Faculty of Agriculture Science & Technology

Department of Agriculture Science

Study and Evaluation Scheme

Of

Bachelor of Science (Agriculture) (Honors)

B.Sc. (Ag) (Hons.)

AKS UNIVERSITY, SATNA

Study and Evaluation Scheme

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Faculty of Agriculture Science and Technology

Department of Agriculture Science

TEACHING & EXAMINATION SCHEME

B.Sc. (Ag) Hons.

Semester I

Sr. No.	SUBJECT CODE	SUBJECT NAME	L	P	Credits
1	**21AN101**	Principles of Agronomy and Introductory Agriculture	2	-	2
2	**21AN102**	Principles of Agricultural Meteorology	1	-	1
3	**21GP103**	Principles of Genetics	2	-	2
4	**21SC104**	Introduction to Soil Science	2	-	2
5	**21EC105**	Principles of Agriculture Economics	2	-	2
6	**21BI107**	Elementary Botany and Zoology	2		2
7	**21SS108-H/I**	SPIRITUAL STUDIES (H/I)	3		3
8	**21SD109**	SSD – Functional English-I	3		3
9	**21AN151**	Principles of Agronomy and Introductory Agriculture - LAB		2	1
10	**21AN152**	Principles of Agricultural Meteorology - LAB		2	1
11	**21GP153**	Principles of Genetics - LAB		2	1
12	**21SC154**	Introduction to Soil Science - LAB		2	1
13	**21BI155**	Elementary Botany and Zoology - LAB		2	1
		Total	**17**	**10**	**22**

B.Sc.(Ag) Hons.

Semester II

Sr. No	Subject Code	Subject	Periods		Credit
			L	P	
1	21MS201	Agricultural Statistics	1		1
2	21SC202	Manures & Fertilizers	2		2
3	21GP203	Principles of Plant Breeding	2		2
4	21EV204	Environmental Science	1		1
5	21AN205	Water Management Including Micro Irrigation	2		2
6	21EN206	Insect Morphology and Systematics	2		2
7	21BI207	Crop Physiology	2		2
8	21CA208	Introduction to Computer Application	1		1
9	21PP209	Principles of Plant Pathology	2		2
10	21SD210	SSD-Functional English-II	2		2
11	21MS251	Agricultural Statistics (Lab)		2	1
12	21SC252	Manures & Fertilizers (Lab)		2	1
13	21GP253	Principles of Plant Breeding (Lab)		2	1
14	21EV254	Environmental Science (Lab)		2	1
15	21AN255	Water Management Including Micro Irrigation (Lab)		2	1
16	21EN256	Insect Morphology and Systematics (Lab)		2	1
17	21BI257	Crop Physiology (Lab)		2	1
18	21CA258	Introduction to Computer Application (Lab)		2	1
19	21PP259	Principles of Plant Pathology (Lab)		2	1
		TOTAL	**17**	**18**	**26**

B.Sc. (Ag) (Hons.)

Semester III

Sr. No.	Paper Code	Subject	L	P	Credits
1	21PP301	Introductory Nematology	2		2
2	21AE302	Farm Power and Machinery	2		2
3	21EC303	Agricultural Finance and Cooperation	2		2
4	21HO304	Production Technology of Vegetables and Flowers	2		2
5	21BT305	Elementary Microbiology and Soil Microbiology	2		2
6	21EN306	Insect Ecology and Integrated Pest Management including beneficial Insects	2		2
7	21EX307	Dimensions of Agricultural Extension	2		2
8	21AN308	Field Crops (Cereals, Millets and Pulses) (Kharif Season)	2		2
9	21AN351	Crop Production (Kharif Crops) (Lab)		2	1
10	21PP352	Introductory Nematology (Lab)		2	1
11	21AE353	Farm Power and Machinery (Lab)		2	1
12	21EC354	Agricultural Finance and Cooperation (Lab)		2	1
13	21HO355	Production Technology of Vegetables and Flowers (Lab)		2	1
14	21BT356	Elementary Microbiology and Soil Microbiology (Lab)		2	1
15	21EN357	Insect Ecology and Integrated Pest Management including beneficial Insects (Lab)		2	1
16	21AN358	Field Crops (Cereals, Millets and Pulses) (Kharif Season) (Lab)		2	1
		Tutorial	**2**		**NC**
		Total	**16**	**16**	**24**

B.Sc. (Ag) (Hons.)

Semester IV

Sr. No.	Paper Code	Subject	L	P	Credits
1	21AE401	Soil and Water Conservation and Watershed Management	2		2
2	21AN402	Weed Management	1		2
3	21HO403	Production Technology of Fruits Crops	2		2
4	21PP404	Diseases of Horticultural crops and Their Management	2		2
5	21AE405	Protected Cultivation and Post-Harvest Technology	1		1
6	21EC406	Fundamentals of Farm Business Management	1		1
7	21EX407	Fundamentals of Rural Sociology and Educational Psychology	2		1
8	21AN408	Field Crops (Rabi Season)	2		2
9	21EN409	Crop Pests and Stored Grain Pests and Their Management	2		2
10	21AE451	Soil and Water Conservation and Watershed Management (Lab)		2	1
11	21AN452	Weed Management (Lab)		2	1
12	21HO453	Production Technology of Fruits Crops (Lab)		2	1
13	21PP454	Diseases of Horticultural crops and Their Management (Lab)		2	1
14	21AE455	Protected Cultivation and Post-Harvest Technology (Lab)		2	1
15	21EC456	Fundamentals of Farm Business Management (Lab)		2	1
16	21AN457	Field Crops (Rabi Season) (Lab)		2	1
17	21EN458	Crop Pests and Stored Grain Pests and Their Management (Lab)		2	1
		Tutorial	2		NC
		Total			**23**

B.Sc. (Ag) (Hons.)

Semester V

Sr. No.	Paper Code	Subject	L	P	Credits
1	21BT501	Fundamentals of Biochemistry	2		2
2	21AH502	Livestock Production and Management	2		2
3	21PP503	Diseases of Field crops and Their Management	2		2
4	21GP504	Principles of Seed Technology	2		2
5	21AE505	Renewable Energy	1		1
6	21EC506	Agricultural Marketing, Trade and Prices	1		1
7	21EX507	Extensions Methodologies for Transfer of Agricultural Technology	1		1
8	21HO508	Production Technology of Spices, Aromatics, Medicinal and Plantation Crops	2		2
9	21AE509	Post Harvest Practices of Cereals, Pulses and Oil Seeds	2		2
10	21BT551	Fundamentals of Biochemistry (Lab)		2	1
11	21AH552	Livestock Production and Management (Lab)		2	1
12	21PP553	Diseases of Field crops and Their Management (Lab)		2	1
13	21GP554	Principles of Seed Technology (Lab)		2	1
14	21AE555	Renewable Energy (Lab)		2	1
15	21EC556	Agricultural Marketing, Trade and Prices (Lab)		2	1
16	21EX557	Extensions Methodologies for Transfer of Agricultural Technology (Lab)		2	1
17	21HO558	Production Technology of Spices, Aromatics, Medicinal and Plantation Crops (Lab)		2	1
18	21AE559	Post Harvest Practices of Cereals, Pulses and Oil Seeds (Lab)		2	1
		Tutorial	2		NC
		Total			**24**

B.Sc. (Ag) (Hons.)

Semester VI

Sr. No.	Paper Code	Subject	L	P	Credits
1	21AN601	Farming Systems and Sustainable Agriculture	1		1
2	21GP602	Breeding of Field/ Horticulture Crops	2		2
3	21AN603	Organic Farming	1		1
4	21EC604	Production, Economics and Farm Management	1		1
5	21HO605	Post Harvest Management and Value Addition of Fruits and Vegetables	1		1
6	21EX606	Entrepreneurship, Development and Communication Skills	1		1
7	21SC607	Soil Chemistry, Soil Fertility and Nutrient Management	2		2
8	21BT608	Introduction to Plant Biotechnology	2		2
9	21AH609	Milk and Milk Processing	2		2
10	21AN651	Practical Crop Production (Rabi/Zaid Crops) (LAB)		2	1
11	21AN652	Farming Systems and Sustainable Agriculture (Lab)		2	1
12	21GP653	Breeding of Field/ Horticulture Crops (Lab)		2	1
13	21AN654	Organic Farming (Lab)		2	1
14	21EC655	Production, Economics and Farm Management (Lab)		2	1
15	21HO656	Post Harvest Management and Value Addition of Fruits and Vegetables (Lab)		2	1
16	21EX657	Entrepreneurship, Development and Communication Skills (Lab)		2	1
17	21SC658	Soil Chemistry, Soil Fertility and Nutrient Management (Lab)		2	1
18	21BT659	Introduction to Plant Biotechnology (Lab)		2	1
19	21AH660	Milk and Milk Processing (Lab)		2	1
		Tutorial	2		NC
		Total			**23**

B.Sc. (Ag) (Hons.)

Semester VII

RAWE Scheme

B.Sc. (Ag) (Hons.)

Sr	Subject Code	Subject	Credits (Theory+Practical)
	Rural Agriculture Work Experience (RAWE)		
1	21AG751	Crop Production	5 (0+5)
2	21AG752	Crop Protection	4 (0+4)
3	21AG753	Rural Economics	3 (0+3)
4	21AG754	Extension Program	4 (0+4)
5	21AG755	Research Station/KVK/DAATT centre Activities and Attachment to the Agro based Industries	4 (0+4)
		Total	**20 (0+20)**

Semester VIII

Specialization Based Scheme

Experiential Learning Courses

Course Modules for VIII Semester

Students have to choose any one out of these modules.

S. No.	Name of the Module and name of the papers to be studied in the module
1	**CROP PRODUCTION (20 Credit)** 1. Seed production technology 3(1+2) 2. Remote sensing GIS and land use planning 3(1+2) 3. Integrated farming system 3(1+2) 4. Water management (Micro-irrigation, use of problematic water, and watershed management) 4(1+3) 5 Soil Management (Conservation, Problematic soil, Soil quality) 4(1+3) 6. Crop growth simulation modelling 3(1+2)
2	**CROP PROTECTION (20 Credit)** 1. Integrated pests and disease management (Pest disease scouting) 4(2+2) 2 Management of post harvest insect pests and diseases 3(1+2) 3 Non insect pests and their management 2(1+1) 4 Productive insects 3(1+2) 5 Mushroom cultivation 2(0+2) 6 Bio-control agents and bio-pesticides (Mass production and uses) 3(1+2) 7. Pesticides and plant protection equipment 3(1+2)
3	**HORTICULTURE (20 Credit)** 1. Commercial vegetable Production 3(1+2) 2. Commercial floriculture 3(1+2) 3. Commercial fruit production 3(1+2) 4. Nursery management of horticultural crops 3(1+2) 5. Protected cultivation of horticultural crops 3(1+2) 6. Seed production of vegetables and flowers 2(1+1) 7. Processing and value addition of horticultural crops 3(1+2)
4	**POST HARVEST TECHNOLOGY AND VALUE ADDITION (20 Credit)** 1. Post harvest technology of horticultural crops 3(1+2) 2. Unit operation for quality value addition processing and development of new products 4(1+3) 3. Postharvest technology of spices, plantation crops, medicinal and aromatic crops. 4(1+3) 4. Integrated storage management of fruits, flowers and vegetables 3(1+2) 5. Post harvest handling of cut flowers and dry flowers 3(1+2) 6. Processing and value addition of cereals, pulses and oilseeds 3(1+2)
5	**AGRI-BUSINESS MANAGEMENT (20 Credit)** 1. Information and communication management 3 (1+2) 2. Management of agro based industries 4(1+3) 3. Marketing management 3 (1+2) 4. Financial management of agri business 4(1+3) 5. Natural resource economics and management 3 (1+2) 6. Project formulation, evaluation and monitoring 3 (1+2)

6	**COMMERCIAL AGRICULTURE (20 Credit)** 1. Commercial Floriculture 3(1+2) 2. Commercial fruit production 3(1+2) 3. Nursery management of horticultural crops 4(1+3) 4. Cultivation of commercially important medicinal and aromatic plants 2(1+1) 5. Commercial vermiculture, apiculture & mushroom cultivation 3(1+2) 6. Production technology of economic forest plants 2(1+1) 7. Commercial seed production 3(1+2)
7	**Basic Science (20 Credit)** 1. Molecular Breeding 3(1+2) 2. Plant tissue culture 4(1+3) 3. Recombinent DNA Technology 3(1+2) 4. Bioinformatics 3(1+2) 5. Microbial & Environmental Technology 4(1+3) 6. Molecular Diagnosis 3(1+2)

B.Sc.(Ag) Hons.

Semester I

Principles of Agronomy and Introductory Agriculture 3(2+1)

Objective: To study about importance of agronomy in agriculture and execution of various cultivation practices in the field.

Unit 1: Agriculture and its development.
History of Agricultural Development; Ancient India, Agriculture in Civilization Era, Chronological Agricultural Technology development in India. Agro-climatic zones of India and M.P.

Unit 2: Basics of agronomy, Meaning, definition and scope of agronomy. Relationship with other disciplines, divisions of agronomy- Classification of crop plants based on the intensity of cultivation, uses, life span, growth habit, and climatic response and/or habitat. Agronomic classification of crops-Botanical classification- Category of cultivars- classification of crops based on special purpose.

Unit 3: Crop production and its empire. National and International Agricultural Research Institutes in India, Planting geometry and its effect on growth and yield cropping systems. Basic elements of crop production. Factors affecting crop production.

Unit 4: Growth and plantation of plants in field. Growth- definition, factors affecting growth -Crop yield contributing characters-harvest index. Seed - definition, characteristics of good quality seed. Vegetative propagation in field crops- setts, slips, tubers, and rhizomes. Methods of sowing/planting – planting geometry and its effect on growth and yield.

Unit 5: Field preparation and nutrient management. Tillage – definition, objectives, types of tillage, tillage implements. Tilth - characteristics of good tilth. Soil productivity and fertility- Crop nutrition, nutrients, classification, Nutrient sources, organic manures fertilizers, biofertilizers. Integrated Nutrient Management. Harvesting Art.

Practical:

- Visit to crop museum and identification of crops
- Study of tillage implements. Country plough, mouldboard plough, Bose plough and disc plough
- Practice of ploughing and puddling
- Study of intercultivation implements (cultivators, harrows) and practices
- Hoes: broad blade chopping hoe (*Mammatty)*, digging hoe or pick (*Thoomba*), spade, digging fork, hand fork, conoweeder, etc.
- Study of seeding equipments.
- Different methods of sowing; direct seeding: broadcasting, dibbling and drilling transplanting-
- Identification of manures and fertilizers-organic manures: bulky and concentrated
- Fertilizer recommendation and calculation for field crops.
- Computation of seed rate for various crops
- Practice of methods of fertilizer applications- broadcasting, placement, foliar application and fertigation

Text Books:

- Principles of Agronomy – T.Yellamande reddy & G.H.Sankara Reddy.

Reference Books:

- Principles & practices of Agronomy - Bala Subramaniyan.
- Fundamentals of Agronomy – De Gopal chandra.
- Fundamentals of Agriculture – Arun katayan (Volume I)

B.Sc.(Ag) Hons.

Semester I

Agricultural Meteorology 2(1+1)

Objectives: To Study of Agricultural Meteorology for Better Knowledge about Weather forecasting, Climate, and Atmosphere and its effects on Agriculture Production and Cropping Patterns.

Unit 1: Introduction, Scope and Importance of Agricultural Meteorology

Introduction to Meteorology and Agricultural Meteorology, Scope and importance of Agricultural Meteorology, Agricultural seasons Concept of weather and climate, Micro, meso and macro climates, Composition of Atmosphere - Effect of greenhouse gases in global environment

Unit 2: Solar Radiation

Electromagnetic Spectrum, Nature and properties of solar radiation, shortwave radiation and long wave radiation, Radiation balance, ~~Response of plants to solar radiation~~ and photosynthetically active radiation. Thermal structure of atmosphere, vertical profiles, factors affecting surface air temperature, spatial and temporal variations in surface air temperature, soil temperature and its variations.

Unit 3: Atmospheric Pressure and Winds

Atmospheric pressure and its variation with height, Global distribution of pressure and wind, Atmospheric humidity, saturation and actual vapour pressure, relative humidity and dew point temperature,

Unit 4: Cloud and Rainfall

Cloud classification and measurements, cloud seeding, Rainfall and its mechanisms, forms and types of rainfall, Indian monsoons types and its effects across India and M.P. - Rainfall over India and M.P.

Unit 5: Weather Forecasting

Weather forecasting definition, scope, classification, importance in Agriculture, weather service to farmers, crop weather diagrams and calendars, crop weather relationships, Role of weather on insect pest and diseases, weather and climate related natural disasters, risk and management - Climate change and global warming. Weather modification. Introduction to Remote Sensing.

Practical:

- Study and identification of local weather elements.
- Study of Meteorological Station
- Types of Agricultural Meteorological Stations
- Selection of site and layout planning of agrometeorological stations
- Installation and exposure of meteorological instruments
- Identification of clouds
- Measurement method of rainfall

Text Book:

- Shree Dheman, Agricultural Meterology.
- G S Mahi and P K Kingra, Fundamentals of Agrometeorology. Kalyani Publishers

Reference:

- Buddhadev Bhattacharya, Advanced Principals and Practices of Agronomy. Kalyani Publisher

B.Sc.(Ag) Hons.
Semester I

Elementary Botany & Zoology 3(2+1)

Objective: To study about floral and faunal classification, morphology, anatomy and physiology.

Unit 1: Classification Five Kingdom biological classifications, Classification of plant kingdom. (Natural classification) and flower Characteristic features of prokaryotic and eukaryotic cell.

Unit 2: Morphology- Morphology of Angiospermic plants. Modification of root, stem and leaf. Taxonomic characteristics of families—Brassicaceae, Solanaceae, Malvaceae, Asteraceae, Apocynaceae, Leguminoceae and Poaceae.

Unit 3: Anatomy and Embryology Histology, simple and complex tissues, special tissues, anatomy of dicot and monocot root, stem, leaf. Embryology- parts of flower and types of ovule. Development of male and female gametes. Double fertilization.

Unit 4: Animal classification Classification of animal kingdom, Characteristic features of major phyla, Animal nutrition, Respiration in animals, circulation in animals.

Unit 5: Animal physiology Excretion in animals, Nervous coordination and integration in animals, Reproduction system in male & females, fertilization & embryo development in animals.

