee Publications, Jaipur
5. Palaniappan, S.P.1985. Cropping Systems in the Tropics: Principles and Management, Wiley Easter Ltd. and TNAU, Coimbatore.
6. Reddy S. R. 2004. Principles of Agronomy, Kalyani Publishers, Ludhiana.
7. Palaniappan, S.P. and Sivaraman, K. 1996. Cropping system in Tropics, New International Pvt. New Delhi.

L	P	Total Credit	Max Marks
2	1	3	100

Semester-V

ENTO505-PESTS OF CROPS, STORED GRAINS AND THEIR MANAGEMENT

COURSE CONTENT

UNIT-I (Weightage 75 Percent)

Distribution, biology, nature and symptoms of damage and management strategies of insect and non-insect pests of rice, sorghum, maize, wheat, sugarcane, cotton, mesta, sun hemp, pulses, groundnut, castor, gingerly, safflower, sunflower, mustard, brinjal, bhendi, tomato, cruciferous and cucurbitaceous vegetables, potato, sweet potato, colacasia, drumstick, amaranths, chillies, mango, citrus, grapevine, cashew, banana, pomegranate, guava, sapota, ber, apple, coconut, tobacco, coffee, tea, turmeric, betel vine, onion, coriander, curry leaf, pepper, ginger and ornamental plants.

UNIT-II (Weightage 25 Percent)

Biology, nature of damage and management of stored grain pests: *Sitophilus*, *Trogoderma*, *Rhyzopertha*, *Tribolium*, *Callosobruchus*, *Lasioderma*; *Sitotroga*, *Cadra*, *Corcyra*, *Pthorimea*, *Plodia*.

PRACTICAL

Identification of pests and their damage symptoms of important crops as covered in theory.

Suggested Readings:

1. Atwal, A. S. and Dhaliwal, G. S. 1997. Agricultural Pests of South Asia and their Management. Kalyani Publishers, Ludhiana.
2. Ayyar, T. V. R. 1984. Handbook of Economic Entomology for S. India. Narendra Publishing House, Delhi.
3. David. B. V. 2001. Elements of Economic Entomology. Popular Book Depot. Chennai.
4. Khare, B. P. 1993. Stored Grain Pests and Their Management. Kalyani Publishers, Ludhiana.
5. Pedigo, L.P. 2002. Entomology and Pest Management [IV Edition]. Prentice- Hall of India, New Delhi.
6. Pradhan. S. 1983. Agricultural Entomology & Pest Control. ICAR Publication, New Delhi.

L	P	Total Credit	Max Marks
1	1	2	100

Semester-V

HORT506-POST HARVEST MANAGEMENT AND VALUE ADDITION OF FRUITS AND VEGETABLES

COURSE CONTENT

UNIT-I (Weightage 25 Percent)

Importance of post harvest in horticultural crops. Maturity indices, harvesting and post harvest handling of fruits and vegetables. Maturity and ripening process. Factors affecting ripening of fruits and vegetables. Pre harvest factors affecting quality on post harvest shelf life of fruits and vegetables. Factors responsible for detioration of harvested fruits and vegetables.

UNIT-II (Weightage 25 Percent)

Chemicals used for hastening and delaying ripening of fruits and vegetables. Methods of storage – precooling, prestorage treatments, low temperature storage, controlled atmospheric storage, hypobaric storage, irradiation and low cost storage structures. Various methods of packing for export of mango, banana, grapes kinnow, sweet orange and mandarin etc.

UNIT-III (Weightage 25 Percent)

Importance and scope of fruit and vegetable preservation in India. Principles of preservation by heat, low temperature, chemicals and fermentation. Unit layout – selection of site and precautions for hygienic conditions of the unit. Preservation through canning, bottling, freezing, dehydration, drying, ultraviolet and ionizing radiations.

UNIT-IV (Weightage 25 Percent)

Preparation of jams, jellies, marmalades, candies, crystallized and glazed fruits, preserves, chutneys, pickles, ketchup, sauce, puree, syrups, juices, squashes and cordials. Spoilage of canned products, biochemical, enzymatic and microbial spoilage. Preservatives, Colours permitted and prohibited in India.