Practical

- Identification and comments upon specimens and permanent slides of major phyla (protozoa, porifera, coelenterata, platyhelminthes, Nemathelminthes, Annelida, Arthropoda, Mollusca, Echinodermata, Hemichordata, Chordata)
- Study of earth worm (elementary canal, reproductive system, nerve ring)
- Preparation of glycine mount double stain temporary slides of plant material (dicot & monocot stem)
- Morphological study of various modifications of root, stem & leaf.
- Study of various parts of flower (LS of a typical flower).
- Study of various types of ovules.
- Description of plant families (Brassicaceae, Solenaceae, Malvaceae, Asteraceae, Apocynaceae, Leguminoceae and Poaceae)

Text Books:

- A Text book of zoology- Parker and Haswell.
- Vertebrate zoology- R.L.Kotpal.
- Unified zoology- Dr.V.K.Tiwari & Dr. V.K. Singh.
- Elementary Botany- Bendra & Kumar
- College Botany- Ganguli & kar,S B Agarwal

Reference Books:

- Animal Physiology- H.R.Singh, Vander.
- Comparative Anatomy of Vertebrate Zoology- Kent.
- A Dictionary of Entomology- leftwich.
- Invertebrates- R.L.Kotpal, Nigam, Jordan.

B.Sc.(Ag) Hons.

Semester I

Principles of Genetics 3(2+1)

Objective: The purpose of this subject is that students should become aware about the cell where all the activities regarding life occur.

Unit: 1 Mendelism: Mendel's laws of inheritance and exceptions to the laws; Types of gene action, Multiple alleles, Pleiotropism, Penetrance and expressivity; Quantitative traits, Qualitative traits and differences between them; Multiple factor hypothesis;

Unit: 2 Mutation: Cytoplasmic inheritance, it's characteristic features and difference between chromosomal and cytoplasmic inheritance; Mutation and it's characteristic features and classification; Methods of inducing mutations and ClB technique. Gene expression and differential gene activation; Lac operon.

Unit: 3 Cell: Ultra structure of cell and cell organelles and their functions; Study of chromosome structure, morphology, number and types, karyotype and Idiogram, fine structure of genes. Mitosis and meiosis, their significance and differences between them; Mechanism of crossing over and cytological proof of crossing over.

Unit: 4 Genetic Material: DNA and its structure, function, types, modes of replication and repair. RNA and its structure, function and types; Transcription, Translation, Genetic code and outline of protein synthesis;

Unit: 5 Chromosomal Aberrations: Linkage, types of linkage and estimation of linkage; Numerical chromosomal aberrations and evolution of different crop species like Cotton, Wheat, Tobacco, Triticale and Brassica, Structural chromosomal aberrations.

Practical:

- **To study about the compound microscope.**
- Study of fixatives and stains. Squash and smear techniques.
- Demonstrations of permanent slides of cell division,
- illustration in plant cells, pollen fertility and viability
- Induction of polyploidy using colchines
- Solving problems of monohybrid, dihybrid, and test cross, gene interactions, Chromosomal map and ideogram

Text book:

- Fundamentals of genetics- B.D. Singh, Kalyani publisher

Reference Book:

- Elements of Genetics- Phundan Singh, Kalyani publisher

B.Sc.(Ag) Hons.

Semester I

Introduction to Soil Science 3(2+1)

Objective: To Study the introduction to Soil Science for study about different types of soils which are suitable for crops and cropping pattern.

Unit -I Soil Formation. Pedagogical & edaphological concepts, origin of earth, earth crust, mineral weathering, factors & processes of soil formation, components of soil, soil profile, soil texture, textural classes, soil physical properties.

Unit -II Classification of Soil; Classification of soil, major soils of India, principle silicate structures, Ion exchange phenomenon, activity **of** ions in soil system, soil aggregates, significance soils water, retention & potential, movement of soil water, infiltration, percolation, permeability, drainage method of determination of soil moisture.

Unit -III Properties of Soil Thermal properties of soil, soil air, temperature & their effect on plant growth, gaseous exchange, properties, soil biology, biomass, soil organisms & their roles, carbon, nitrogen & phosphorus cycle, bio-fertilizers.

Unit -IV Soil Colloids; Soil colloids and their significance: - Layered silicate clays- genesis, charges: adsorption of ions, ion exchange and its significance.

Unit -V Soil Reaction; Soil reaction: - Soil organic matter composition, decomposition, mineralization humus and its fractionation.

Practical:

- Determination of bulk density and particle density
- Soil moisture determination, Soil moisture constants – Field capacity Infiltration-rate, water holding capacity
- Soil texture and mechanical analysis – Soil temperature
- Analytical chemistry – Basic concepts, techniques and calculations
- Collection and processing of soil for analysis – Organic carbon, pH, EC, soluble cations and anions
- Study of a soil profile – Identification of rocks and minerals

Text Book:

- Fundamentals of Soil Science Indian socity of soil science. New Delhi
- Soil Science and Manures by Vinay Singh
- Introductory soil science (2004) by D. K. Das, Kalyani publisher New Delhi.
- Tex book of soil scienc by T. D. Biswas and S. K. Mukharge 2001. Tata Mc Graw – Hill Sducation.
- Physical and chemical methods in soil analysis, Dipak Sankar and Abhijit Haldar. New AGE INTER National Publisher

Reference Book:

- Soil Science and Fertilizer Manure By Dr Sharma and Dr Singh
- Soil Fertility and Integrated Nutrient Management By Dr Sharma and Sharma

B.Sc.(Ag) Hons.

Semester I

Principles of Agriculture Economics 2(2+0)

Objective: To Study about fundamentals of economics for application in agriculture.

Unit 1- 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, classifications of wants, importance

Unit 2-Theory of consumption-Law of diminishing marginal utility, meaning, definition, assumption, illustration, limitations, law of equimarginal utility-Importance- Consumer surplus- Meaning, definition, importance. Demand- Meaning, definition, kinds of demand, demand schedule, demand curve, law of Demand, extension and contraction vs increase and decrease in demand.

Unit 3-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 .

Unit 4-Supply-meaning, supply function-Law of supply- factors influencing supply. Production- Meaning, factors of production- land, labour, capital, organization, profit- National Income –definition and concepts.

Unit 5-Public finance- meaning- Public resource- Meaning- sources- Taxation types- Public expenditure- meaning, Principles- Money- meaning- evolution- Inflation: definition, types of inflation- Welfare economics- Meaning and basic concepts.

Text Book:

- Agricultural Economics by Dr Markande and Kulshresthe.
- Introduction of Agriculture Natural Resources Economics and Farm management by Pro. Harsharan das.
- Pricnciples of Agricultural Economics by Pro. Harsharan Das

Reference Book:

- Elementary Agriculture Economics by Dr V K Singh
- Production Economics and Farm Management by Pro. Dhondyal ans Singh

SSD - FUNCTIONAL ENGLISH-1

1st Semester

B.Tech (Engg.)/B.Tech (Ag.)/B.Tech (BT)/B.Sc.(Hons) Ag./B.Sc (BT)/B.Pharm/BBA/B.Com/B.com(Hons)/BCA(Hons)/Diploma (Engg.)

INTRODUCTION: Grammar is vital for the efficient use of language in academic as well as social environment. You already know that our speech is made up of sentences. A sentence is the basic unit of the written and spoken language. In this unit we will learn about various structural and functional parts of the sentence, their types , subtypes and their usage.

Objectives:

- To enable the students to use verbs in appropriate contexts.
- To improve students' command of spoken English by practicing the functional language needed in different situations
- To familiarize the students with the concept of Functional English as a multi-focal discipline.
- To enable the students to use English correctly and confidently

UNIT-1

a. Articles: Definite, Indefinite and Zero, Noun: numbers (singular and plural) and Personal Pronouns

b. Introduction to verb :Ordinary and Auxiliary verbs, Regular and Irregular verbs

c. **The Present Tense:** Present Continuous, Simple Present (Form and Use)

UNIT-2

The Past and Perfect Tenses: Simple Past, The Past Continuous, The Present Perfect, The Present Perfect Continuous, The Past Perfect and The Past Perfect Continuous. (Form and Use)

UNIT-3

The Future Tense: Future Simple, The future Continuous (Form and Use),Causative Verbs,The Sequence of Tenses.

UNIT-4

Introduction to Modal Auxiliaries (Form and Use)
May and can for Permission and Possibility.
Could for permission in the Past
May ,Might for Possibility.
Can and be able for Ability.
Ought, Should, Must, have to,had to, Need for Obligation.

UNIT-5

The Conditional Sentences, The Passive Voice; Active Tenses and their Passive Equivalents including Modals, Use of Passive Structure.

NOTE: Coverage of 1220 Regular (600) and Irregular Verbs (620) with their meaning and uses.

(Teachers are required to Introduce 25 verbs from the given verb list in every lecture)

SPIRITUAL STUDIES (HINDUISM)

SRIMADBHAGWADGITA

Compulsory for All Prgramme/ Courses

श्रीमद्भगवद्गीता

UNIT-I

अध्याय–एक

अर्जुन की मोहग्रस्तता,

अध्याय–दो

अर्जुन का नैराश्य, शरीर और आत्मा का विश्लेषण, कर्तव्यपालन, निष्काम कर्मयोग, स्थितप्रज्ञ एवं तापत्रय

अध्याय–तीन

कर्मयोग, षटिवकार

UNIT-II

अध्याय–चार

गीता का इतिहास, भगवान के प्राकट्य का कारण एवं उनकी सर्वज्ञता

अध्याय–पांच

ईश्वरभावनाभावित कर्म

अध्याय–छः

ध्यान योग या सांख्य योग, सिद्धि या समाधियोग

अध्याय–सात

परा और अपरा शक्ति, पुण्यात्मा मनुष्य के लक्षण

UNIT-III

अध्याय–आठ

ब्रह्म, आत्मा, अधिभूत, अधिदैव, अधियक्ष, मुक्तिलाभ की विधि

अध्याय–नौ

परमगुह्माज्ञान

अध्याय–दस

श्रीभगवान का ऐश्वर्य

UNIT-IV

अध्याय–ग्यारह

श्रीभगवान का विराटस्वरूप

अध्याय–बारह

भक्तियोग का वर्णन, अव्यक्त की उपासना में क्लेश, शुद्ध भक्त के लक्षण

अध्याय–तेरह

क्षेत्र, क्षेत्रज्ञ एवं कर्मक्षेत्र की परिभाषा, ज्ञान, ज्ञेय, प्रकृति एवं परमात्मा, चेतना

अध्याय–चौदह

त्रिगुण स्वरूप

अध्याय–पंद्रह

परम पुरुष का स्वरूप, जीव का स्वरूप

UNIT-V

अध्याय–सोलह

दैवीय स्वभाव, आसुरी स्वभाव

अध्याय–सत्रह

श्रद्धा के तीन प्रकार, भोजन के प्रकार, यज्ञ के प्रकार, तप के प्रकार, दान के प्रकार, ऊँ कार का प्रतिपादन, सत्, असत् का प्रतिपादन

अध्याय–अठारह

सन्यास एवं त्याग में अंतर, त्याग के प्रकार, कर्म के कारण, कर्म के प्रेरक तत्व, कर्म के प्रकार, कर्ता के प्रकार, चार वर्णों के स्वाभाविक गुण, प्रभु के प्रति समर्पण भाव

Recommended books

संदर्भ ग्रंथ सूची

1. श्रीमद्भगवद्गीता–गीताप्रेस, गोरखपुर।
2. श्रीमद्भगवद्गीता–मधुसूदनसरस्वती, चौखम्भा संस्कृत संस्थान, वाराणसी, 1994।
3. श्रीमद्भगवद्गीता–एस.राधाकृष्णन् कृत व्याख्या का हिन्दी अनुवाद, राजपाल एण्ड सन्स, दिल्ली, 1969।
4. श्रीमद्भगवद्गीता–श्रीमद् भक्तिवेदांत स्वामी प्रभुपाद, भक्तिदांत बुक ट्रस्ट, मुंबई, 1996।
5. Srimadbhagawadgita-English commentary by Jaydayal Goyandaka, Gita Press, Gorakhpur, 1997.

SULLABUS

SPIRITUAL STUDIES (ISLAM)

Compulsory for All Prgramme/ Courses

UNIT-I

इस्लाम धर्मः– 6वीं शताब्दी में अरब की (राजनैतिक, धार्मिक, सामाजिक, आर्थिक परिस्थितियां व कबीलाई व्यवस्था)

मोहम्मद साहब का जीवन परिचय, संघर्ष व शिक्षाएं, इस्लाम का प्रारम्भ,

इस्लाम क्या है और क्या सिखाता है, ईमान–ईमाने मोजम्मल, ईमाने मोफस्सल।

UNIT-II

इस्लाम धर्म की आधारभूत बातेंः–

तोहीद, कल्मा–कल्मा–ऐ–शहादत, कल्मा–ऐ–तैय्यबा, नमाज, रोजा, जकात और,

हज का विस्तारपूर्वक अध्ययन

UNIT-III

खोदा–तआला की किताबें (आसमानी किताबें):–

''वही'' की परिभाषा, तौरेत, जुबूर, इंजील का परिचय, पवित्र कुरान का संकलन, पवित्र कुरान का महत्व, कुरान की मुख्य आयतें, पवित्र कुरान और हाफिजा

UNIT-IV

पवित्र हदीसें और सुन्नतेंः–

हदीस और सुन्नत क्या है, हदीस और सुन्नत का महत्व, कुछ प्रमुख सुन्नतें और हदीसों का अध्ययन,

सोकर उठने की सुन्नतें, लेबास की सुन्नतें, बीमारी और अयादत की सुन्नतें, सफर की सुन्नतें

UNIT-V

इस्लाम धर्म की अन्य प्रमुख बातेंः–

मलाऐका या फरिशते (देवदूत), खुदा के रसूल, खुदा के पैगम्बर, नबी और रसूल में अन्तर, कयामत, सहाबा, खलीफा, मोजिजा और करामात, एबादत, गुनाह (कुफ्र और शिर्फ), माता–पिता, रिश्तेदार व पड़ोसी के अधिकार, इस्लाम में औरत के अधिकार, इस्लाम में सब्र और शुक्र, इस्लाम में समानता और भाईचारा

ADDITIONAL KNOWLEDGE:-

IN THE LIGHT OF 'QURAN' AND 'HADEES', TEN POINTS WILL BE DELIVERED TO THE STUDENTS DAILY, IN A SECULAR COUNTRY THE STUDENTS SHOULD KNOW THE PHILOSOPHY OF OTHER RELIGION ALSO SUCH AS "JAINISM", "BUDHISM" AND "SANATAN DHARMA".

B.Sc.(Ag) Hons.

Semester II

Water Management Including Micro Irrigation 3(2+1)

Objective-Knowledge of water utilization by crops, importance of irrigation and production of maximum dry matter by minimum amount of water is the main objective of this course.

Unit 1: Irrigation: definition and objectives, water resources and irrigation development in India and M.P., Environment, some major and medium irrigation schemes of India; Soil plant water relationships (concept and basic terms)

Unit 2: Methods of soil moisture estimation (Tensiometer, Gypsum block, Neutron moisture meter, Pressure membrane & Pressure plate approach). Soil moisture characterstic curve; Evaporation, Transpiration, Evapotranspiration- Definition; crop water requirement; effective rainfall; Scheduling of irrigation- Climatological, Irrigation water/ Cumulative pan evaporation (IW\CPE), Can evaporimetry, combination & Critical stage approaches including simple techniques for irrigation scheduling.

Unit 3: Methods of irrigation- surface (Flooding, Check besin, Besin, Border strip, furrow, Surge &cablegation method), sprinkler and drip irrigation- Component, Working, Advantage & Disadvantage; Irrigation efficiency- Conveyance, Water application, Water storage & Water distribution efficiency; Crop & field water use efficiency.

Unit 4: Conjunctive use of water, irrigation water quality [Total soluble salts (TSS), sodium absorption ratio (SAR,) Boron content] and its management. Water management of different crops (rice, wheat, maize, groundnut, sugarcane, mango, banana and tomato)

Unit 5: Surface & subsurface method of agricultural drainage- Need, Definition, Advantage & Disadvantage; Watershed management- Need, Importance, Definition & Steps.

Practical:

- Determination of bulk density, soil moisture content by gravimetric method, tensiometer, electrical resistance block and moisture meter.
- Determination of field capacity and infiltration rate.
- Measurement of irrigation water through flumes and weirs.
- Calculation of irrigation water requirement (Problems).
- Demonstration of different methods of irrigation.
- Visit to farmers field and cost estimation of drip irrigation system.
- Demonstration of filter cleaning, fertigation, injection and flushing of laterals.
- Measurement of emitter discharge rate, wetted diameter and calculation of emitter discharge variability.
- Erection and operation of sprinkler irrigation system.
- Determination of water quality parameters (EC, pH).
- Determination of carbonates, biocarbonates, Ca++ and Mg++ in irrigation water (quality parameters)

Text Books:

- Principles of Agricultural Engineering, Vol. - II. by A. M. Michel & T.P. Ojha Jain Brothers,New Delhi.
- Irrigation: Theory & Practices by A.M. Michael

Reference Books:

- Irrigation by A.M. Michael and T.P. Ojha.
- Water Management: Principles and Practices by R.A. Singh and S.R. Singh.

B.Sc.(Ag) Hons.

Semester II

Crop Physiology 3(2+1)

Objective- Study of physiological process of crops, growth and development of crops and role of plant growth regulators.

Unit-1: Introduction, importance in agriculture. Seed physiology, seed structures, morphological, physiological and biochemical changes during seed development, physiological maturity – morphological and physiological changes associated with physiological maturity in crop, harvestable maturity, seed viability and vigor, factors affecting seed viability and vigor. Methods of testing seed viability and vigor germination, utilization of seed reserves during seed germination, morphological, physiological and biochemical changes during seed germination, factors affecting seed germination.

Unit-2: Growth and development, definition, determinate and indeterminate growth, monocarpic and polycarpic species with examples. Measurement of growth, growth analysis growth characteristics, definitions and mathematical formulae. Crop water relations, physiological importance of water to plants; osmosis, diffusion, wall pressure, turger pressure, water potential, guttation, imbibition force and ascent force water potential and its components, measurement of water status in plants. Transpiration, significance, transpiration in relation to crop productivity, water use efficiency, Water Use Efficiency (WUE) in C3, C4 and CAM plants. Factors effecting WUE.

Unit-3: Photosynthesis, Energy synthesis, significance of C3, C4 and CAM pathway, relationship of photosynthesis and crop productivity, translocation of assimilates, phloem loading, apoplastic and symplastic, transports of assimilates, source and sink concept. Photorespiration; Factors affecting photosynthesis and productivity, methods of measuring photosynthesis, photosynthetic efficiency. Translocation of assimilates, phloem loading, apoplectic and simplistic transport of assimilates, source and sink concept, dry matter partitioning, harvest index of crops,

Unit 4: Respiration and its significance, brief account of growth respiration and maintenance respiration, alternate respiration – salt respiration – wound respiration –measurement of respiration. Nutriophysiology – definition – classification of plant nutrients based on quantity, function and mobility – physiology of nutrient uptake –functions of plant nutrients – deficiency and toxicity symptoms of plant nutrients – foliar nutrition – hydroponics. Introduction of photoperiodism and vernalisationin relation to crop productivity – photoperiodism.

Unit 5: Plant growth regulators – occurrence – biosynthesis –mode of action of auxins, gibberellins, cytokinins, ABA, Ethylen. Novel plant growth regulators, commercial application of plant growth regulators in agriculture.Senescence –physiological and biochemical changes and their significance. Post harvest physiology –seed dormancy – definition – types of seed dormancy – advantages and disadvantages of seed dormancy – causes and remedial measures for breaking seed dormancy, optimum conditions of seed storage – factors influencing seed storage (ISTA standards). Fruit ripening - metamorphic changes – climateric and non-climeteric fruits – hormonal regulation of fruit ripening (ethrel, CCC, polaris, paclobuterazole)

Practical:

- Preparation of solutions.
- Growth analysis; calculation of growth parameters and yield analysis.
- Leaf anatomy of C3 and C4.
- Stomata; structure
- Identification of plant nutrient deficiency symptoms.
- Imbibition and Seed germination studies
- Seed dormancy- methods of breaking dormancy.
- Seed viability and vigor tests.

Text Books:

- Noggle G.R. & Fritz G.J. 1992. Introductory Plant Physiology II End. Prentice Hill of India (P) Ltd., New Delhi (TB)
- Gupta .N.K and Sunita Gupta.2002. Plant Physiology. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.

Reference Books:

- Devlin R.M. 1979. Plant Physiolgoy II End. Affiliated East West Press, New Delhi
- Devlin R. M. and Witham F. H. 1983. Plant Physiology 4th Edn. CBS Publishers andDistributors, New Delhi.
- Malick, C.P and Srivastava,A.K.,2000. Textbook of Plant Physiology. Kalyani publishers,New Delhi.

B.Sc.(Ag) Hons.

Semester II

Environmental Science 2(1+1)

Objective-Knowledge of environmental pollution and its effect on crop growth. It is also to know about control measures.

Unit 1: Multidisciplinary nature of environmental studies

Definition, scope and importance, Need for public awareness.

Natural resources and associated problems.

a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.

b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.

f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

• Role of an individual in conservation of natural resources.

• Equitable use of resources for sustainable lifestyles.

Unit 2: Ecosystems

• Concept of an ecosystem, Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem:- Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its conservation

- Introduction – Definition: genetic, species and ecosystem diversity. Bio-geographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega-diversity nation. Hot-sports of biodiversity. Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

Unit 3:Environmental Pollution

- Definition Cause, effects and control measures of: - Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution. Nuclear hazards. Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management: floods, earthquake, cyclone and landslides.

Unit 4: Social Issues and the Environment

- From Unsustainable to Sustainable development, Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Case Studies. Environmental ethics: Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.

Unit 5: Human Population and the Environment

- Population growth, variation among nations. Population explosion – Family Welfare Program. Environment and human health. Human Rights. Social Value Education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health.

Practical:

- Visit to a local polluted site -Collection, processing and storage of effluent – soil and water samples.
- Allelopathic studies in agro- ecosystems- bioassay using root exudates of *Cyperus rotundus*
- Determination of total dissolved solids (TDS) in effluent samples
- Estimation of nitrate content in ground water and determination of the temporary and total hardness of water samples
- Visit to Social Service Organization / Environmental Education Centre, Crop adaptation to environmental variations and soil conditions
- Identification of plant species in an ecosystem
- Plant adaptations- hydrophytes and xerophytes- morphological and anatomical features and special adaptations
- Visit to Social Service Organization / Environmental Education Centre, Crop adaptation to environmental variations and soil conditions

Text Book:

- Agarwal KC, 2001. Environmental Biology, Nidi Publishers Ltd. Bikaner.
- Miller TG, Jr. Environmental Science, Wadsworth Publishing CO

Reference Book:

- BharuchaErach, 2003. The Biodiversity of India, Mapin Publishing Pvt. Ltd, Ahmedabad 4. Clark RS, Marine Pollution, Clanderson Press, Oxofrd
- Cunningham WP, Cooper TH, Gorhani E & Hepworth MT, 2001. Environmental Encyclopaedia, Jaico Publishing House, Mumbai, 1196pgs.

B.Sc.(Ag) Hons.
Semester II
Manures and Fertilizers 3(2+1)

Objective-To study role of Manures and Fertilizers and amount required for batter crop Production.

Unit-1- Introduction – 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 retuses

Unit-2- Fertilizers –classifications, Manufacturing processes and properties of major nitrogenous (ammonium sulphate, urea, calcium ammonium nitrate, ammonium nitrate, ammonium sulphate nitrate)

Unit-3- phosphatic (single super phosphate, enriched super phosphate, diammonium phosphate, ammonium poly phosphate).

Unit-4- Potassic and complex fertilizers their fate and reactions in the soil, Secondary and micronutrients fertilizers. Amendments. Fertilizer Control Order, Fertilizer storage.

Unit-5- Biofertilizers ,-advantage and their uses in agriculture.

Practical:

- FCO regulations for sampling and analysis and sampling of fertilisers
- Estimation of nitrogen in ammonium sulfate and urea
- Estimation of water soluble P_2O_5 in super phosphate, Estimation of soil fertilizer.
- Rapid tests to detect adulteration in fertilizers
- .

Text Books:

- Manures and Fertilizer by Yawalkar K. S., Agarwal J. P. and Borde S. (2011) Agri – Horticultural Publisher House Nagpur.
- Tandon, H.L.S.1992. *Fertilisers, Organic Manures, Recycleable Wastes and Biofertilisers.* FDCO, New Delhi

Reference Books:

- Organic Manures By Gaur etal.published by ICAR, New Delhi.
- Singh, S.S, 1999. *Soil Fertility and Nutrient Management.* Kalyani Publishers, New Delhi

B.Sc.(Ag) Hons.

Semester II

Introduction to Computer Applications 2(1+1

Objective- To provide the basic knowledge computer and its importance in agriculture.

Unit 1: Introduction to Computers, Anatomy of Computers, Input and Output Devices. Units of Memory, Hardware, Software and Classification of Computers. Computer Viruses, Worms and Vaccines; Introduction of network

Unit 2: Operating System – DOS and WINDOWS. Disk Operating System (DOS): Some fundamental DOS Commands. WINDOWS: GUI, Desktop and its elements, WINDOWS Explorer, working with files and folders; setting time and date,starting and shutting down of WINDOWS. Control Panel.

Unit 3: Applications – MSWORD: Word, features of word-processing packages. Creating, Editing, Formatting and Saving a document in MSWORD; Inserting graphs of images, working with tables

Unit 4: MSEXCEL: Electronic Spread sheets, concept, packages. Creating, Editing and Saving a spreadsheet with MSEXCEL. Use of in-built Statistical and other functions and writing expressions. Creating Graphs. Sorting and filtering in database. Power point of internet, MS Power point, Text, images, animations

Unit 5: Internet: World Wide Web (WWW), Concepts, Web Browsing and Electronic Mail; internet security and laws

Practical:

- Practice of some fundamental DOS Commands, TIME, DATE, DIR, COPY, FORMAT,
- VOL, LABEL, PATH;
- Practicing WINDOWS Operating System, Use of Mouse, Title Bar,Minimum, Maximum and Close Buttons, Scroll Bars, Menus and Tool Bars; WINDOWSExplorer, Creating Folders, COPY and PASTE functions;
- MSWORD: Creating a Document,Saving and Editing; MSWORD, Use of options from Tool Bars, Format, Insert and Tools(Spelling & Grammar) Alignment of text; MSWORD, Creating a Table, Merging of Cells,
- Column and Row width;
- MSEXCEL: Creating a Spreadsheet, Alignment of rows, columnsand cells using Format tool bar; MSEXCEL: Entering Expressions through the formula toolbar and use of inbuilt functions, SUM, AVERAGE, STDEV; MSEXCEL: MSEXCEL: Creating Graphs andSaving with & without data;
- MS Power Point: Preparation of slides on Power Point;
- Transforming the dataof WORD, EXCEL;
- Internet Browsing: Browsing a Web Pageand Creating of E-Mail ID

Text Books:

- Fundamentals of Computers, By Balaguruswamy
- Fundamentals of Computers, By P.K. Sinha

Reference Books:

- Capron.H.L. (1996) Computers – Tools for an information age – Fourth Edition. The Publishing Co. Ltd., New Delhi.
- Colin Haynes. (1990) The Computer Virus Protection Handbook. BPB Publications

B.Sc.(Ag) Hons.

Semester II

Principles of Plant Breeding 3(2+1)

Objective-Experimental and theoretical knowledge of breeding of different crop varieties for high Production.

Unit 1: Floral biology, Emasculation and Pollination techniques in cereals, millets, pulses, oil seeds, fibers, plantation crops etc. History, aims and objectives of Plant Breeding; Scope of plant breeding; improvement of crop plants. Origin, exploration, domestication, evolution of crops and centers of diversity. Plant exploration, evolution and domestication of crop plants, center of origin; crop genetic resources- conservation and utilization.

Unit 2: Modes of reproduction, Sexual, Asexual, Apomixis and their classification; Significance in plant breeding; Modes of pollination, genetic consequences, differences between self and cross pollinated crops.

Unit 3: Methods of breeding –Plant Introduction and acclimatization. Selection, Mass selection Johannson' s pure line theory, genetic basis, pure line selection; combining ability,its significance in plant breeding. Hybridization, Aims and objectives, types of hybridization; role of inter specific and inter generic hybridization. Methods of handling of segregating generations, pedigree method, bulk method, back cross method and various modified methods.

Unit 4: Incompatibility and male sterility and their utilization in crop improvement; Heterosis, inbreeding depression, various theories of Heterosis, exploitation of hybrid vigour development of inbred lines, single cross and double cross hybrids.

Unit 5: Population improvement programmes, recurrent selection, synthetics and composites; Methods of breeding for vegetatively propagated crops; Clonal selection; Mutation breeding; polyploidy breeding; Wide hybridization, significance in crop improvement.

Practical

- Botanical description and floral biology
- Study of megasporogenesis and microsporogenesis
- Fertilization and life cycle of an angiospermic plant
- Plant Breeder's kit
- Hybridization techniques and precautions
- Floral morphology, selfing, emasculation and crossing techniques

Text Books:

- Plant Breeding by B.D. Singh, Kalyani Publishers
- Plant Breeding: Principles and Methods by B.D. Singh, Kalyani Publishers

Reference Books:

- Principles and Procedures of Plant Breeding: Biotechnological and Conventional Approaches
- Breeding field crops by John Milton Poehlman

B.Sc.(Ag) Hons.

Semester II

Insect Morphology and Systematic 3(2+1)

Objectives- To provide a complete knowledge about insects and their behavioral effects

Unit 1: History of Entomology in India. Factors for insects abundance. Classification of phylum Arthropoda upto classes. Relationship of class Insecta with other classes of Arthropoda.

Unit-2: Morphology: Structure and functions of insect cuticle and moulting. 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 male and female genetalia. Sensory organs. Metamorphosis and diapauses in insects.Types of larvae and pupae.

Unit 3: Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretory (Endocrine) and reproductive system in insects. Types of reproduction in insects.

Unit 4: Systematics**:** Taxonomy– importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order. Classification of class Insectaupto Orders. Orthoptera, Acrididae. Dictyoptera, Mantidae, Odonata, Isoptera, Termitidae, Thysanoptera, Thripidae,

Unit 5: Hemiptera, Pentatomidae, Coreidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Aleurodidae, 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 :

- Collection and preservation of insects and their immature stages.
- External features of Grasshopper/Cockroach.
- Types of insect antennae.
- Types of insect mouth parts.
- Types of insect legs.
- Wing venation, Types of wings and wing coupling apparatus.
- Types of insect larvae and pupae.
- Study of digestive system in insects (Grasshopper/ Cockroach).
- Studyof male and female reproductive systems in insects (Grasshopper/ Cockroach).
- Study of characters of order Isoptera ,Thysanoptera.
- Study of characters of order Hemiptera-
- Study of characters of order Lepidoptera.
- Study of characters of order Hymenoptera.

Text Books:

- Mani, M. S. 1968. *General Entomology*. Oxford and IBH Publishing Company, New Delhi.
- Chapman, R. F. 1981. *The Insects: Structure and Function*. Edward Arnold Publishing Limited , London

Reference Books:

- Nayar, K. K., Ananthakrishnan T. N. and David. B.V. 1976. *General and Applied Entomology*, Tata McGraw Hill Publishing Company Limited, New Delhi,
- Pedigo, L. P. 1999. *Entomology and Pest Management.* Third Edition. Prentice Hall, New Jersey, USA,
- Srivastava, P. D. and Singh, R. P. 1997. *An Introduction to Entomology*, Concept Publishing Company, New Delhi

B.Sc.(Ag) Hons.

Semester II

Agricultural Statistics 2(1+1)

Objective:-Knowledge of statistical calculation of production & Agricultural experiments.

Unit:-1 Descriptive statistics, Frequency distribution: classification, tabulation, graphical representation of data, type of Frequency distribution.

Unit:-2 Measure central tendency- mean, median, mode, geometric mean, harmonic mean.

Unit:-3 Measure of dispersion – range, quartile deviation, mean deviation, standard deviation square deviation, root mean square deviation, e. v., combined variance.

Unit:-4 Theory of probability, binomial, Poisson distribution, normal distribution, test of significance: - hypothesis, null hypothesis, types of error, chi-square test for goodness of fit, student t-test and its properties

Unit:-5 co-relation and regression coefficient, fitting of regression equation. Experimental Designs **:-** Basis Design : completely randomized design (CRD), Layout and analysis with equal and unequal number of observation ,random block design (RBD) , layout and analysis, Latin Square design (LSD),

Practical:

- Construction of Frequency Distribution Tables and Frequency Curves
- Computation of Arithmetic Mean for Un-Grouped and Grouped data
- Computation of Median for Un-Grouped and Grouped data
- Computation of Mode for Un-Grouped and Grouped data
- Computation of Standard Deviation, Variance and Coefficient of Variation for Un-Grouped and Grouped data
- Two Samples; Student's t-test for Single Sample; Student's t-test for Two Samples
- Paired t test and F test; Chi-Square Test in 2x2
- Computation of Correlation Coefficient 'r' and its testing
- Fitting of regression equations- Y on X and X on Y
- Analysis of Completely Randomized Design (CRD)
- Analysis of Randomized Block Design (RBD)
- Analysis of Latin Square Design (LSD)

Text Books:

- Gupta.S.C. andKapoor.V.K. (1997) Fundamentals of Mathematical Statistics. Sultan Chand& Sons Publisher, New Delhi.
- Chakravorthi. S.R. and Giri.N. (2002) Basic Statistics. South Asian Publishers, New Delhi – 110 014.
- Rangaswamy. R. (2002) A text book of Agricultural Statistics. John Wiley & Sons

Reference Books:

- Cochran.W.G. (1989) Sampling Techniques. Oxford and IBH Publishing Co.
- Fisher.R.A. and Yates (1948) Statistical Tables for Biological, Agricultural and MedicalResearch. Oliver & Boyd, Edinburg.
- Ferrold H. Zar. (2005) Biostatistical Analysis. Fourth Edition, Pearson Education, India.

B.Sc.(Ag) Hons.

Semester II

Principles of Plant Pathology 3(2+1)

Objective-To study principles of plant pathology and the study of pathogens which cause diseases in crops.

Unit-1: Introduction – principles of plant pathology, history of plant pathology, definitions of terminology, classification of plant diseases on the basis of plant parts, crops infected, causal organisms and occurrence. Koch postulates. Abiotic causes of plant diseases. Plant disease epidemiology.

Unit-2: General characters of fungi, classification of fungi, methods of reproduction. General characters, taxonomy, somatic structures, reproduction,life cycle and plant pathological significance of the Division Myxomycota,*Plasmodiophora,Spongospora.* Diplomastigomycotina- *Pythium, Phytophthora, Albugo, Sclerospora, Peronosclerospora ,Peronospora & Plasmopara.* Zygomycotina- *Rhizopus* and *Mucor.* Ascomycotina- *Protomyces, Taphrina, Erisiphe, Uncinula, Podosphera, Phyllactinia, Claviceps, Venturia, Penicillium, Aspegillus, & Saccharomyces.*

Unit-3: General characters, taxonomy, somatic structures, reproduction, life cycle and plant pathogenic significance of *Puccinia, Melampsora, Uromyces*, *Ustilago, Tilletia, Sphacelotheca Tolyposporium,Agaricus,Colletotrictum,Alternaria,Cercospora,Fusarium,Helminthosporium,Pyricularia,Sclerotium,Rhizoctonia,Phyllosticta, Trichoderma, & Verticillium.*

Unit-4: Characters and classification of phytopathogenic bacteria- size and shape of bacteria,reproduction, symptoms of bacterial diseases, mode of entry and spread. General characters of Virus – definition- nature, properties, common symptoms of viral diseases. Viroid. Phytoplasmas and Spiroplasmas-general characters and diseases caused by them. Characters of algae and phanerogamic plant parasites.

Unit-5: Pathogenesis; inoculum, inoculums potential, virulence, penetration, invasion, colonization, infection, symptoms, factors affecting disease development. Survival and dispersal of plant pathogens. General principles of plant disease management.

Practical

- Culture media preparation
- Bacterial staining—differential (Gram staining).
- Study of lower fungi -,*Phytophthora, Albugo, Sclerospora, Peronosclerospora, Peronospora & Plasmopera* by temporary slides.
- Study of *Rhizopus* and *Mucor* by preparation of temporary slides.
- Study of *Penicillim*, *Aspergillus* and *Claviceps* by preparation of temporary slides.
- Study of powdery mildew by preparation of temporary slides.
- Study of rust fungi by preparation of temporary slides.
- Study of smut fungi by preparation of temporary slides.
- Study of agaricus by preparation of temporary slides.
- Study of deuteromycetous fungi by preparation of temporary slides.
- Study of Phanerogamic plant causing diseases in crops.
- Plant inoculation by virus.

Text Books Text book of Mycology and Plant Pathology by Paul Y. S. Kalyani publishing

- Text book on Fungi by Ram Krushna Kar, Nihar Manjari Misra Kalyani publishing
- Introductory Plant Pathology by Tripathi D. P. (Hindi medium) Kalyani publishing
- Plant pathology by B.P. Singh

Reference Books

- Plant Disease Management in Horticultural Crops by Ahamad Shahid *et al eds* Astral Publishing.
- An introductory Mycolog by Alaxopolus & Mims New Hills
- Plant Pathology by Agrios G. N.