PRACTICAL

Practice in judging the maturity of various fruits and vegetables. Conservation of zero energy cool chambers for on farm storage. Determination of physiological loss in weight (PLW), total soluble solids (TSS), total sugars, acidity and ascorbic and content in fruits and vegetables. Packing methods and types of packing and importance of ventilation. Pre cooling packing methods for export or international trade. Methods of prolonging storage life. Effect of ethylene on ripening of banana, sapota, mango. Identification of equipment and machinery used is preservation of fruits and vegetables. Preservation by drying and dehydration. Preparation of

jam, jelly and marmalades. Preparation of squash, cordials and syrups. Preparation of chutnerys, pickles sauces and ketchup. Visit to local processing units. Visit to local market yards and cold storage units. Visit to local market and packing industries.

Suggested Readings:

1. Lal, G.; Siddappa, G.S. and Tandon, G.L. 1967. Fruit and Vegetable preservation. ICAR publication
2. Cruess, W.V. 1958. Commercial fruit and vegetable products. Mc Grew-Hill Book Co. Inc., New York

L	P	Total Credit	Max Marks
2	1	3	100

Semester-V

MBB507-INTRODUCTORY BIOCHEMISTRY

COURSE CONTENT

Objective

To provide elementary knowledge/overview of structure, functions and metabolism of biomolecules.

UNIT-I (Weightage 25 Percent)

Biochemistry – Introduction and importance, Plant cell, cell wall and its role in live stock, food; and paper; industries, Bio-molecules-Structure, properties and applications: Amino acids, peptides and proteins-Plant proteins and their quality.

UNIT-II (Weightage 25 Percent)

Enzymes- factors affecting the activity, classification, Immobilization and other industrial applications. Lipids-Acyl lipids, Their industrial application in soaps, detergents, paints, Varnishes, lubricants, adhesives, plastics, nylon, Biodiesel, Biodegradable plastics etc. Carbohydrates; Nucleotides and Nucleic acids, Metabolic energy and its generation.

UNIT-III (Weightage 25 Percent)

Metabolism-Basic concepts, Glycolysis, Citric acid Cycle, Pentose phosphate pathway, oxidative phosphorylation, Fatty acid oxidation. General reactions of amino acid degradation. Biosynthesis of carbohydrates.

UNIT-IV (Weightage 25 Percent)

Lipids, Proteins and Nucleic acids. Metabolic regulation. Secondary metabolites, Terpenoids, Alkaloids, Phenolics and their applications in food and pharmaceutical industries.

PRACTICAL

Paper Chromatography for the separation of plant pigments; Protein denaturation-heat, pH, precipitation of proteins with heavy metals, Protein estimation by Lowry method; Enzyme kinetics, competitive inhibition, enzyme immobilization; Extraction of nucleic acids, column chromatography of RNA hydrolysate; Characterization of lipids by TLC; Extraction of oil from oil seeds; Estimation of fatty acids by GLC; Quantitative determination of sugars; Isolation characterization of nucleic acids determination of terpenoids and alkaloids.

Reference books:

1. Reginald H. Garnett and Charles M.Grisham (2005). Biochemstry. Thomson Brooks/Cole USA.
2. Mousumi Debnath (2005). Tools and Techniques of Biotechnology. Pointer Publishers Jaipur
3. Lehninger (2004). Principles of Biochemistry. W.H. Freeman and Company.USA
4. Goodwin and Mercer (2003) Introduction to Plant Biochemistry. CBS Publishers & Distributors, New Delh
5. Sahney, S.K. and Singh, R.R. (2002) Introductory Practical; Biochemistry. Narosa Publishing House.New Delhi.
6. Rodney Boyer. (2001). Modern Experimental Biochemistry. Pearson Education, Inc. Singapore.
7. Buchanan, B.B; Gruissem. Wilhelm and Jones Russell L. (2000) Biochemistry and Molecular Biology of Plants. J.K International Pvt. Ltd.