B.Sc.(Ag) Hons.

Semester III

Field Crops-I (*Kharif*) 3(2+1)

Objective: Improved crop production technologies under the changing crop production environment can make farming sustainable and profitable.

Origin, geographic distribution, economic importance, soil and climatic requirement**,** varieties, cultural practices and yield of different kharif crops--

Unit 1: Cerals and millets: Rice, Maize, Sorghum, Pearl Millet and Minor millets

Unit 2: Pulse crops: Pigeonpea, Mung bean (Green gram), Urd bean(Black gram), Cowpea

Unit 3: Oilseed crops: Groundnut, Sesame, Soybean, Sunflower, Niger, Caster.

Unit 4: Fibre crops: Cotton, Jute, Sunhemp, and Mesta

Unit 5: Forage crops: Sorghum, Maize, Cowpea, Cluster bean and Napier.

Practical:

- Identification of crops.
- Identification of associated weeds in field crops.
- Rice nursery preparation and transplanting/ seed bed preparation and sowing of kharif crops.
- Calculations on seed rate.
- Study of crop varieties and important agronomic practices.
- Study of yield contributing characters, yield calculations, harvesting and yield estimation of above crops.
- Top dressing of nitrogen in any seasonal crop.
- Effect of seed size on germination and seedling vigour of any seasonal crop.

Reference books:

- Modern techniques of raising field crops- Chhidda Singh. OXFORD & IBH Publishing Co. Pvt. Ltd.
- Kharif crops. Omprakash and Ahlawat- Meerut publication.
- Crop production- Nazir M. S. National Book
- Principles of field crop production 2nd Ed- Reddy, S.R. kalyani publishers, New Delhi, India

Text book:

- Production of field crop: A textbook of Agronomy-McGraw Hill Book Co. NewYork.
- Field crops. Rajendra Prasad
- A textbook of Agronomy- B. Chandrasekaran. New Age International Publishers.

SSD- CSEP(COMMUNICATION SKILLS ENHANCEMENT PROGRAM)

FUNCTIONAL ENGLISH-II

2nd Semester

B.Tech (Engg.)/B.Tech (Ag.)/B.Tech (BT)/B.Sc.(Hons) Ag./B.Sc (BT)/B.Pharm/BBA/B.Com/B.com(Hons)/BCA(Hons)/Diploma (Engg.)

Unit-1

Subject verb Agreement, Adjectives and Comparison of Adjectives, Determiners

Unit-2

Introduction to Prepositions (Use and omission), Preposition of travel and movement, Preposition of Date and Time, Relations expressed by Preposition, Words followed by preposition, Finite and Non Finite Clauses& Uses of Let.

Unit-3

Conjunction: Co-ordinating and Subordinating, Sentences :Simple, Compound and Complex

Unit-4

Statement : Direct & Indirect, Phrasal Verb, Antonyms, Synonyms, Letter Writing: Formal (Parts& Layout)

Unit-5

Communication: Definition & Meaning of Communication, Importance &Process,Types: Verbal & Non-Verbal, Barriers, and how to overcome these barriers.

Reference:

Thomson, A.J and A.V. Martinet.*A Practical English Grammar.* Oxford University Press: New York.

Wren and Martin.*High School English Grammar and Composition.*S.Chand& Company Pvt. Ltd. : New Delhi

Greenbaum, Sidney. *Oxford English Grammar.* Oxford University Press: New York.

Rudzka-Ostyn, Brygida.(2003) *Word Power: Phrasal Verbs and Compounds.*Mouton de Gruyter, Berlin: New York

Chambers Dictionary of Antonyms & Synonyms

Hudson, Richard. *English Grammar.* Routledge: New York.

Rodriques, M.V. *Effective Business Communication*. Concept Publishing Company: New Delhi.

Raman,Meenakshi&Sangeeta Sharma.Communication Skills. Oxford University Press

B.Sc.(Ag) Hons.

Semester III

Insect Ecology and Integrated Pest Management Including Beneficial Insects 3(2+1)

Objective: To study about relationship between pests and environment and different controlling methods that keep maintain our nature.

Unit 1: Insect Ecology

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 and environmental resistance and causes for outbreak of pests in agro-ecosystem. Pest surveillance and pest forecasting. Categories of pests.

Unit 2: Integrated Pest Management

IPM; Introduction, importance, concepts, principles and tools of IPM-Host plant resistance, Cultural, Mechanical, Physical, Legislative, Biological (parasites, predators & transgenic plant pathogens such as bacteria, fungi and viruses) methods of control.

Unit 3: Chemical Control of Insects

Chemical control – importance, hazards and limitations. Classification of insecticides, toxicity of insecticides and formulations of insecticides. Study of important insecticides Cyclodiens, Organophosphates, Carbamates, Synthetic pyrethroids,. Application techniques of spray fluids. Phytotoxicity of insecticides. Symptoms of poisoning, first aid and antidotes.

Unit 4: Botanical insecticides Recent Method of Pest Control

Botanical insecticides – neem based products, Novel insecticides, Pheromones, Nicotinyl insecticides, Chitin synthesis inhibitors, Phenyl pyrazoles, Avermectins, Macrocyclic lactones, Oxadiazimes, Thiourea derivaties, pyridine azomethines, pyrroles, etc. Nematicides, Rodenticides, Acaricides and fumigants. Recent methods of pest control, repellents, antifeedants, hormones, attractants, gamma radiation and genetic control. Practices, scope and limitations of IPM. Insecticides Act 1968 – Important provisions.

Unit 5: Beneficial insects and Non Insect Pests

Beneficial insects: parasites and predators used in pest control and their mass multiplication techniques. Important groups of microorganisms, bacteria, viruses and fungi used in pest control and their mass multiplication techniques. Important species of pollinators, weed killers and scavengers, their importance. Non insect pests – mites, nematodes, rodents and birds.

Practical:

- Visit to meteorological observatory / automatic weather reporting station/ Agriculture college REWA/ KVK
- Study of terrestrial and pond ecosystems of insects; Studies on behavior of insects 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, pheromone traps and field incidence
- Practicable IPM practices, Mechanical and physical methods; Cultural and biological methods Chemical control

- Insecticides and their formulations
- Calculation of doses/concentrations of insecticides
- Compatibility of pesticides and Phytotoxicity of insecticides
- IPM case studies
- Identification of rodents and bird pests and their damage
- Other beneficial insects – Pollinators, weed killers and scavengers

Text Book:

- Agriculture Entomology - By Mathur and Uppadhayay Kalyani publication
- A Text Book of Entomology - By Mathur and Uppadhayay Kalyani publication
- Agriculture Entomology - By Pro. Singh and M C Sharma Badaut publication, Meerut (U.P)

Reference Books:

- An Outline of Entomology - By G S Dhaliwal Kalyani publication
- Applied Entomology - By K P Shrivastava
- Vertibrate Zoology - By R L Kotpal

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B.Sc.(Ag) Hons.

Semester III

Production technology of vegetables and flowers 3(2+1)

Objective: To study about the knowledge of different vegetable, gardens and flower crops and different propagation method, whose they are include shelf life.

Unit 1: **Introduction:** Importance of Olericulture, Importance of vegetables in human diet and Indian economy, Classification of vegetables.

Unit 2: **Cultivation of fruit vegetables:** Origin, area, production, varieties, package and practices for fruit vegetables – tomato, brinjal, chilies and okra. Cucurbitaceous vegetables- cucumber, sponge gourd, ridge gourd, ash gourd, snake gourd, bottle gourd, bitter gourd and melons (watermelon and muskmelon).

Unit 3: **Cultivation:** Cole crops – Cabbage, Cauliflower, Knol-Khol, Broccoli and Brussel sprouts. Bulb crops – Onion and Garlic. Beans and Peas – French beans, Cluster beans, Dolichos bean, Garden peas and Cowpea. Tuber crops – Potato, Sweet potato, Colocasia. Root crops – Carrot, Radish, Turnip and Beet root. Leafy vegetables – Amaranthus, Palak, Lettuce. Perennial vegetables – Drumstick, Coccinia and curry leaf.

Unit 4: **Ornamental horticulture:** Importance of ornamental gardens. History and scope in India, Planning of ornamental gardens. Types and styles of ornamental gardens. Use of trees, shrubs, shrubberries, climbers and palms. Houseplants and seasonal flowers in the gardens. Ornamental hedges & their classification, Establishment and maintenance of lawns, Edging and bonsai.

Unit 5: **Cultivation of flower crops:** Rose, Jasmine, Chrysanthemum, Marigold, Tuberose, dahalia, Gerbera and Gladiolus.

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
- Layout of lawns and maintenance
- Depotting, repotting and maintenance of house plants
- Visit to commercial vegetable farms
- Training and pruning of rose (standards, hybrid 'T' roses canted roses) and chrysanthemum (pinching and disbudding)
- Intercultural operations in vegetable plots
- Seed production in vegetable crops
- Harvesting indices of different vegetable crops

Reference Books

- Vegetable crops. T. K. Bose.
- Modern olericulture and floriculture. G.S. Sani.
- Beautiful garden. M.S. Randhawa
- Introductory ornamental horticulture. J.S. Arora
- Commercial flower. T.K Bose
- Floriculture in India J. S. Randhawa

Text books

A textbook of vegetable tuber and spices crop. S. Thamburaj and N. Singh
Handbook of horticulture. K.L Chaddha

B.Sc.(Ag) Hons.

Semester III

Elementary microbiology and Soil Microbiology 3(2+1)

Objective: To provide knowledge about structure, characteristic, metabolism, industrial products, laboratory procedure, agricultural and biotechnological aspects of microorganisms.

Unit1: History of microbiology: Spontaneous generation theory, roles of microbes in fermentation, germ theory of disease, protection against infection, applied areas of microbiology metabolism in bacteria: ATP generation, chemoautotrophy, photo autotrophy, respiration, fermentation.

Unit2: Bacteriophages: Structure and properties of bacterial virus; Lytic and Lysogenic cycles, Viroids, Prions. Bacterial genetics: DNA structure, Bacterial DNA Replication, Prokaryotic transcription and translation. Gene expression. Genetic recombination: Transformation, Conjugation, Transduction, Genectic engineering, plasmids, episomes, Genetically modified organisms.

Unit3: Soil microbiology: microbial groups in soil. Microbial transformation of Carbon, Nitrogen, Sulphur, Phosphorus. Biological nitrogen fixation, microflora of rhizosphere and phyllosphere. Microbes in composting.

Unit4: Microbiology of water. Microbiology of food; microbial spoilage and principles of food preservation. Beneficial microorganisms in agriculture: biofertilizer(Bacterial, Cyanobacterial and Fungal). Microbial insecticides.

Unit5: Microbial agents for control of plant diseases. Biodegradation. Biogas production. Plant microbe interaction.

Practical:

- Instrumentation: General instructions, familiarization with instruments, materials, glassware etc.
- Sterlization techniques
- Stoichiometry
- Serial dilution
- Media preparation
- Isolation of bacteria by streak plate method
- Morphological examination of bacteria by simple and differential staining

Text books:

- An Introduction to Microbiology, R.P. Singh and Kamal, Central Book Depot Allahabad.
- Agricultural Microbiology,G. Rangaswamy and D.J. Bagyraj, Prentice Hall India.

Reference book:

- Biology of Micro-organisms, Brock, Madigan, Martinko, Parker Prentice Hall publications.

B.Sc.(Ag) Hons.

Semester III

Dimensions of Agricultural Extension 2 (2+0)

Objectives: To Study about Dimension of Agricultural Extension for how can develop the programs for Agricultural Extension.

Unit 1: Introduction; Education – Meaning, Definition, Types – Formal, Informal and Non-formal education and their Characteristics. Extension Education and Agricultural Extension – Meaning, Definition, Concepts, Objectives and Principles. Rural development – Meaning, Definition, Concepts, Objectives, Importance and Problems in rural development.

Unit 2: Rural Development Programmes; Developmental programmes of pre-independence era – Sriniketan, Marthandam, Gurgaon experiment and Gandhian constructive programme. Development programmes of Post independence era, Firka Development, Etawah Pilot project and Nilokheri Experiment.

Unit 3: Community Development; Community Development Programme – Meaning, Definition, Concepts, Philosophy, Principles, Objectives, National Extension service. Panchayat Raj system – Meaning of Democratic – Decentralization and Panchayat Raj, Three tiers of Panchayat Raj system, Powers, Functions and Organizational setup.

Unit 4: Agriculture Development Programmes; Agricultural Development Programmes with reference to year of start, objectives & sailent features – Intensive Agricultural District Programme (IADP), High Yielding Varieties Programme (HYVP), Watershed Development Programme (WDP), ATMA, ATIC. Social Justice and Poverty alleviation programmes –Integrated Rural Development Programme (IRDP), Swarna Jayanthi Gram Swarojgar Yojana (SGSY)

Unit 5: Women Development Programs; New trends in extension, privatization. Women Development programmes – Development of Women and Children in Rural Areas (DWCRA), Rashtriya Mahila Kosh (RMK), Integrated Child Development Scheme (ICDS) and Mahila Samriddi Yojana (MSY). Reorganized extension system (T&V System) – Salient features, Fortnight Meetings, Monthly workshops, Linkages, Merits and Demerits, Emergence of Broad Based Extension (BBE).

Text Book:

- Fundamentals of Extension Education and Rural Education By Dr Jitendra Chouhan

Reference Book:

- Dimension of Agri. Extension by Dr A K Singh,Dr Lakhan Singh and Dr Burman

B.Sc.(Ag) Hons.

Semester III

Agricultural Finance and Co-Operation 2(1+1)

Unit 1: Introduction: Agricultural finance: nature and scope. Time value of money, Compounding and Discounting. Agricultural credit: meaning, definition, need, classification. Credit analysis: 4R's 5C's and 7 P's of credit, repayment plans.

Unit 2: History: History of financing agriculture in India. Commercial banks, nationalization of commercial banks. Lead bank scheme, regional rural banks, scale of finance. Higher financing agencies, RBI, NABARD, AFC, Asian Development Bank, World Bank, Insurance and Credit Guarantee Corporation of India.

Unit 3: Evaluation: Assessment of crop losses, determination of compensation. Crop insurance, advantages and limitations in application, estimation of crop yields.

Unit 4: Agricultural cooperation: philosophy and principles. History of Indian cooperative Movement, pre-independence and post independence periods, cooperation in different plan periods, cooperative credit structure: PACS, FSCS.

Unit 5: Reorganization of cooperative credit structure in Madhya Pradesh and single window system. Successful cooperative systems in Gujarat, Maharastra. Punjab, MP etc.

Practical:

- To study of classification of Agriculture Credit.
- Factors governing use of Capital and identification of credit needs; Time value of money, Compounding and discounting.
- Terminology use in agriculture finance.
- Tools of financial management, Balance sheet, Income statement and cash flow analysis;
- Preparations and analysis of loan proposals; Types of repayment loans;
- Study of financial institutions: PACS, DCCB, Apex Banks, RRBs, CBs, NABARD.

Text books

- Agricultural finance- Theory and Practical – Kahlon and Tyagi

Reference book

- Agricultural finance and management- S. Subba Reddy and P. Raghuram

B.Sc.(Ag) Hons.

Semester III

Farm Power and Machinery 2(1+1)

Objective: The study shall give an insight into the various forms of power used on farm for efficient agriculture starting from sowing of seed to the harvesting.

Unit 1: Farm mechanization- definition, scope, farm power in India: Sources of farm power -conventional & non-conventional energy sources, Study of I.C engines, working principles, two stroke and four stroke engines, I.C. engine terminology, engine components their construction, operatingPrinciples and functions. Study of different systems of I.C. engine.

Unit 2: History: of Tractors, Types of Tractors, Makes and models of 4 wheel drive tractors, Selection of tractor and economics.

Unit 3: Tillage implements: Principle and working of Primary and Secondary tillage Implements and their examples, Principle and working of implements for intercultural operations and their examples. Study of seed drill, seed-cum-fertilizer drill and its calibration. Introduction to Potato Planters & paddy translators,

Unit 4: Plant protection equipment: manual and power operated sprayer- selection, constructional features of different components and adjustments. Introduction to agricultural aircraft for aerial application.

Unit 5: Threshing and harvesting equipment: Principles & types of cutting mechanisms. Construction & adjustments of shear & impact-type cutting mechanisms. Introduction to mowers, winnowers, reapers, reaper binders and forage harvesters. Threshing mechanics & various types of threshers. Introduction to straw combines & grain combines, maize harvesting & shelling equipment.

Practical:

- Study of different components of I.C. Engine.
- Study of working of four stroke engine.
- Study of working of two stroke engine.
- Study of primary tillage equipments.
- Study of secondary tillage equipments.
- Study, maintenance and operation of tractor.
- Learning of tractor driving.
- Study, maintenance and operation of power tiller.
- Study of sowing equipments.
- Study of harvesting equipments.

Textbook:

- Sahay .J, Elements of Agricultural engineering, Agro Book Agency.
- Michel A.M. & Ojha T.P., Principles of Agricultural Engineering, Vol – 1, Jain Brothers, New Delhi.

Reference Book:

- E.L. Barger, J.B. Lijedahl, W.M. Carleton, E.G. Mokibben, Tractors and their Power Units. Wiley Eastern Private Ltd., New Delhi.

B.Sc.(Ag) Hons.

Semester III

Introductory Nematology 2(1+1)

Objective- Study of phytophagous nematodes, damage caused by them and their control measures.

Unit 1: Introduction: History of phytonematology. Economic importance. General characteristics of plant pathogenic nematodes.

Unit 2: Nematode general morphology and biology.

Unit 3: Classification of nematodes upto family level with emphasis on groups containing economically important genera. Classification of nematodes by habitat. Identification of economically important plant nematodes upto generic level with the help of keys and description.

Unit 4: Characteristics and symptomtology of most important plant parasitic nematodes – *Meloidogyne, Pratylenchus, Heterodera, Ditylenchus, Globodera, Tylenchulus, Xiphinema, Longidorus, Radophylus, Rotylenchulus, and Helicotylenchus* Symptoms caused by nematodes with examples. Interaction between plant parasitic nematodes and disease causing fungi, bacteria and viruses.