Sixth Semester

Course Code	**Course Title**	**Course Type**	**L**	**P**	**CU**	**Max Marks**
AGECON 601	PRODUCTION ECONOMICS AND FARM MANAGEMENT	Core Course	1	1	2	100
AGRON 602	PRACTICAL CROP PRODUCTION II(RABI CROPS)	Core Course	0	1	1	100
EXTED 603	COMMUNICATION SKILLS AND ENTREPRENEURSHIP DEVELOPMENT	Core Course	1	1	2	100
MBB 604	PRINCIPLES OF PLANT BIO TECHNOLOGY	Core Course	2	1	3	100
NEMAT 605	ELEMENTARY NEMATOLOGY	Core Course	1	1	2	100
STAT 606	INDUSTRIAL STATISTICS	Core Course	1	1	2	100
PBG 607	PRINCIPLES OF SEED TECHNOLOGY	Core Course	2	1	3	100
	Total Credit		8	7	15	700

AGECON - 601 PRODUCTION ECONOMICS AND FARM MANAGEMENT

Cr. Hr. 2(1+1)

Theory:

Production Economics; Meaning, Definition, Nature and Scope of Agricultural Production Economics. Basic Concepts and terms. Concepts of Production. Production Function: Meaning, Definition. Laws of returns: Increasing, Constant and Decreasing. Factor Product Relationships. Factor Factor Relationships. Product Product Relationships. Types of enterprises. Returns to Scale: Meaning, Definition, Importance. Farm Management: Meaning, Definition, Scope. Economic principles applied to the Organisation and Operation of farm business. viz. Principle of Variable Proportion, Cost Principle, Principle of comparative Advantage. Types and systems of farming. Farm Planning and Budgeting. Risk & uncertainty.

Practical:

Computation of cost concepts; Methods of computation of Depreciation; Analysis of Net Worth Statement; Preparation of Farm Plans and Budgets; Preparation of Profit and Loss Account; Break-even Analysis; Application of Farm Management Principles. viz. Principle of Variable Proportion, Cost Principle, Principle of comparative Advantage.

References :

1. Johl, S.S. and T.R. Kapur, 1989, **Fundamentals of Farm Business Management**, Kalyani Publishers, Ludhiyana.
2. Kahlon, A.S. and Karam Singh, 1980, **Economics of Farm Management in India**, Allied Publishers, New Delhi.
3. Sankhayan, P. L., 1988, **Introduction to the Economics and Agricultural Production**, Prentice Hall of India Private Limited, New Delhi.
4. Heady, Earl O and Dillon John L, 1988, **Agricultural Production Function,** Kalyani Publishers, New Delhi.
5. Singh, I. J., 1977, **Elements of Farm Management Economics**, Affiliated East-West Press Pvt. Ltd., New Delhi.

EXTED- 603 COMMUNICATION SKILLS AND ENTREPRENEURSHIP 2(1+1)

DEVELOPMENT

Theory: Communication Skills: Meaning and Process of communication, verbal and non-verbal communication; listening and note taking, writing skills, oral presentation skills. Reading and comprehension of general and technical articles. Public speaking. Entrepreneurship Development: Concept & Meaning. Overview of Indian social, political and economic systems and their implications for decision making by individual entrepreneurs. Globalization and the emerging business / entrepreneurial environment. Entrepreneurial and managerial characteristics; managing an enterprise; motivational drives; entrepreneurial ethics; Entrepreneurship development Programmes SWOT analysis, Generation, incubation and commercialization of ideas and innovations. Government schemes and incentives for promotion of Entrepreneurship. Government Policy on Small and Medium Enterprises (SMEs) / SSIs. Export and Import Policies. Contract farming and joint ventures, public-private partnerships. Social Responsibility of Business.

Practical: Listening and note taking, writing skills, oral presentation skills; field diary and lad record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, précis writing, summarizing, abstracting; individual and group presentation.

Suggested Readings:

1) Akhouri, M.M.P., Mishra, S.P. and Sen Gupta, R.1989. Trainers Manual on Developing Entrepreneurial Motivation, NIESBUD, New Delhi.

2) Bidgoli, H.1989. Decision Support Systems: Principles and Practices, St.Paul, West Publishing Co.,USA.

3) Goyal, D.P.1994. Management Information System: Concept and Application, Deep & Deep Publisher, New Delhi.