Unit 5: Different methods of nematode management. Cultural methods (crop rotation, fallowing, soil amendments, other land management techniques), physical methods (soil solarisation, hot water treatment) Biological methods, Chemical methods (fumigants, non fumigants). Resistant varieties. IDM

Practical:

- Methods of survey – sampling methods, collection of soil and plant samples;
- Extraction of nematodes from soil and plant tissues following combined Cobb s decanting –
- sieving and Baermann funnel technique,
- Counting and estimation of plant parasitic nematodes;
- Preparation of temporary and permanent mounts;
- Method of preparation of perineal patterns for identification of species of *Meloidogyne;*
- Study and identification of most important plant parasitic nematodes with special reference to their characteristics and symptomtology – *Meloidogyne, Pratylenchus; Heterodera, Ditylenchus, Globodera,Tylenchulus, Xiphinema, Radopholus, Rotylenchulus, and Helicotylenchus.*
- Experimental techniques used in pathogenicity studies with root knot nematode.

Text books

- Plant nematology: Pathak and B.S. Yadav
- Papad sutrakrami: Sushil kumar and B.P. Singh

Reference Book:

- Plant nematology: N.G. Ravichandra

B.Sc.(Ag) Hons.

Semester III

Practical Crop Production I (Kharif Crops) 1(0+1)

Objective: To Study about the Field Crops (Kharif) in details on practical.

Practices of raising 8-10 prevailing Kharif crops of the agro-climatic zones will be done by the students. One crop will be grown by a students or group of 2-4 students depending upon the strength of students in the class, on a minimum of 100 m2 area. Following practices will be performed by student(s) for raising the allotted crop to them separately, besides observing the practices performed by other students in their plots for raising the crops.

Practical:

- Crop planning for raising Kharif - crops
- Field preparation and Preparation of nursery beds for crop.
- Seed Treatment, seed inoculation and sowing of crop
- Fertilizer application (Basal, top dressing and foliar spray) in crop.
- Water management (irrigation and drainage) in crop.
- Weed management (cultural/mechanical/chemical) in crop
- Management of insect pests and diseases in crops
- Harvesting, drying, and tying bundles and transport to threshing floor of crop.
- Threshing, winnowing and drying of produce
- Storage and marketing of produce.
- Preparation of balance sheet including cost of cultivation,
- Determination of net monetary returns per student or per group of students and benefit cost ratio.

B.Sc.(Ag) Hons.

Semester IV

Fundamentals of Rural Sociology and Educational Psychology 2 (2+0)

Objective- It is necessary for an extension worker to know about Rural Sociology and Psychology of rural peoples in regarding Agriculture technology transfer.

Unit I Extension Education and Agricultural Extension – Meaning, Definition, Scope and Importance. Sociology and Rural Sociology, Meaning, Definition, Scope, Importance of Rural Sociology in Agricultural Extension and Interrelationship between Rural Sociology & Agricultural Extension. Differences and Relationship between Rural and Urban societies.

Unit II Social Groups – Meaning, Definition, Classification, Factors considered in formation and organization of groups, Motivation in group formation and Role of Social groups in Agricultural Extension. Social Stratification –Meaning, Definition, Functions, Basis for stratification, Forms of Social stratification –Characteristics and – Differences between Class & Caste System.

Unit III 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 Organizations – Meaning, Definition, Types of organizations

Unit IV Social Control – Meaning, Definition, Need of social control and Means of Social control. Social change – Meaning, Definition, Nature of Social change, Dimensions of social change and factors of social change. Training of Leaders – Meaning Definition, Methods of training, Advantages and Limitations in use of local leaders in Agricultural Extension. Psychology and Educational Psychology – Meaning, Definition, Scope and Importance of Educational Psychology in Agricultural Extension.

Unit V Intelligence –Meaning, Definition, Types, Factors affecting intelligence and Importance of intelligence in Agricultural Extension. Personality – Meaning, Definition, Types, Factors influencing the Personality and Role of personality in Agricultural Extension. Principles of learning and their implication for teaching

Practical

- Characterization of Indian Rural Society.
- Major institution rural society in India and their work.
- Role of social organization in Agriculture extension pertaining M.P.
- To study about classification and characterization of Leader and Leadership.

Text Books

- Chitambar, J.B. (1977). Introductory Rural Sociology Wilcy Eastern Ltd., New Delhi.
- Sharma. R.N. (1975). Introductory Sociology. Rajhans Prakashan mandir, Meerut.

Reference Books

- Bhatia II.R. (1968). General Psychology. Oxford and IBH Publishing Company, New Delhi.
- Reddy. A.A. (1987). Extension Education- Sree Lakshmi Press. Bapatla.
- Desai A.R. (2003). Rural Sociology in India- Popular Prakasan, Bombay.

B.Sc.(Ag) Hons.

Semester IV

Production Technology of Fruit Crops 3(2+1)

Objectives- Plant identification and their propagation so that we can produce these practices throw different fruit production technique.

Unit-1- **Introductory of fruit science** Definition and importance of horticulture. Divisions of horticulture. Climatic zone of Horticulture crops.

Unit-2- Major fruits - Area and production of different fruit crops. Selection of site, fencing and wind break, planting systems, high density planting, planning and establishment, Propagation methods and use of rootstocks. Methods of training and pruning. Use of growth regulators in fruit production. Package of practices for the cultivation of major fruits – mango, banana, citrus, grape, guava.

Unit-3-Temperate fruits- sapota, apple, litchi. Papaya. pear, plum, peachs and chery.

Unit-4 – **Minor fruits-** pineapple, annonaceous fruits (Custard)pomegranate.

Unit-5- Arid fruits- ber, fig, phalsa, jack.

Practical

- Study of horticultural tools and implements and their uses, Containers mixture, potting, depottin and repotting.
- Plant propagation, seed propagation, Propagation by cuttings (soft wood, hardwood and semi hardwood)layering (simple layering, Air layering, stooling in guava)
- Layout and planting systems (Traditional system and high density planting methods)
- Methods of pruning and training ,Training of ber, grape and pomegranate, Pruning of ber, grape, phalsa, fig, apple, pear, peach.
- Description and identification of varieties of mango, guava, grape, papaya, apple and Sapota, banana, citrus (lime lemon, sweet orange, mandarin, grape fruit) pomegranate, ber, pear and chery.
- Irrigation methods in fruit crops including drip – Micro irrigation methods of establishment of orchard;.
- Methods of Fertiliser application methods in fruit crops including fertigation technology
- Visit to local commercial orchards
- Preparation of growth regulators, powder, solution and lanolin paste for propagation;
- Application of growth regulators for improving fruit set, fruit size, quality, delaying ripening and hastening ripening.

Reference Books:

- Commercial Fruits – Dr.S.P. Singh, *Kalyani Publishers, ludhiyana*.
- Phal utpadan: Siddhant evam praudyogiki. Dr. Prabhakar singh evam Dr. Shailendra Agrawal, *gautam publishers and distributors, vishal nagar, Raipur. (in hindi)*
- Bharat me phalotpadan –K.N. Dubey, *Rama Publishing House, Meerut.(in hindi)*

Text Books

- Fruit culture in india" –Dr. Shyam singh,Dr. S.L.Katyal, *I.C.A.R., New delhi.*
- Phalvriksha pravardhan: phaldar ped lagane ki bagwani"-Dr. Ram kripal pathak, *I.C.A.R., New delhi.(in hindi*

B.Sc.(Ag) Hons.

Semester IV

Field Crops- II (Rabi) 3(2+1)

Objective:- Improved crop production technologies under the changing crop production environment can make farming sustainable and profitable.

UNIT 1 Cereals: wheat and barley. Pulses: Chickpea, lentil, peas, french bean

UNIT- II Oilseeds: Rapeseed and mustard, sunflower, safflower and linseed;

UNIT- III Sugar crops: Sugarcane and sugarbeet,

UNIT -IV Commercial crops: Potato and tobacco,

UNIT -V Forage crops: Berseem, lucerne and oats.

Different rabi crops mentioned above will be taught under the following heads:

1. Origin, history, geographical distribution, and economic importance, soil and climatic requirements,
2. Agronomic characteristic of the important varieties suitable for the various farming situations of the state.
3. Land preparation and sowing management: selection of seeds, seed rate plant population , planting geometry, seed treatment and seed inoculation, sowing depth, suitable sowing methods, gap filling and thinning, watching of sown seeds and germinating seedlings.
4. Application of manure and fertilizer : time and method of application,
5. Inter culture and weeding : earthing, hoeing, control of weeds by agronomical and chemical means, critical period of weed control
6. Irrigation : method of irrigation and critical growth stage of crops for irrigation.
7. Plant protection measures : insect pest and diseases causing damage to the crops and remedial measures to control them
8. Judging of maturity stage of crop and method of harvesting.
9. Efficient and suitable method of winnowing, cleaning, grading, and measurement of yield
10. Proper storage of produce at suitable at suitable moisture content in grains, protection against insect pest and moisture.
11. Suitable crop-rotation and crop mixture.

Practical:

Identification of different rabi crops and their associated weeds

- Calculations on seed rate; plant population, fertilizer requirement and herbicide requirement for the crop.
- Top dressing of nitrogen in wheat and study of fertilizer experiments on wheat and mustard;
- Application of herbicide in wheat and grain legumes.
- Study of morphological characters of wheat, sugarcane, chickpea and mustard;
- Yield attributing characters of wheat, gram. Calculation of yield estimation of sugarcane, potato and wheat etc

- Yield and quality analysis of sugarcane;
- Visit to important agronomic experiments and research stations related to rabi crops.

Text Books

- Field Crops by Y. M. Iyyer
- Text Book of Field Crops by Rajendra Prasad, ICAR Publication

Reference Books

- Modern techniques of raising field crops by Chhidda Singh. OXFORD & IBH Publishing Co. Pvt. Ltd.
- Hand book of Agriculture (IV ed.2006) by CAR Publication
- Scientific Crop Production (1&2) by C. Thakur

B.Sc.(Ag) Hons.

Semester IV

Diseases of Horticultural Crops and Their Management 3(2+1)

Object- To minimize losses caused by different diseases of horticultural crops.
Unit –I Economic Importance, symptoms, cause, disease cycle and integrated management of diseases of: citrus, mango, guava, papaya

Unit-II Banana, grapevine, pomegranate, sapota, apple.

Unit-III Chilli, brinjal, bhendi, potato, tomato.

Unit-IV Crucifers, cucurbits, beans, onion.

Unit-V Coffee, tea, rose, chrysanthemum and jasmine.

Practical:

- Study of diseases of beans.
- Study of citrus, ~~ber~~ grapes & apple diseases.
- Study of guava & pomegranate diseases.
- Study of papaya diseases.
- Study of banana diseases.
- Study of diseases of mango.
- Study of diseases of chilli, brinjal, potato , tomato & okra.
- Study of diseases of crucifers, cucurbits, onion, ~~garlic~~.
- Study of diseases of rose, chrysanthemum and ~~jasmine~~.
- Field visits at appropriate time during the semester.

Text Books

- Plant Disease Management in Horticultural Crops by Ahamad Shahid *et al eds* Astral Publishing.
- Introductory Plant Pathology by Tripathi D. P. (Hindi medium) Kalyani publishing

Reference Books

- Microbial Biopesticides and Pest Management by Parmar G. M.,Jadav N.B. Kalyani
- Publishing
- Plant Pathology by Agrios G. N.
- Crop Diseases: Identification and Management A color Handbook by Gangawane, LV & VC Khilare *eds* Astral Publishing.

B.Sc.(Ag) Hons.

Semester IV

Protected Cultivation and Post Harvest Technology 2 (1+1)

Objective:- Post harvest technology is inter-disciplinary "science and technique" applied to agricultural produce after harvest for its protection, conservation, processing, packaging, distribution, marketing and utilization to meet the food and nutritional requirements of the people in relation to their needs.

Unit I :-

Green house technology, Introduction, Types of Green Houses; Plant response to Green house environment, Planning and design of greenhouses, Design criteria of greenhouse for cooling and heating purposes. Green house equipment, materials of construction for traditional and low cost green houses.

Unit II:-

Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying. Cost estimation and economic analysis. Choice of crops for cultivation under greenhouses, problems / constraints of greenhouse cultivation and future strategies.

Unit III:-

Growing media, soil culture, type of soil required, drainage, flooding and leaching, soil pasteurization in peat moss and mixtures, rock wool and other inert media, nutrient film technique (NFT) / hydroponics.

Unit IV:-

Winnowing, manual and power operated winnowers, care and maintenance. Groundnut decorticators, hand operated and power operated decorticators, principles of working, care and maintenance. Maize shellers & castor shellers.

Unit V:-

Drying, grain drying, types of drying, types of dryers. Fruits and vegetables cleaning & grading-principle, machinery for cleaning & grading of fruits and vegetables, care and maintenance. Evaporation- Principle, types of evaporators

Practical:-

- Study of different types of green houses based on shape, construction and cladding materials
- Measurement of heat and moisture transfer in green house.
- Identification of soil and preparation of nutrient film.
- Study of maize sheller.
- Study of thresher.
- Study of winnowers and cleaners.
- Study of groundnut decorticator.
- Study of dryers.

Text Books

- Green house management for horticultural crops, S. Prsad /U. Kumar, Agrobio (India).
- Unit operations of Agricultural processing, K.M. Sahay and K.K. Sinh, Vikas Publishing House, Pvt.Ltd.

Reference Books

- Post harvest technology of cereals, pulses and oilseeds, A. Chakroborty, Oxford & IBH publishing Co. Pvt. Ltd.
- Protected Cultivation by Adikant Pradhan Astral Publishing.

B.Sc.(Ag) Hons.

Semester IV

Weed management 2(1+1)

Objective- Orientation of students about weeds and menace caused by them including their eradication.

Unit 1: Introductory weed science-Weeds: Introduction, harmful and beneficial effects, classification, propagation and dissemination.

Unit 2: weeds prevention and eradication Weed biology and ecology, crop weed association, crop weed competition and allelopathy Concepts of weed prevention, control and eradication.

Unit 3: Ways to control loses due to weeds. Methods of weed control: physical, cultural, chemical and biological methods. Integrated weed management

Unit 4: Chemicals and their use in weed eradication. Herbicides: advantages and limitation of herbicide usage in India, Herbicide classification, formulations, methods of application; Introduction to Adjuvant and their use in herbicides; Introduction to selectivity of herbicides; Compatibility of herbicides with other agro-chemicals.

Unit 5: Weed flora and their diversity. Weed management in major field and horticultural crops, shift of weed flora in cropping systems, aquatic and problematic weeds and their control.

Practical:

- To study about identification of weeds.
- Survey of weeds in crop fields and other habitats.
- Preparation of herbarium of weeds.
- Calculations on weed control efficiency and weed index.
- To study about herbicide label information.
- To study about computation of herbicide doses.
- Study of herbicide application equipment and calibration.
- Demonstration of methods of herbicide application.
- Preparation of list of commonly available herbicides.
- Biology of nut sedge, bermuda grass, parthenium and celosia.
- Economics of weed control practices.
- Tours and visits of problem areas.

Text Books:

- Principles of weed science – V.S.Rao(1994), Oxford and IBH Publication, New Delhi.
- Weed management –Walia, U.S.(2003), Kalyani publication, New Delhi.

Reference Books:

- Weed management- principles and practices - Gupta, O.P.(2000).
- Weed science : Basics and Applications – T.K.Das(2008), Jain Brothers publication.
- All about Weed Control – subramaniam, S., Ali, A.M. and Kumar, R.J.(1977), Kalyani publication, New Delhi.

B.Sc.(Ag) Hons.

Semester IV

Crop Pests and Stored Grain Pests and Their Management 3(2+1)

Objective: This course aims to gather updated information's on insect and non insect pests of National importance with reference to their identification, host range, distribution, Nature of damage and various methods of management practices in field and Horticultural crops.

Unit I : Economic importance of insects, nature and extent of damage, life history and management of the major insect pests of following crops as mentioned against them:
Paddy; *Leptocorisa varicronis, Hieroglyphus* Spp., *Nilaparvata legens*, *Nephotetix*, spp., *Mythimna separata*. Jowar & Maize; *Chilo partellus, Atherigona variosoccata*.

Unit II: Sugarcane; *Pyrilla prepussila. Scirpophaga nivella, Excerpatalis,Chilo infuscatellus*
Cotton; *Pectinophora gossypiella, Earias Spp., Sylepta derogata, Dysdercus Spp., Bemisia tabaci, Amrasca bigutulla.*

Unit III: Oilseeds; *Lipaphis erysimi, Athalia proxima Bagrada Cruciferarun, Dasyneura lini.*
Pulses ; *Helicoverpa armigera Agrotis Spp., Etiella Zinckenella, Melanagromyza obtusa, Phytomyza atricornis.*

Unit IV:Pests of Fruit crops ; *Drosicha mangiferae, papilio Democlius, Diaphorina citri Phyllocnisris citrella, Eriosoma lanigerum.* Pest of Vegetable crops; *Leucinodes orbonalis, Epilachna viqintioctopunctata. Dacus cucurbitae, Plutella xylostella. Raphidopaltha foveicollis.*
Unit V: **Pests of Stored Grains** ; *Sitophilus oryzae, Trogoderma granarium, Sitotroga cerealella, Callosobruchus chinensis* .Polyphagus pests; *Odontotermes obesus, Holotrichia consanguinea, Spilosoma obliqua, Spodoptera litura, Amshcta Spp.* Elementary knowledge of apiculture

Practical

- Collection, mounting and preservation of insect pests of crops stages.
- Identification and management of cucurbits pests.
- Identification and management of mango pests.
- Identification and management of cruciferous pests.
- Identification and management of stored grain pests.
- Identification and management of leguminous pests.
- Identification and management of brinjal tomato, bhindi and chilli pests.
- Identification and management of potato pests.

Text Books:

- An outline of Entomology by G S Dhaliwal.
- Krishi Keet Vigyana by Mathur and Upadhaya.
- A Text book of entomology by Mathur and Upadhaya

Reference Books:

- Applied Entomology Vol. –I & II by K P Shrivastava.
- Integrated pest management by G.S. Dhaliwal.

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Semester IV

Fundamentals of Farm Business Management 2 (1+1)

Objective- It is necessary to know about farm business management for maximum profit, therefore, this syllabus will fulfill required object.

Unit: I. Agribusiness: meaning, Definition, Structure of Agribusiness (input, farm, product sectors).Importance of Agribusiness in Indian Economy. Agribusiness Management: distinctive features, importance of good management.

Unit II: Management: definition, management functions-meaning- definitions- Planning (types of plans-purpose or mission, goal or objective, strategies policies, procedure, rules, programme, budget.), organization: Staffing, directing, motivation, ordering, leading, supervision, communications, control.

Unit-III. Capital Management: meaning definition, Financial Management of Agribusiness management: Importance of financial statement, balance sheet, profit and loss statement, Ratios (Turnover ratio, profitability ratio, liquidity ratio).Agro based industries- Importance and need, types, procedure to setup agro based industries, Constraints in setup of agro based industries.

Unit-IV Marketing Management: meaning definition, marketing mix, 4p's of marketing, market segmentation, -meaning and need, Product life cycle, Pricing policy-meaning and method. Project definition –project cycle-identification-formulation-implementation-monitoring and evaluation.

Unit-V Appraisal and evaluation techniques-NPW, BCR, IRR, N/K Ratio, characteristics of agricultural projects: preparation of project reports for various agricultural activities and allied sectors: Dairying, poultry, fisheries, and agro-industries.

Practical:

- Study of financing institutions-Cooperative, Commercial bank, RRB's, and Agribusiness finance limited, NABARD
- Preparation of projects, Feasibility reports, projects appraisal techniques, case studies of agro based industry.
- To study about the different phases of project cycle.

Text Books:

- Syllabus B. Sc.(Hons.)Ag. IV Sem. Agribusiness Management - Smita Diwase (Everest Publishing House.)
- Introduction to Agribusiness - Omri Rawlins, N

Reference Books:

- Agribusiness Management by W.DavidDowney and Steven P Erickson.
- Agri.Business Management, Broadway, Kalyani Publications.
- Project Management by S Choudhary, Hill publications New Delhi.
- Agribusiness management by Gangadhar Bhatia Mittal Publications.
- Project management and control by Rao.
- Project Planning Analysis, Selection,Implementation and Review by Chandra.

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Semester IV

Soil and Water Conservation and Watershed Management 3 (2+1)

Objective- To minimize losses caused by different erosions and to study about field surveying and watershed management.

Unit 1
Surveying: survey equipment, chain survey, cross staff survey, plotting procedure, calculations of area of regular and irregular fields. Levelling – levelling equipment, terminology, methods of calculation of reduced levels, types of levelling, contouring.

Unit 2
Soil erosion - causes, types and agents of soil erosion; water erosion - forms of water erosion, mechanics of erosion; gullies and their classification, stages of gully development; soil loss estimation - universal soil loss equation and modified soil loss equation

Unit 3
Erosion control measures – agronomical measures - contour cropping, strip cropping, mulching; mechanical measures - terraces , bunds, gully and ravine reclamation - vegetative and temporary structures, land use capability classification; grassed water ways, water harvesting techniques;

Unit 4
Watershed**-**watershed characteristics – physical and geomorphologic, factors affecting watershed management, hydrologic data for watershed planning, watershed delineation and priority.

Unit 5
Watershed management –principles, objective, participatory watershed management program, evaluation and monitoring of watershed programmes; people's participation in watershed management programmes; planning and formulation of project proposal; cost benefits analysis of watershed programmes.

Practical

- Acquaintance with chain survey equipment;
- Ranging and measurement of offsets;
- Chain triangulation;
- Cross staff survey;
- Levelling with dumpy level and levelling staff
- Analysis of hydrologic data for watershed management;
- Delineation of watershed and measurement of area under different vegetative and topographic condition
- Study of different watershed management structures.
- Study of watershed management technologies.
- Organizing PRA techniques in a village to identify the agricultural problems.

Text Book

- Suresh, R., *Soil and water conservation Engineering*. Standard Publication, New Delhi
- Ojha, T.P. and A.M.Michael. *Principles of Agricultural Engineering*, Vol.II. Jain Brothers New Delhi.3rd edition 2001.

References Book

- Kanetkar, Kulkarni. *Surveying and leveling*, AVG Prakasan, 23RD edition. Jan. 2005
- Singhal, O.P. *Agricultural Engineering*, 1997

B.Sc.(Ag) Hons.

Semester V

Fundamentals of Biochemistry 3(2+1)

Objective: Biochemistry is the chemistry of living organisms. The students will gain the knowledge about life processes at molecular level.

Unit I: Biochemistry: introduction and importance. Introduction to plant cell. Properties of water. Introduction to plant cell, Cell wall, Cell membrane, Movement across the membrane. Laws of thermodynamics.

Unit II: Carbohydrates: classification and nomenclature, oligosaccharides and polysachharides. Stereoisomerism. Cellulose and starch, Pectic compounds – synthesis and degradation. Glycoproteins, Mucopeptides. Lipids: fats and oils, nomenclature of fatty acids. Fatty acids and phosphoglycerides, Sphingolipids, Lipoproteins, Acyl lipids. Biosynthesis of lipids. Industrial application of lipids.

Unit III: Protiens: amino acids, formation of peptide bonds and polypeptide chain. Molecular configuration and conformation. Determination of amino acid sequence. Purification of proteins. Biosynthesis of amino acids and proteins. Enzymes: Structural properties and kinetics. Types of enzymes.

Unit IV: Nucleic acids: Purines and Pyrimidines, nucleosides and nucleotides, molecular structure of DNA, structure of RNA. Sequencing of DNA bases, Histones-Proteins DNA complex, acid proteins. DNA replication. Biosynthesis of DNA and RNA.

Unit V: Metabolism: Basic concepts; Respiration and Fermentation. Glycolysis, TCA cycle, Pentose Phosphate Pathway, Oxidative phosphorylation, Fatty acid oxidation. Metabolic regulation: Secondary metabolites; Terpenoids, Alkaloids, Phenolics and their application.

Practical:

- Qualitative tests of carbohydrates: 3 practical
- Qualitative tests of lipids: 1 practical
- Qualitative tests of proteins: 4 practical
- DNA isolation
- Electrophoresis

List of books:

- Biochemistry (Hindi) by Kumar, Publisher Jaypee (ISBN: 8180613119)
- Plant Physiology and Biochemistry (Hindi and English) by Dr. V. Singh, Dr. P.C. Pande & Dr. D.K. Jian, Rastogi Publication

Text Books:

1.A text book of Biochemistry by S.N. Gupta, Rastogi Publication (ISBN: 978-81-7133-938-9)

2.Elements of Biochemistry By H. S. Srivastava, rastogi Publication (ISBN: 81-7133-882-8)

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Semester V

Extension Methodologies for Transfer of Agricultural Technology 2(1+1)

Objective- How Agricultural technologies can be transferred to rural people for batter production & rural development is the main objective of Agriculture research.

Unit- I

Communication –Meaning, Definition, Models, Elements and their Characteristics, Types and Barriers in communication. Extension Programme Planning – Meaning, Definitions of Planning, Programme, Project, Importance, Principles and Steps in Programme Development Process, Monitoring and Evaluation of Extension Programmes.

Unit- II

Extension Teaching methods– Meaning, Definition, Functions and Classification. Individual contact methods – Farm and Home visit, Result Demonstration, Field trials – Meaning, Objectives, Steps, Merits and Demerits. Group contact methods – Group discussion, Method demonstration,

Unit- III

Field Trips –Meaning, Objectives, Steps, Merits and Demerits. Small group discussion techniques – Lecture, Symposium, Panel, Debate, Forum, Buzz group, Workshop, Brain Storming,Seminar and Conference. Mass contact Methods – Campaign, Exhibition, Kisan Mela, Radio & Television – Meaning, Importance, Steps, Merits & Demerits.

Unit- IV

Factors influencing in selection of Extension Teaching Methods and Combination (Media Mix) of Teaching methods. Innovative Information sources – Internet, Cyber Cafes, Video and Tele conferences, Kisan call centers, Consultancy clinics. Agricultural Journalism – Meaning,Scope and Importance, Sources of news, Types, Merits and Limitations.

Unit- V

Diffusion and Adoption of Innovations – Meaning, Definition, Models of adoption Process, Innovation –Decision Process – Elements, Adopter categories and their characteristics, Factors influencing adoption process. Capacity building of Extension Personnel and Farmers –Meaning, Definition, Types of training, Training to farmers, farm women and Rural youth –FTC and KVK.

Practical:

- Organization of Group discussion and Method demonstration.
- Planning and Writing of scripts for Radio and Television.
- Audio Visual aids – Meaning, Importance and Classification.
- Selection,Planning, Preparation, Evaluation and Presentation of visual aids.
- Planning & Preparation of visual aids – Charts, Posters, Over Head Projector, (OHP) Transparencies, Power PointSlides.
- Planning and Preparation of Agricultural Information materials – Leaflet, Folder,

Reference Books

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- Blun, A. (1996). Teaching and Learning in Agriculture – A Guide for agricultural
- education, FAO, Rome,
- Chandrakantan, K and Palaniswamy, (2000). Advances in communication Technology,

- Indian PublishersRaydu, C.S., (1993). Media and Communication Management HimalayaPublishing House, Mumbai.
- Dahama, O.P. and Bhatnagar, O.P. (2003). Education and Communication for Chandrakantan, K and Palaniswamy Development. Oxford, IBH, New Delhi.
- Ray, G.L. (1991). Extension Communication and Management. Naya Prokash, Calcutta.
- Rogers, E.M. (1983). Diffusion of Innovations. Free Press, New York.

B.Sc.(Ag) Hons.

Semester V

Diseases of Field Crops and Their Management 3 (2+1)

Objective-To know losses caused by diseases and their management to minimize the loss in crop production

Unit I Economic importance, symptoms, cause, epidemiology and disease cycle and integrated management of diseases of rice, sorghum, bajra, maize, wheat,

Unit II Economic importance, symptoms, cause, epidemiology and disease cycle and integrated management of diseases of sugarcane,turmeric, tobacco,groundnut,

Unit III Economic importance, symptoms, cause, epidemiology and disease cycle and integrated management of diseases of sesamum, sunflower, cotton, mustard

Unit IV Economic importance, symptoms, cause, epidemiology and disease cycle and integrated management of diseases of redgram, bengalgram, blackgram, greengram,

Unit V Economic importance, symptoms, cause, epidemiology and disease cycle and integrated management of diseases of ,soybean, linseed, fanumgreecum, coriander

Practical:

- Study of symptoms, etiology, host-parasite relationship and specific control measures of the following crop diseases.
- Presentation of disease samples
- Collection of Diseases of rice, sorghum;
- Study of wheat, bajra & maize diseases .
- Study of sugarcane diseases.
- Study of groundnut, ~~castor & sunflower~~ diseases.
- Study of sesamum & cotton.
- Study of redgram, greengram, blackgram, bengalgram & beans diseases.
- Field visits at appropriate time during the semester

Text Books

- Plant Pathology – P D. Sharma. Kalyani publication.
- Plant Pathology –R. P. Singh. Kalyani publication.
- Crop Diseases: Identification and Management A color Handbook by Gangawane, LV & VC Khilare *eds* Astral Publishing.

Reference Books

- Plant Pathology by Agrios G. N.

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Semester V

Agricultural Marketing, Trade and Prices 2 (1+1).

Objective-The objectives of this course is to provide applied and practical understanding of Practices involved in Agriculture Marketing and Trade.

Unit I: Agricultural marketing: concepts and definition-Scope and subject matter-Market and marketing-meaning-definitions-elements of a market-classification-agricultural Market.

Unit II: Market structure, Conduct, performance. Marketing structure, Market functionaries or agencies, Producer's surplus: Meaning, Types of producers surplus, marketable surplus. Marketed surplus, importance, Factors affecting Marketable surplus. Marketing channels: Meaning, Definition, Channels for different products. Market integration, Meaning, Definition, Types of Market Integration.

Unit III: Marketing efficiency: Meaning, Definition, Marketing costs, Margins and price Spread, Factors affecting the cost of marketing, Reasons for higher marketing costs of farm Commodities, Ways of reducing marketing costs. Theories of International Trade: Domestic Trade, Free trade, International Trade, GATT, WTO, Implications of AOA.

Unit IV: Market access, Domestic support, Export subsidies, EXIM-Policy & Ministerial conferences. Cooperative Marketing. State Trading. Ware Housing Corporation; Central and State, Objectives, Functions, advantages. Food Corporation of India: Objectives and Functions. Quality Control, Agricultural Products, AGMARK.

Unit V: Price Characteristics of agricultural product process, Meaning, Need for Agricultural Price Policy. Risk in Marketing: Meaning and importance, Types of Risk in Marketing. Speculations and Hedging, Futures trading, Contract farming.

Practical:

- Abbreviation agricultural marketing.
- Important Institutes related to agricultural marketing.
- Identification of marketing channels.
- Study of regulated markets.
- Calculation of marketing cost marketing, marketing margin, and price spread and marketing efficiency.
- Study to market institutions, NAFED.
- Marketed and marketable surplus of different commodities.

Reference Book and Text Books:

- Acharya, S.S., Agarwal, N.L.1987. Agricultural Marketing in India. Oxford and IBH, New Delhi.
- Acharya, S.S., Agarwal, N.L.1994. Agricultural Prices and Policy. Oxford and IBH, New Delhi.
- Philip, K.2004. Principles of Marketing. Prentice Hall, New Delhi.

B.Sc.(Ag) Hons.

Semester V

Renewable Energy 2 (1+1)

Objective – Use of renewable energy in Agriculture can minimize the cost of production; therefore farmer will get more benefit.

Unit I Energy sources, Introduction, Classification, Energy from Biomass, Types of biogas plants, constructional details, Biogas & slurry production and its utilization,

Unit II Agricultural wastes, Principles of combustion, pyrolysis and gasification, Types of gasify Producer gas and its utilization.

Unit III Briquettes, Types of Briquetting Machines, uses of Briquettes, Shredders. Solar energy, solar collators (flat plate and focusing plate) collectors, solar air heaters, solar space heating, and cooling,

Unit IV Solar energy applications / Solar energy gadgets, Solar cookers, Solar water heating systems, solar grain dryers, Solar Refrigeration system, Solar ponds, Solar photo voltaic systems, solar lantern, Solar street lights, solar fencing, Solar pumping systems.

Unit V Wind energy, Types of wind mills, Constructional details & application of wind mills. Liquid Bio fuels, Bio diesel and ethanol from agricultural produce, its production & uses.

Practical:

- Constructional details of KVIC & Janatha type biogas plants.
- Constructiona details of Deen Bandu type biogas plants.
- Field visit to biogas plants; Constructional details of different types of gasifiers.
- To study and find the efficiency of solar cooker
- To study and find the performance of a solar still
- To study and find the performance of a solar dryers
- Study and performance evaluation of domestic solar water heater
- Study and performance evaluation of solar lantern
- Study and performance evaluation of solar street light
- To study the performance of different types of wind mills; Field visit to wind mills
- To study the processing of Bio-diesel production from Jatropha.

Reference Books

- Ojha, T.P. and A.M.Michael. Principles of Agricultural Engineering, Vol.I. Jain Brothers
- New Delhi.3rd Edition 2001
- Ojha, T.P. and A.M.Michael. Principles of Agricultural Engineering, Vol.II. Jain Brothers
- New Delhi 3rd Edition 2001
- Sahay, Jagdiswar. Elements of Agricultural Engineering. Agro book Agencies, 1977
- Singhal, O.P. Agricultural Engineering 1977
- Tomer, Sadachari Singh Kheti ke vaikalpic urja National Publishing House, New Delhi.
- Tomer, S.S. Energy, Agriculture & Environment Mittal Publications, New Delhi.

B.Sc.(Ag) Hons.

Semester V

Principles of seed technology (1+1)

Objective :- To study about production of quality seed for seed production of Field and Horticulture crops.

Unit 1:,
Importance of Seed Production, Deterioration of crop varieties, Factors affecting deterioration and their control. Maintenance of genetic purity during seed production.

Unit 2:
Seed quality; Definition, Characters of good quality seed, Different classes of seed, Production of nucleus & breeder's seed. Foundation and certified seed production in maize. Foundation and certified seed production of rice. Foundation and certified seed production of tomato, brinjal, chilli and bhindi.

Unit 3:
Seed certification, procedure for seed certification, field inspection and field countsetc..Seed Act and Seed Act enforcement, Central Seed Committee, Central Seed Certification Board, State Seed Certification Agency, Central and State Seed Testing Laboratories. Duties and powers of seed inspectors, offences and penalties. Seed control order Seed Control Order 1983, Seed Act 2000 and other issues related to seed quality regulation.

Unit 4:
Intellectual Property Rights, Patenting, WTO, Plant Breeders Rights, Seed Drying: Forced air seed drying, principle, properties of air and their effect on seed drying, moisture equilibrium between seed and air, Heated air drying, types of air distribution systems for seed drying.

Unit 5:
Seed processing: air screen machine and its working principle. Different upgrading equipments and their use, establishing a seed testing laboratory; Seed testing procedures for quality assessment. Seed treatment; importance, types, equipment. Seed packing, storage, factors affecting seed longevity during storage and conditions required for good storage, General principles of seed storage, measures for pest and disease control, temperature control, Seed marketing, marketing structure, marketing organization, factors affecting seed marketing.

Practical

- Seed sampling principles and procedures;
- Physical analysis of Field and Horticultural crops;
- Germination analysis of Field and Horticultural crops;
- Moisture tests of Field and Horticultural crops; Viability test of Field and Horticultural crops; 5. Seed health test of Field and Horticultural crops;
- Vigor tests of Field and Horticultural crops;
- Seed dormancy and breaking methods;
- Grow out tests for varietal identification;
- Visit to Seed production plots of Rice; Chillies and Vegetables.
- Varietal identification in seed production plots;
- Planting ratios, isolation distance, rouging etc.

Text Books

- Agrawal, P.K. 1994. Principles of Seed Technology Kalyani Publishers, Ludhiana
- Agrawal, R.L. 1990. Seed Technology Kalyani Publishers, Ludhiana
- Agrawal, P.K. and N. Dadlani 1995. Techniques in Seed Science and Technology

Reference Books

- Neal C. Stoskopf, Dwight T. Tomes and B.R. Christie. 2006. Plant Breeding Theory and Practice. Scientific Publishers (India), Jodhpur.
- Dahiya, B.S.; Rai, K.N. 1995 Seed Technology Kalyani Publishers, Ludhiana
- Nema, N.P. 1999 Principles of Seed Certification and Testing Allied Publishers Pvt. Ltd.,New Delhi.

B.Sc.(Ag) Hons.

Semester V

Livestock Production and Management 3 (2+1)

Objective: The overall objective of this course is to present an overview, discussion and practical skills to students about livestock & role of livestock in agriculture.

Unit I.
Place of livestock in the national economy, different livestock development programmes of Govt. of India.

Unit II.
Important exotic and Indian breeds of cattle, buffalo, sheep, goat and swine. Measures and factors affecting fertility in livestock, reproductive behavior like oestrus,Parturition, farrowing and artificial insemination technique and collection of semen, semen dilutors.

Unit III.
Milk secretion, milking of animals and factors affecting milk yield and composition. Selection and breeding of livestock for higher milk and meat production.

Unit IV.
Feeding and management of calves, growing heifers and milch animals and other classes and types of animals, housing principles, space requirements for different species of livestock. Disease control measures, sanitation and care, breeding, feeding and production records.