4) Mancuso, J.1974. The Entrepreneurs Handbook (Vol.192), Artech House, Inc., USA.

5) Patel, V.G.1987. Entrepreneurship Development Programme in India and Its Relevance to Developing Countries, Entrepreneurship Development Institute of India, Ahmedabad.

6) Rao, T.V.1974. Development of an Entrepreneur, Indian Institute of Management, Ahmedabad.

MBB 604 : PRINCIPLES OF PLANT BIOTECHNOLOGY
3(2+1)
Objective
To provide elementary knowledge/overview of plant biotechnology principles and concepts.
Theory: Concepts of Plant Biotechnology: History of Plant Tissue Culture and Plant Genetic Engineering; Scope and importance in Crop Improvement. Totipotency and Morphogenesis, Nutritional requirements of *in-vitro* cultures; Techniques of *in-vitro* cultures, Micro propagation, Anther culture, Pollen culture, Ovule culture, Embryo culture, Test tube fertilization, Endosperm culture, Factors affecting above *in-vitro* culture; Applications and Achievements; Somaclonal variation, Types, Reasons: Somatic embryogenesis ;and synthetic seed production technology; Protoplast isolation, Culture, Manipulation and Fusion; Products of somatic hybrids and cybrids, Applications of tissue culture in crop improvements; Plant Genetic engineering; Restriction enzymes; Vectors for gene transfer- Gene cloning-Direct and indirect method of gene transfer-Transgenic plants and their; application. DNA finger printing- DNA based markers- RFLP, AFLP, RAPD, SSR and DNA Probes-Mapping QTL-Future prospects. MAS, and its application in crop improvement. Molecular analysis of transgenics
Practical: Techniques in Plant Tissue Culture; Media components and preparations; Sterilization techniques and Inoculation of various explants; Aseptic manipulation of various explants; Callus induction and Plant Regeneration; Micro propagation of important crops; Anther, Embryo and Endosperm synthetic seed production; Isolation of protoplast; Demonstration of Culturing of protoplast; Isolation of DNA, Purity analysis, Restriction analysis of Plant DNA, gene transfer techniques, direct methods, indirect methods; Demonstration of Confirmation genetic transformants.
Recommended books:
Bains W (2004) Biotechnology: From A to Z 3rd Edn Oxford University press Oxford
Purohit S S (2004) Biotechnoology: Fundamentals and Applications 3rd Edn. Student Edition, Jodhpur
Gupta P K (2004) Biotechnology and genomics, Rastogi publications, Meerut
Chawla H S (2002) Introduction to Plant Biotechnology. 2nd Edn Oxford IBH publishing New Delhi
Ratledge C and Kristiansen B (2001) Basic Biotechnology 2nd Edn. Cambridge Univ Press

NEMAT 605 Elementary Nematology (B. Sc. Ag) 2(1+1)

Theory

History and economic importance of nematodes; characters of phylum Nematoda, systematic position of nematodes in animal kingdom; general morphology and biology of nematodes; plant nematode relationship; nematode ecology and disease complexes. Nematode diseases of crop plants of economic importance with special reference to Meloidogyne, Heterodera, Pratylenchus, Radopholus, Anguina, Rotylenchulus and Tylenchulus. Principles of nematode management, integrated pest management.

Practical

Collection of soil and plant samples, extraction of nematodes from soil and roots. Preparation of temporary mounts of nematodes, staining and separation of nematodes in plant tissues, collection and preservation of diseased plant samples, identification of important plant parasitic nematodes.

Suggested Reading:

1. R.K.Walia and H.K.Bajaj (2003). Text book on Introductory Plant Nematology. ICAR New Delhi publication.
2. Reddy,P.P. (1993). A treatise on phytonematology. Agric. Publ.Academy, New Delhi.
3. Sasser, J.N. and W.R.Jenkins. Nematology. S.Chand & Company, Ramnagar, New Delhi.
4. Singh,R.S. & K.Sitaramaiah (1993). Plant Pathoges the Nematodes. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi
5. Swarup,G. (1982). Padap Krimivigyan, Rajasthan Sahitya Academy, Jaipur (in Hindi)

STAT -606
INDUSTRIAL STATISTICS
Cr.Hrs. 2(1+1)
Theory:
Definition and scope of Statistics, Measures of central tendency, Measures of dispersion, Moments, Skewness and Kurtosis, Elementary notions of probability, Laws of addition and multiplication probability, Binomial, Poisson and Normal distributions and their applications, Introduction to testing of hypotheses and tests of significance, 'Z' and 't' test for one and two sample problems, 'Chi - square' test for independence of attributes and goodness of fit, Simple Correlation coefficient and its test of significance, Simple Linear regression.
Practicals:
Measures of central tendency, Measures of dispersion, Application of 'Z' test for one and two sample problems, Application of 't' test for one and two sample problems, Application of Chi –Square test, Simple Correlation and regression.
Suggested Readings:
1. Snedecor and Cochran (1967). Statistical Methods. Oxford and IBH Publishing Co., New Delhi.
2. V.K. Kapoor (2005). Fundamentals of Statistics for Business and Economics. Sultan Chand and Sons, New Delhi.
3 S.C. Gupta and V.K. Kapoor (2006). Fundamentals of Statistics. Himalaya Publishing House, New Delhi.

Seven Semester

Course Code	**Course Title**	**Course Type**	**L**	**P**	**CU**	**Max Marks**
AGRON 701	INTEGRATED WATERSHED MANAGEMENT	Core Course	2	1	3	100
ENTO 702	INTEGRATED PEST MANAGEMENT	Core Course	2	1	3	100
PBG 703	HETEROSIS AND HYBRID SEED PRODUCTION IN FIELD CROPS	Core Course	2	1	3	100
EXTED 704	TRAINING PROCESS AND CURRICULUM DEVELOPMENT	Core Course	2	1	3	100
EXTED 705	EXTENSION METHODOLOGIES FOR TRANSFER OF AGRICULTURAL TECHNOLOGY	Core Course	2	1	3	100
	Total Credit		10	5	15	500

AGRON - 701 INTEGRATED WATERSHED MANAGEMENT

4 (2+2)

Theory:

Watershed: concept, importance and use; Factors affecting watershed management; Principles of watershed management; Objectives of watershed management, delineation & toposequence of watershed area; Land capability classification; Specific problems of watershed area; Components of watershed management; Agronomical measures for soil and water conservation; Soil and water conservation for arable and non-arable lands; Horticulture and forestry for watershed area; Execution of proposed plan for development and conservation of soil, water and vegetation resources ; Crop management in watershed areas ; Evaluation of systems in terms of stability and sustainability of programme executed; Studies of soils, vegetation and socio-economic status of watershed area ; Modification of plan during execution based on ground needs ; Monitoring of the growth, productivity and resources with various systems.

Practical:

Study of on going watershed management programmes; Identification of grass and tree species suitable for soil and water conservation; Study of soil and water conservation measures as per land use capability classification (Arable lands); Study of soil and water conservation measures as per land use capability classification (Non-arable lands); Measures for in - situ moisture conservation; Visit to model watershed areas of the zone IV a and b; Dry seeding practices suitable for watershed areas and after care; Acquaintance with different soil conservation structures *viz.* terraces, bunds water ways etc., Practicing suitable agronomic measures for sustainable crop production in watershed areas ; Alternate land use systems in watershed areas ; Study of water storage structures for watershed areas ; Visit to forest areas of zone IV a and b

Suggested Readings:

1. Murthy, J. V. S. 1994. Watershed Management, Wiley Eastern Limited. New Age International Limited, New Delhi.
2. Dhruva Narayan, V.V. Singh, P.P., Bhardwaj, S.P., U. Sharma, Sikha, A.K., Vital, K.P.R. and Das, S.K. 1987. Watershed Management for Drought Mitigation, ICAR, New Delhi.
3. Singh, R.P., Sharma, S., Padmnabhan, N.V. , Das, S.K. and Mishra, P.K. 1990.A Field Manual on Watershed Management, ICAR (CRIDA), Hyderabad.
4. Singh, P.K. 2000. Watershed Management (Design & Practices), e-media Publication, Udaipur, India.