Unit V.
Breed characteristics of poultry, their methods of rearing, feeding and management, incubation, hatching and brooding, vaccination and prevention of diseases, preservation and marketing of eggs, its economics and keeping quality. Cost of production of milk, economical units of cattle, buffalo, sheep, goat.

Practical:

- Identification, handling and restraining of animals;
- Judging and culling;
- Feeding and ration formulation;
- Hatching, housing and management of poultry;
- Visit to livestock farms and Economics of livestock production.

Text and Reference Books:

- Hand Book of Live Stock Management.
- Livestock Production and Management by H.C.Gupta, Bharti Bhandar Publication.
- Livestock Production and Managemnt by Dr Rajveer Singh & Bhati Dahma, Bharti Bhandar Publication.
- Animal Husbandry and Vetrinary Science by Dr Rohal..

B.Sc.(Ag) Hons.

Semester V

Production Technology of Spices, Aromatic, Medicinal and Plantation Crops.

3 (2+1)

Objective: The objective of this course is to provide applied and practical knowledge of Production Technology of Spices, Aromatic, Medicinal and Plantation Crops

Unit: I. Importance and cultivation technology of Spices – Ginger, Turmeric, Pepper, Cardamom, Coriander, Cumin, Fenugreek.

Unit II: Aromatic crops – Lemon grass, Citronella, Palmarose, Vetiver, Geranium, Dawana.

Unit-III.Plantation crops – coconut, Arecanut, Betelvine, Cashew, Cocoa, Coffee, and Oilpalm;

Unit-IV Medicinal plants – Diascoria, rauvolfia, opium, Ocimum, Perwinkle, Aloe, Guggul,

Unit-V Meditional plants -Belladonna, Nuxvomica, Aonla, Senna, Plantago, Stevia, Coleus and Acorus.

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.
- ~~Propagation and~~ Planting techniques of ginger, turmeric.
- Harvesting procedures in aromatic plants.

Reference Books:

- Aushadhiya Paudhe by SK Jain. NBT New Delhi.
- Medicinal plants of India & Pakistan by Dr Kirti Garg.
- Plantation crops by K V Peter NBT New Delhi.
- Pruthi.J.S. 1993. Major Spices of India, Crop Management – Post Harvest Technology, ICAR, New Delhi.

B.Sc.(Ag) Hons.

Semester V

Post Harvest Practices for Cereals, Pulses and Oil Seeds 3(2+1)

Unit I

Current scenario of post harvest technology in India; Structure and composition of food grains; physical properties, mechanical properties and thermal properties agricultural material;

Unit II

Cleaning, Grading and Shorting: Screening; types of screen; grizzly; revolving screen; shaking screen; rotary screen; vibratory screen; horizontal screen; perforated metal screen; wire mesh screen; Screen analysis, effectiveness of screen; air-screen cleaners; separators

Unit III

Utilities of drying; drying theory; methods of drying; types and classification of grain dryers.

Unit IV

Direct damages; indirect damages; sources of infestation; traditional storage structure; Improved storage structure; modern storage structure; controlled and modified atmosphere storage

Unit V

Theory of size reduction and size reduction procedures; oil expression and extraction; Rice milling; parboiling; huller; pulse milling; pulse milling processes

Introduction to Material handling devices- Belt conveyor, Bucket elevators, screw conveyors and Pneumatic conveyors; feed; fiber; and by-products utilization

Practical

- Determination of Geometric Mean Diameter of grain.
- Determination of bulk density and true density of grain.
- Study of grain grading equipment;
- Determination of angle of repose.
- Determination of moisture content of crop produces.
- Study of separation equipment; (a) Cleaner and grader (b) Cyclone separator
- Evaluation of performance of indented cylinder and screen pre-cleaner;
- Study of various size reduction equipments; Hammer mill, Attrition mill, Ball mill.
- Study design of conveying equipments; Belt conveyor, , Screw conveyor and Bucket elevator.

Reference Books

- Chakraverty, A. "Post Harvest Technology of Cereals, Pulses and Oil Seeds".5th Ed., Oxford & IBR 2008
- Sahai, K.M. and Singh, K,K. "Unit operation in Agricultural Engineering", Vikas Publishing House Pvt. Ltd" 1994

B.Sc.(Ag) Hons.

Semester VI

Soil Chemistry, Soil Fertility and Nutrient Management 3 (2+1)

Objectives: To study the chemistry of soil fertility and nutrient management in soil for better good crop production and soil health.

Unit I: Soil as a source of plant nutrients. Essential and beneficial elements, criteria of essentiality, forms of nutrients in soil, mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants. Measures to overcome deficiencies and toxicities.

Unit II: Problem soils – acid, salt affected and calcareous soils, characteristics, nutrient availabilities. Reclamation – mechanical, chemical and biological methods. Fertilizer and insecticides and their effect on soil water and air. Irrigations water – Quality of irrigation water and its appraisal. Indian standards for water quality. Use of saline water for agriculture.

Unit III: Soil fertility – Different approaches for soil fertility evaluation. Methods, Soil testing – Chemical methods. Critical levels of different nutrients in soil.

Unit VI: Plant analysis – DRIS methods, critical levels in plants. Rapid tissue tests. Indicator plants. Biological method of soil fertility evaluation. Soil test based fertilizer recommendations to crops.

Unit V: Factors influencing nutrient use efficiency (NUE) in respect of N. P. and K. ~~S. Fe and Zn~~ fertilizers. Source, method and scheduling of nutrients for different soils and crops grown under rainfed and irrigated conditions.

Practical:

- Principles of analytical Instruments Colorimetry and flame photometry.
- Estimation of available N in soil, & plants
- Estimation of available P in soil, & plants
- Estimation of available K in soil, & plants
- Soluble cations and anions in soil water extracts.
- Lime requirement and gypsum requirement of problem soils.

Text Books:

- Soil Fertilizers. An Int6roduction to Nutrient Management by Havlin J. L., Beaton J. D., Tisdale S. L. and Nelson W.L. 2012 , PHI Lerrning Pvt. Lit. New Delhi.
- Fundamental of soil science 2012, Indian society of soil science New Delhi.

Reference Books:

- Singh, S.S. 2011, Soil fertility and nutrient management. Kalyani Publishers, New Delhi.
- Nahre and properties of soil by N. C. Brady and Ray R. weil 2012 . Pearson Prentice Hall.
- Manures and Fertilizer by Yawalkar K. S., Agarwal J. P., and Brady S (2011) Agri-Horticultural Publishing House, Nagpur.

B.Sc.(Ag) Hons.

Semester VI

Breeding of Field / Horticulture Crops 3(2+1)

Objective: To impart knowledge to the students on the botanical description, origin, distribution and various breeding approaches used for the development of varieties / hybrids in various field and horticultural crops

Unit I: Breeding objectives and important concepts of breeding self pollinated, cross pollinated and vegetatively propagated crops; Hardy-Weinberg Law; Study in respect of origin, distribution of species, wild relatives and forms, Cereals, (rice, wheat, maize, millets, sorghum, bajra, ~~ragi~~); Pulses (redgram, greengram, blackgram, soybean)

Unit II: Oilseeds (Groundnut, sesame, sunflower, mustard) etc. Fibers (Cotton, jute) etc. Vegetables (Tomato, bhindi, chilli, cucumbers)

Unit III: Flowers crops (Chrysanthemum, rose, & marigold); Fruit crops (aonla, guava, mango, papaya)

Unit IV: Major breeding procedures for development of hybrids / varieties of various crops; Plant Genetic Resources their conservation and utilization in crop improvement; Ideotype concept in crop improvement; Breeding for resistance to biotic and abiotic stresses variability in pathogens and pests; Mechanisms of resistance in plant to pathogens and pest;

Unit V: Genetic basis of adaptability to unfavourable environments; Definition of biometrics, assessment of variability i.e., additive, dominance and epistasis and their differentiation; Genotype x Environment interaction and influence on yield/performance, IPR and its related issues.

Practical:

- Practical: Emasculation and Hybridization techniques
- Handling of segregating generations, pedigree methods
- Handling of segregating generations, bulk methods
- Handling of segregating generations, back cross methods
- Field lay out of experiments
- Field trials, maintenance of records and registers

Reference Books:

- Kumar, N.. Breeding of Horticultural Crops – Principles and Practices. New India Publishing Agency, New Delhi.
- Phundan Singh,. Essentials of Plant Breeding . Kalyani Publishers, New Delhi.
- Singh, B.D.. Plant Breeding: Principles and Methods. Kalyani Publishers, New Delhi

Text Books:

- Poehlman, J.M. and Borthakur, D. Breeding Asian Field Crops. Oxford and IBH Publishing Co., New Delhi.
- Sharma, J.R.. Principles and Practice of Plant Breeding. Tata McGraw Hill, Publishing Company Ltd., New Delhi.

B.Sc.(Ag) Hons.

Semester VI

Production Economics and Farm Management 2 (1+1).

Objective-The objectives of this course is to provide applied and practical understanding of Production economics and farm management techniques with emphasis on its economic analysis.

Unit I: Production economics- Meaning, definition, nature and scope of agricultural production Economics- Basic concepts and terms- technical units-farm firm- plant. Resources and resource services- fixed and variable resources- flow and stock resources- product- production.

Unit II: Production period- production function- continuous and discrete function -short and long term production function- choice indicator, slope of a curve concepts of production. Production functions: Meaning, definition, types.

Unit III: Laws of returns- Increasing, Constant and decreasing. Factor product relationship. Determination of optimum input and output. Factor facto relationship - Product product relationship. Enterprise relationships- Returns to scale- Meaning, definition, importance.

Unit IV: Farm management. Economic principles applied to the organizations of farm business- Time comparison. Principle- capital productivity analysis- Farm inventory –Methods of valuation of farm assets- depreciation-meaning - methods of computation -Types and systems of farming.

Unit V: Farm planning and budgeting. Farm budgeting. Crop insurance, animal insurance.

Practical:

- Computation of cost concepts.
- Methods of computation of depreciation.
- Analysis of net worth statement.
- Preparation of farm plans and budgets
- Types of farm records and accounts
- Application of Farm management Principles.

Reference Book and Text Books:

- Johl, S.S., Kapur, T.R. 2000. Fundamentals of Farm Business Management. Kalyani Publishers, New Delhi.
- Dhondyal, S.P.1987. Farm Management: an Economic Analysis. Friends Publications, Meerut.
- Reddy, S.S., Ram, P.R., Sastry, T.V.N., Devi, J.B.2004. Agricultural Economics. Oxford & IBH publishing Co. New Delhi.
- Kahion, A.S., Singh, K.1992.Economics of Farm Management in India.Theory of Practice, Allied Publishers.
- Tandon, P.K. & Dhandyal, S.P. Principles and Methods of Farm Management, 1971, A. Joshi, 3A/24 Azad Nagar, Kanpur.

B.Sc.(Ag) Hons.

Semester VI

Introduction to Plant Biotechnology 3 (2+1)

- **Objective:** To impart knowledge to the students on the various techniques of plant tissue culture, principles of plant biotechnology and their role in crop improvement
- **Unit I:** Biotechnology – definitions –and importance – biotechnology in India; History of plant tissue culture and plant genetic engineering – terminology used in plant tissue culture; Plant cell and tissue culture – steps in general tissue culture techniques – merits and limitations – applications of plant tissue culture in crop improvement; Different techniques used for sterilization in plant tissue culture, growth room chambers and instruments
- **Unit II:** Types of media – solid and liquid media – advantages and limitations; Preparation and composition of Murashige and Skoog (MS) medium; types of cultures – callus and suspension cultures; Totipotency and morphogenesis – growth and differentiation in cultures – Micropropagation – meristem culture – procedure – various approaches for shoot multiplication, applications – problems – advantages and limitations
- **Unit III:** Somaclonal variation – types – origin – applications – advantages – limitations – achievements: Anther / pollen culture, factors affecting androgenesis; applications of haploids in crop improvement; Embryo culture; ovule culture; ovary culture; Endosperm culture – purpose – procedure – applications; Somatic embryogenesis – stages of somatic embryo development – general procedure factors affecting somatic embryogenesis – applications – limitations
- **Unit IV:** Artificial seed / synthetic seed production – desiccated systems and hydrated systems of synthetic seed production – advantages and limitations; *In vitro* pollination and fertilization – factors affecting *in vitro* pollination – applications; Protoplast culture – methods of protoplast isolation – culture of protoplasts – somatic hybridization – procedure – isolation, culture, fusion of protoplasts, and regeneration of hybrid plants and cybrids – advantages and limitations of somatic hybridization
- **Unit V:** Genetic engineering – definition – general approach for genetic engineering in plants –risks of genetic engineering; Method of cloning DNA in bacteria – steps involved in gene cloning; Restriction enzymes; Vectors for gene transfer– cloning and expression vectors (plasmids and cosmids); Isolation of DNA fragments – applications of blotting techniques – southern, northern and western blotting; Polymerase Chain Reaction (PCR) – procedure and applications; Molecular markers – definition – brief description of different types of DNA based markers – Restriction Fragment Length Polymorphism (RFLP), Amplified Fragment Length Polymorphism (AFLP); Transgenic plants – applications in crop improvement – limitations
- **Practical:**
- Sterlization Techniques
- Preparation of culture medium
- Isolation of single cell / Single cell culture
- Ovule / Ovary culture
- Anther / Pollen culture
- Preparation of explants / culture
- DNA isolation and Electrophoresis

Text Books:

- Biotechnology (Hindi) by S S Purohit and S. Mathur (Daya Publishing House) (ISBN 817754473X)
- Bilgrami, K.S. and Pandey, A.K. 1992. Introduction to Biotechnology. CBS Pub., New

Delhi.

Reference Books:

- Chahal, G.S. and Gosal, S.S. 2002. Principles and Procedures of Plant Breeding – Biotechnological and Conventional Approaches. Narosa Publishing House, New Delhi.
- Chawla, H.S. 2005. Introduction to Plant Biotechnology. Oxford and IBH Publishing Co., New Delhi.
- Gupta, P.K. 1994 Elements of Biotechnology. Rastogi and Co., Educational Publishers, Meerut

B.Sc.(Ag) Hons.

Semester VI

Entrepreneurship Development and Communication Skills 2 (1+1)

Unit I Entrepreneurship Development: Assessing overall business environment in the Indian economy. Overview of Indian social, political and economic systems and their implications for decision making by individual entrepreneurs.

Unit II Globalisation and the emerging business entrepreneurial environment. Concept of entrepreneurship; entrepreneurial and managerial characteristics; managing an enterprise; motivation and entrepreneurship development; importance of planning, monitoring, evaluation and follow up; managing competition; entrepreneurship development programs; SWOT analysis, Generation, incubation and commercialization of ideas and innovations.

Unit III Government schemes and incentives for promotion of entrepreneurship. overnment policy on Small and Medium Enterprises (SMEs) / SSIs. Export and Import Policies relevant to agriculture sector. Venture capital. Contract farming and joint ventures, public-private partnerships. Overview of agri inputs industry. Characteristics of Indian agricultural processing and export industry. Social Responsibility of Business.

Unit IV Communication Skills: Structural and functional grammar; meaning and process of communication, verbal and non-verbal communication; listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures.

Unit V Reading and comprehension of general and technical articles, precis writing, summarizing, abstracting; individual and group presentations, impromptu presentation, public speaking; Group discussion. Organizing seminars and conferences.

Practical:

- Listening and note taking,
- Writing skills,
- Oral presentation skills;
- Field diary and lab record; indexing, footnote and bibliographic procedures.
- Reading and apprehension of general and technical articles,
- Precis writing, summarizing, abstracting; individual and group presentations.

Reference Books

- Akhodri. N.M.P. etl (1989). Trainers Manual on Developing entrepreneurial motivation. NIES Bud. New Delhi.
- ED. Institute of India. (1987). Developing New entrepreneurs. EDII. Ahmedabad. NISIET. libraries . 338.93/EDI.
- Rao. T.V. (11974). Development of an entrepreneur: A behavioural model IIM (A)
- Goyal. D.P. (1994). Management information system (MIS). concept applications. New Delhi. Deep and Deep, New Delhi
- James S A.F and Freeman, R.E. (1994). Management. New Delhi. Prentice Hall of India. Pvt. Ltd.

B.Sc.(Ag) Hons.

Semester VI

Farming Systems and Sustainable Agriculture 2(1+1)

Unit 1.Sustainable agriculture: Introduction, definition, goal and current concepts, factors affecting ecological balance and ameliorative measures;

Unit 2. Land degradation and conservators of natural resources, LEIA & HEIA; Irrigation problems, wastelands and their development;

Unit 3 Organic farming: definition, principles and components;

Unit 4. Farming systems: definition, principles and components,

Unit 5. IFS models for wetland, irrigated dryland and dryland situations.

Practical:

- Preparation of cropping scheme for irrigated situations
- Preparation of cropping scheme for dry land situations
- Study of existing farming systems in nearby villages
- Preparation of integrated farming system model for wetlands
- Preparation of integrated farming system model for dry lands
- 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.

Reference Books

- Balasubramaniyan, P. and Palaniappan, S.P. 2001. *Principles and Practices of Agronomy.*
- Agrobios Publishers, Jodhpur
- Chatterjee, B.N., Maiti, S. and Mandal, B.K. 1989. *Cropping Systems - Theory and*
- *Practice*. Oxford and IBH Publication, New Delhi
- Francis, C.A. 1986. *Multiple Cropping Systems*. Macmillan Publication
- Francis, C.A. 1989. Biological efficiencies in multiple cropping systems. *Advances in*
- *Agronomy*, 42.1-42.
- Gomez, A.A. and Gomez, K.A. 1983. *Multiple Cropping in the Humid Tropics of Asia*.

B.Sc.(Ag) Hons.

Semester VI

Organic Farming 2(1+1)

Objective- Production of quality products by utilizing of organic farm inputs & to minimize cost of production.

Unit 1.
Introduction, concept, relevance in present context;

Unit 2.
Organic production requirements; Biological intensive nutrient management-organic manures, vermicomposting, green manuring, recycling of organic residues,

Unit 3
biofertilizers; Soil improvement and amendments;

Unit 4
Integrated diseases and pest management – use of bio-control agents, bio-pesticides pheromones, trap crops, bird perches;

Unit 5
Weed management; Quality considerations, certification, labeling and accreditation processors, marketing, exports.

Practical:

- Raising of vegetable crops organically through nutrient,
- Diseases and pest management;
- Vermicomposting;
- Vegetable and ornamental nursery raising;
- Macro quality analysis, grading, packaging,
- Post harvest management.