ENT. 702 INTEGRATED PEST MANAGEMENT 4 (2+2)

Theory:

Introduction, principles, and concept of IPM. Ecological basis of IPM. IPM modules for major crops under open and protected cultivation. Biotechnological approaches and their potential in IPM. Survey and surveillance techniques of important pests and their natural enemies.

Introduction, components of integrated disease management – cultural, chemical, biological and host plant resistance; Development of IDM, IDM of rice, wheat, cotton, maize, bajra, sugarcane, chickpea, mustard and important vegetables and fruits; genetically modified crops.

Practical:

Sampling of pest population utilizing various traps. Monitoring of insect pest, and natural enemies. Concept and calculation of injury levels, estimation of losses, visit of IPM fields in major crops and protected cultivation.

Application of cultural, chemical and biological agents, their compatibility and integration in IDM, demonstration of IDM in *Rabi* (wheat & mustard) / *Kharif* (maize and groundnut) crops.

Suggested readings:

1. David, B.V. 2000. Elements of Entomology. CAB Publications, Chennai.
2. Dhaliwal, G.S. and E.A. Heinrichs. 1998. Critical issues in pest management. Commonwealth Publishers, New Delhi. 287 p.
3. Dhaliwal, G.S. and Ramesh Arora 2002. Integrated Pest Management – Concept and Approaches. Kalyani Publishers, New Delhi, 297 p.
4. Metcalf, R.L. and Luckmann, W.H. 1982. Introduction of Insect Pest Management. A wiley – Interscience Publication, 561 p.
5. Pedigo, L.P. 2002. Entomology and Pest Management. Prentice hall of India, New Delhi.
6. Pradhan, S. 1983. Agricultural Entomology and Pest Control. Indian Council of Agricultural Research, New Delhi, 267 p.
7. Gupta V.K. & Sharma, R.C. (Eds). 1995. Integrated Disease Management and Plant Health. Scientific Publ., Jodhpur.
8. Mayee C.D., Manoharachary C, Tilak KVBR, Mukadam D.S. & Deshpande Jayashree (Eds.). 2004. Biotechnological Approaches for the Integrated Management of Crop Diseases. Daya Publ. House, New Delhi.
9. Sharma, R.C. and Sharma, J.N. (Eds). 1995. Integrated Plant Disease Management. Scientific Publ., Jodhpur.

PBG 703 HETEROSIS AND HYBRID SEED PRODUCTION IN FIELD CROPS

3 (1+2)

Theory:

Heterosis breeding – heterotic pools and populations, their development and improvement. Inbred lines – development, evaluation, improvement, nature and number of testers, combining ability. Type of hybrids, their development and prediction of hybrid performance. Male sterility and self-incompatibility system, their development, maintenance and exploitation in hybrid breeding. Hybrid seed production – field layout, isolation, rouging, characterization of inbred lines. Use of male sterility systems, two and three line system of hybrid seed production, development of A, B and R lines. Current status and future prospects of hybrid development in maize, bajra, cotton, sorghum, wheat, rice, castor, mustard, sunflower, pigeonpea and vegetable crops (okra, brinjal, tomato). Hybrid seed production – identification of seed production areas and factors affecting seed production.

Practical:

Floral biology, study of controlled pollination and different techniques of emasculation. Crossing and selfing technique in different field crops. Field layout of crossing block in self pollinated crops. Field layout of crossing block in cross-pollinated crops. Field layout of hybrid seed production with and without male sterility system. Development of inbred lines in maize. Maintenance of A, B and R lines. Characterization and identification of parents and hybrids. Varietal identification in field crops.

Suggested Readings:

 Agarwal, R.L. 1991. Seed Technology. Oxford & IBH Publishing Co. New Delhi.

 Chaddha, K.L. and Rajendra Gupta. 1995. Advances in Horticulture Vol. II Medicinal and Aromatic Plant. Malhotra Publishing House, New Delhi.

 Chopra, V.L. 2000. Breeding of Field Crops (Edt.). Oxford and IBH Publishing Co. Pvt. Ltd., New
Delhi.

 Hallauer A.R. and Miranda, J.B. 1989. Quantitative Genetics in Maize. Iowa State Univ. Press Amesterdum.

 Poehlman, J.M. 1987. Breeding of Field Crops. Third Edition, AVI Publication, USA.

 Ram, H.H. 2005. Vegetable Breeding – Principles and Practices. Kalyani Publishers, New Delhi.

 Sharma, J.R. 1994. Principles and Practices of Plant Breeding. Tata-Mc Graw Hill Publication, New Delhi.

EXTED- 704

TRAINING PROCESS AND CURRICULUM DEVELOPMENT 3(2+1)

Technology: Concept, definition and importance, Agricultural technology; appropriate technology and its characteristics. Transfer of technology in Agriculture, Latest transfer of technology programmes of ICAR - KVK, ATIC, ATMA and NAIP; Communication – definition, nature , importance, functions elements and principles, kinds of communication, Models of Communication-Berlo's model, Lagan's model, barriers in Communication

Training- Concept, meaning and definition, importance and principles of extension training, characteristics of an effective trainer; Important elements of training situation; Training and education; Training typology, Training process - pre- training, training and post- training, training need assessment, developing training plan, designing training programme. Training objective, curriculum development, training methodology, implementation of training. Evaluation and monitoring of training. Important training techniques- brain storming, symposium, buzz session, group discussion, method demonstration, case study, role playing, seminar and conference.

Practical

1. Exercise on training needs assessment of farmers and farmwomen.
2. To develop a training schedule for short-term training Programme.
3. Evaluation of training programme in initial stage and at the end of training programme.
4. Visit of training institute
5. Participation in one training programme
6. Exercise on different training techniques

Suggested Readings:

1. Ray, G.L.(2003). Extension Communication and Management; Naya Prakash, 206, Bidhan Sarani Calcutta. 6
2. Lynton, R.P. and Pareek, U.(1967). Training for Development. Richard D. Iswin Inc. and Dorsey Press, Home Wood, IIIinois.
3. Vashistha, S.B. (1987). Farmer's Training for Agricultural Development in India. Deep and Deep Publication, New-Delhi.
4. Craig, R.L. and Bittle, L.R. (1967). Training and Development- Hand Book, Mac Graw Hill Book Co; New York.

EXTED- 705

EXTENSION METHODOLOGIES FOR TRANSFER OF AGRICULTURAL TECHNOLOGY
3(2+1)

Teaching and learning – meaning, definition, characteristics, steps in extension teaching learning process Elements of learning situation. Teaching methods - meaning, definition and classification. Individual approach methods- Farm and home visit, telephone call, E- mail. Group approach methods – Group discussion method, Method and Result demonstration. Small group techniques – Lecture, Panel discussion, Workshop, Syndicate, Brain storming, Seminar, Conference, field trip. Mass approach methods – campaign, exhibition Kisan Mela, Radio, T.V. Farm publication – Pamphlet, bulletin , news letter, folder, news story , success story. Effective use of Audio- visual aids; projected and non – projected aids- Photographs, slides, film strips, power point slides. Visual aids – Poster, charts graphs and flip book. Innovative information sources – Internet, cyber cafe, Video and tele conferencing, Kisan call centers, E-chopal.

Practical : Organization of group discussion and method demonstration. Planning and writing of script for radio and T.V. , preparation and handling of selected audio- visual aids – chart, posters, overhead projector, OHP transparencies, power point slides, leaflets, folder, news stories, success stories, Handling of Public Address Equipment, liquid crystal display (LCD) system.

Suggested Readings:

1. Reddy, A.A.(1993) Extension Education. Shri Laxmi Press, Baptla.
2. Dhama O.P. and Bhatnagar, O.P.(1985) Education and Communication for Development. Oxford & IBH Publishing Co., New Delhi.
3. Krishan, R. (1965). Agricultural Demonstration and Extension Communication. Agra Publishing House, New Delhi.
4. Mohanty, B.B. (1962). A hand book of Audio-visuals aids. Kitab Mahal, Allahabad.
5. Hass K.B. and Packer, H.Q. (1960) Preparation and use of Audio-Visual Aids. Prentice Hall.INC., Englewood Cliffs.
6. Sandhu, A.S.(1994). Textbook on Agril. Communication: Process & Methods. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.