Reference Books

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- Chhonkar, P.K. and Dwivedi, B.S. 2004. Organic farming and its implications on India's food security. *Fertil. News* 49(11): 15-18,21-28,31&38.
- Palaniappan, S.P and Anandurai, K. 1999. *Organic Farming- Theory and Practice*, Scientific Pub., Jodhpur.
- Reddy, M.V. (ed.) 1995. *Soil organism and Litter decomposition in the Tropics*. Oxford & IBH, New Delhi.
- Singh, S.P. (ed.) 1994. *Technology for Production of Natural Enemies*, Project Directorate of Biological Control, Bangalore.
- Veeresh, G.K., Shivashankar, K. and Singlachar, M.A. 1997. *Organic Farming and Sustainable Agriculture,* Association for Promotion of Organic Farming, Bangalore.

B.Sc.(Ag) Hons.

Semester VI

Milk and Milk Processing 3 (2+1)

Objective: The overall objective of this course is to present an overview, discussion and practical skills to students that will model them into professionals that will provide technical expertise in a range of appropriate skills and techniques needed by those who manage dairy in an efficient & effective manner.

Unit I Importance of milk, operation Flood (White revolution), Milk and. its secretion, composition of colostrums and milk of different species like cow, buffalo, sheep and goat. Physical properties of colostrums, cow and buffalo milk. Factors affecting the quantity and quality of milk. Clean milk production.

Unit II. Microorganism of milk and their functions. Agencies engaged in handling and transportation of milk pricing of milk. Common adulterants and preservatives used in milk and their detection.

Unit III. Processing the milk. Filtration, Clarification bactofugation pasteurization ultra high temperature treatment, homogenization, sterilization, cooling and chilling of milk.

Unit IV. Definition, composition and method of manufacture of cream, butter, dahi, khoya, Chhenna, Ice cream, condensed milk, milk powder, cheddar and cottage cheese, common adulterants of Ghee and khoa and their detection, Cleaning and sanitization of dairy equipments.

Unit V. Nutritive value of milk and milk products.

Practical:

- Sampling of milk.
- Determination of specific gravity by lactometer and westphal balance.
- Fat test by Gerber's method total solid and SNF percentage by richmonds scale and formula.
- Determination of acidity of milk.
- Detection of common milk adulterants.5. Demonstration of cream separation.
- Demonstration of preparation of butter, Ghee, Khoa, Chhenna, Ice Cream and dahi.

Text and Reference Books:

- Dairy Science by H.S.Pawar.
- Milk and Milk Processing by H.S.Pawar.
- Milk Product Technology by Amit Kumar.
- Dairy Science by Bhatti and Lawaniya.

B.Sc.(Ag) Hons.

Semester VI

Post Harvest Management and Value Addition of Fruits and Vegetables 2(1+1)

Objective: The objective of this course is to provide applied and practical understanding of Post Harvest Management and Value Addition of Fruits and Vegetables to convert the waste into wealth.

Unit: I. Importance of post harvest technology in horticultural crops. Maturity indices, harvesting and Post harvest handling of fruits and vegetables. Maturity and ripening process. Factorsaffecting ripening of fruits, and vegetables.

Unit II: Factors responsible for detioration of harvested fruits and vegetables. Chemicals used for hastening and delaying ripening of fruits and vegetables. Methods of storage – precooking, prestorage treatments, low temperature storage, controlled atmospheric storage, irradiation and low cost storage structures.

Unit-III. Various methods of packing, packaging materials and transport. Packing technology forexport. Fabrication of types of containers, cushioning material, vacuum packing, and poly shrink packing, specific packing for export of mango, banana, grapes kinnow, sweet orange, and mandarin etc

Unit-IV 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-V 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.
- Methods of prolonging storage life.
- Identification of equipment and machinery used is preservation of fruits and vegetables.
- Preparation of jam, jelly and marmalades.
- 4 Preparation of squash, cordials and syrups.
- Visit to local market yards and cold storage units.
- Visit to local processing units.
- Visit to local market and packing industries.

Reference books:

- Fruits and Vegetable Preservation by R.P.Srivastava. IBH Publication.
- Phal Shabaji Sanrankshan by Dalpat singh Khurdiya. ICAR Publication.
- Fruits and Vegetable Preservation by Dr Girdhari Lal. ICAR Publication.
- Post Harvest Technology of Fruits and Vegetable by Dr Neelam Kashetrapal . IBH Publications.

B.Sc.(Ag) Hons.

Semester VI

Practical Crop Production I (Ravi Crops) 1(0+1)

Objective: To Study about the Field Crops (Kharif) in details on practical.

Practices of raising 8-10 prevailing Rabi crops of the agro-climatic zones will be done by the students. One crop will be grown by a students or group of 2-4 students depending upon the strength of students in the class, on a minimum of 100 m2 area. Following practices will be performed by student(s) for raising the allotted crop to them separately, besides observing the practices performed by other students in their plots for raising the crops.

Practical:

- Crop planning for raising Rabi - crops
- Field preparation and Preparation of nursery beds for crop.
- Seed Treatment, seed inoculation and sowing of crop
- Fertilizer application (Basal, top dressing and foliar spray) in crop.
- Water management (irrigation and drainage) in crop.
- Weed management (cultural/mechanical/chemical) in crop
- Management of insect pests and diseases in crops
- Harvesting, drying, and tying bundles and transport to threshing floor of crop.
- Threshing, winnowing and drying of produce
- Storage and marketing of produce.
- Preparation of balance sheet including cost of cultivation,
- Determination of net monetary returns per student or per group of students and benefit cost ratio.

Semester VII

RAWE (Rural Agricultural Work Experience in All Departments Related to Field Work)

Subject	Credits (Theory+Practical)
Crop Production (Agronomy and Horticulture)	5 (0+5)
Crop Protection (entomology and Plant Pathology	4(0+4)
Rural Economics	3 (0+3)
Extension Program	4 (0+4)
Research Station/KVK/DAATT centre Activities and Attachment to the Agro based Industries	4 (0+4)
Total	20 (0+20)

S.No.	RAWE Model I	Duration (Week)
1	Orientation	1
2	Village attachment	16
3	Research Station / KVK / DAATT Center activities and attachment to the Agro-based industries	2
4	Project report preparation and examination	1

Evaluation of RAWE Programme

Attendance: Minimum attendance for this programmme - 85%.

Records: Students shall complete the record work based on daily field observation notebooks and weekly diaries maintained by them.

Evaluation Procedure: The students shall be evaluated by Course Coordinator as well as by a designated evaluation Committee. The duration of the RAWEP is 20 weeks with a weightage of 20 credits

B.Sc.(Ag) Hons.

Semester VIII

Specialization Based Scheme

Experiential Learning Courses

Course Modules for VIII Semester

Students have to choose any one out of these modules.

S. No.	Name of the Module and name of the papers to be studied in the module
1	**CROP PRODUCTION (20 Credit)** 1. Seed production technology 3(1+2) 2. Remote sensing GIS and land use planning 3(1+2) 3. Integrated farming system 3(1+2) 4. Water management (Micro-irrigation, use of problematic water, and watershed management) 4(1+3) 5 Soil Management (Conservation, Problematic soil, Soil quality) 4(1+3) 6. Crop growth simulation modelling 3(1+2)
2	**CROP PROTECTION (20 Credit)** 1. Integrated pests and disease management (Pest disease scouting) 4(2+2) 2 Management of post harvest insect pests and diseases 3(1+2) 3 Non insect pests and their management 2(1+1) 4 Productive insects 3(1+2) 5 Mushroom cultivation 2(0+2) 6 Bio-control agents and bio-pesticides (Mass production and uses) 3(1+2) 7. Pesticides and plant protection equipment 3(1+2)
3	**HORTICULTURE (20 Credit)** 1. Commercial vegetable Production 3(1+2) 2. Commercial floriculture 3(1+2) 3. Commercial fruit production 3(1+2) 4. Nursery management of horticultural crops 3(1+2) 5. Protected cultivation of horticultural crops 3(1+2) 6. Seed production of vegetables and flowers 2(1+1) 7. Processing and value addition of horticultural crops 3(1+2)
4	**POST HARVEST TECHNOLOGY AND VALUE ADDITION (20 Credit)** 1. Post harvest technology of horticultural crops 3(1+2) 2. Unit operation for quality value addition processing and development of new products 4(1+3) 3. Postharvest technology of spices, plantation crops, medicinal and aromatic crops. 4(1+3) 4. Integrated storage management of fruits, flowers and vegetables 3(1+2) 5. Post harvest handling of cut flowers and dry flowers 3(1+2) 6. Processing and value addition of cereals, pulses and oilseeds 3(1+2)
5	**AGRI-BUSINESS MANAGEMENT (20 Credit)** 1. Information and communication management 3 (1+2) 2. Management of agro based industries 4(1+3) 3. Marketing management 3 (1+2) 4. Financial management of agri business 4(1+3) 5. Natural resource economics and management 3 (1+2) 6. Project formulation, evaluation and monitoring 3 (1+2)

6	**COMMERCIAL AGRICULTURE (20 Credit)** 1. Commercial Floriculture 3(1+2) 2. Commercial fruit production 3(1+2) 3. Nursery management of horticultural crops 4(1+3) 4. Cultivation of commercially important medicinal and aromatic plants 2(1+1) 5. Commercial vermiculture, apiculture & mushroom cultivation 3(1+2) 6. Production technology of economic forest plants 2(1+1) 7. Commercial seed production 3(1+2)
7	**Basic Science (20 Credit)** 1. Molecular Breeding 3(1+2) 2. Plant tissue culture 4(1+3) 3. Recombinent DNA Technology 3(1+2) 4. Bioinformatics 3(1+2) 5. Microbial & Environmental Technology 4(1+3) 6. Molecular Diagnosis 3(1+2)

B.Sc.(Ag) Hons.

VIII SEM MODULE

CROP PRODUCTION
Seed production technology 3 (1+2)

Unit I: Seed quality – concepts, importance and characteristics

Unit II: Seed dormancy –types, methods to break seed dormancy – Genetic and agronomic principles of seed production

Unit III: Seed processing, post harvest processing, seed blending, seed storage – Problems of storage – Seed testing and certification, quality control, seed treatment, hybrid seed production-

Unit IV: Evaluation of seed farm for profitability and sustainability-Formulation of project proposal for availing funds from various agencies-

Unit V: Preparation of project reports for monitoring and evaluation.

Practical

•Seed sampling
• Visit to ware house of State Warehousing Corporation and familiarisation with seed sampling procedures
• Seed testing –different tests followed in a Seed Testing Laboratory• Germination test-different tests followed in different crops
• Seed Moisture test of different crops
• Visit to Seed Testing Laboratory, familiarisation with equipments and hands on experience in seed testing
• Seed treatment against systemic diseases
• Seed treatment – scarification
• Seed coating and pelleting
• Seed treatment with beneficial organisms,
• Seed treatment for convenience in sowing
• Seed treatment for breaking seed dormancy
• Seed production in rice
• Seed production in tuber crops
• Seed production in vegetable crops
• Seed production in ornamental plants
• Seed production in spices
• Seed production in fruit plants
• Seed production in medicinal plants
• Seed production in fodder crops
• Seed production in green manure crops

B.Sc.(Ag) Hons.

Remote sensing GIS and land use planning 3 (1+2)

Unit I: Computers and Database. Managing your computer-data base concepts. Design and management of RDBMS. Geographic Information Systems. Introduction to GIS -GIS technology and applications -Maps, map scales and data resolution –

Unit II: Conceptual models of spatial and non spatial information -Co-ordinate systems and map projections -Global positioning systems and its uses in data collection for GIS -Electromagnetic radiation and its features –

Unit III: Solar radiation and its interaction with earth and earth features-Introduction to aerial photography and satellite remote sensing-Remote sensing satellites-Satellites, sensors, imageries and their interpretations-

Unit IV: Data structure in remote sensing-Data interpretation techniques -Remote sensing And its applications in Agriculture, forestry and in resource planning -Digital cartography Landscape attributes versus soils.

Unit V: Use of digital elevation models (DEM) -Enabling of GIS data Digitization And structuring of map data -Projection systems-Comparison of software applications in GIS -GIS based resource planning in agriculture-GIS in Watershed planning and development .

Practical

- Familiarisation of Maps map scales
- Use of different maps
- Cartography
- Use of GIS software in handling maps
- Use of GPS
- Remote sensing imageries in GIS
- Digital cartography
- Image classification and interpretation
- Geo-referencing and geo-coding of maps
- Providing proper projection systems
- Vectorisation of data
- Storage and retrieval of data
- Quering and data analysis
- Preparation of reports.
- Project work.

B.Sc.(Ag) Hons.

Integrated farming system 3(1+2)

Unit I: Integrated Farming Systems -goals, components and advantages – Integration of components – livestock, poultry, apiculture, aquaculture, sericulture mashroom culture, etc.

Unit II: Contribution of components in IFS – economic contribution, resource recycling and employment generation Regional adaptation of various farming systems in India and MP –

Unit III: Crops and animal waste utilization – modern techniques – Biogas plant-installation, working and maintenance –

Unit IV: Model IFS in wet lands, uplands and in agro forestry systems-Evaluation of IFS-Evaluation of farms for profitability and sustainability.

Unit V: Environmental impact analysis of IFS-Farm plan models for IFS.

Practical

- Survey of homesteads and identification of various IFS in practice
- Indices to measure efficiency of cropping systems -land use efficiency, biological potential and economic efficiency
- Economic analysis of various farming systems–rice-fish, riceprawn, agroforestry, livestock, apiculture, farming systems, homesteads based farming system involving
- various components-cattle, poultry, etc
- Computation of man power required for various farming systems.
- Visit to livestock farm and study of various practices
- Visit to poultry units and study of various practices
- Visit to goat farm and study of various practices
- Visit to nursery for first hand experience in nursery
- Visit to vermicomposting unit and Vermicompost preparation
- Visit to mushroom raising unit
- Visit to various nursery units
- Bio gas plant installation, working and maintenance
- Visit to successful farmers fields involving integrated farming systems – case studies
- Visit to small scale Agribusiness units

B.Sc.(Ag) Hons.

Water Management
(Micro-irrigation, use of problematic water, and watershed management) 4 (3+1)

Unit I: Importance of irrigation –Methods of irrigation –surface, subsurface and overhead irrigation-Micro Irrigation methods – Sprinkler and drip irrigation-localized irrigation-

Unit II: Irrigation management in Different soil types. Water conveyance structures-Irrigation of principal crops –

Unit III: Water logging and Drainage -quality of irrigation water-Watershed – Concepts, approaches, objectives, delineation, resource appraisal –Planning watershed development –

Unit IV: Watershed development plan – PLA techniques – Implementation of watershed development programmes-soil and water conservation Terracing-

Unit V: Water harvesting and recycling-Ground water recharge-Roof water harvesting

Practical

- Lay out and Field demonstration of surface, and subsurface methods of irrigation
- Overhead irrigation systems, Field demonstration unit of sprinkler irrigation system, installation, operation and maintenance
- Drip irrigation unit with filters, pumps and drippers,
- Lay out of drip irrigation system in other important crops
- Water management for establishing lawn using sprinkler, rain gun etc
- Demonstration of mini and micro sprinkler, mist, foggers, bubblers etc
- Water conveyance structures, Measurement of irrigation water
- Watershed – Delineation of watersheds
- Soil survey -Land capability classification
- Soil and water conservation measures
- Water harvesting structures-demonstration of construction of ferrocement tanks
- Preparation of watershed development plan
- Field study of ongoing schemes and evaluation of watershed scheme

B.Sc.(Ag) Hons.

Soil Management (Conservation, Problematic soil, Soil quality) 4(1+3)

Unit I: Soil loss-soil and water conservation – methods of soil conservation – Agronomic and Engineering.

Unit II: Soil wetness-anaerobiosis – desertification – management and alternative use. Chemical degradation – Soil acidity-liming materials. Acid sulphate soils-genesis – classification-problems associated with crop management in such soils.

Unit III: Salt affected soils-classification , mine soils, causes , problems and management for agriculture and alternate uses..

Unit IV: Quality of irrigation water and its effect on soil. Diagnostic symptoms – deficiency and toxicity of common crops.

Unit V: Soils of the MP state- problems and management Laterites and associated soils- problems and management.

Practical

• Field visit to selected locations – identification of different types soil and water loss
• Estimation of loss for conservation studies by Multislot device
• Soil conservation – erection of vegetative barriers types – scope and limitations
• Conservation measures – agronomic measures for different slope/ crops
• Soil conservation –Engineering measures –construction of terraces and stone walls
• Field visit to locations where both agronomic and engineering measures taken for soil
• conservations
• Field visit to Satna area and study of soil profile and collection of surface and subsurface soil samples and *in situ* observation on soil parameters
• Particle size analysis of the soil sample collected and estimation of pH, EC, Available N, P and K and rating of soils in the soil fertility classes and recommendation of fertilizers for different crops
• Estimation of Ca, Mg and S
• Extraction and estimation of micronutrients and heavy metals and rating of the fertility
• Collection of surface and sub surface soil for Project Work from a near by area
• Project Work – Laying out observational trial for raising field crops based on the soil fertility classes

B.Sc.(Ag) Hons.

Crop growth simulation modeling 3 (1+2)

Unit I: Concept of plant growth and development – Principles of crop production – Impact of natural and induced variability of crop production -Agroclimatic analysis of crop production - Principles in crop forecasting and Crop modelling –

Unit II: Evaluation of crop response and weather elements – Climate change and impacts in agriculture sector – Empirical and statistical crop weather models – Multiple regression analysis – Stepwise regression technique – Time series analysis Incorporating weather, soil, plant and other environmental related parameters and Remote sensing inputs –

Unit III: Water balance models – Agrometeorological crop monitoring using FAO model – Versatile soil moisture budget – Soil water balance model – SPAW model – Crop modelling and its applications – Minimum dataset – Genetic coefficients –

Unit IV: Agrometeorological indices and phasic development – Nitrogen uptake and Nitrogen balance CERES models of barley, millet, sorghum, wheat and rice -ORYZA rice model - CROPGRO models of drybean, peanut and soybean –

Unit V: CROPCAST model for maize, soybean and WTGROW and its application –Forecasting of pests and diseases and other natural hazards

Practical

- Deriving the prediction equations for different crops with the use of empirical and statistical methods
- Crop weather analysis models and crop simulation models
- Forecasting of frost, pests and diseases
- Hands on experience on CERES models of barley, millet, sorghum, wheat and rice
- Hands on experience on CERES models of barley, millet, sorghum, wheat and rice
- Hands on experience on CERES models of barley, millet, sorghum, wheat and rice
- Hands on experience on CERES models of barley, millet, sorghum, wheat and rice
- Hands on experience on ORYZA rice model
- Hands on experience on ORYZA rice model
- Hands on experience on ORYZA rice model
- Hands on experience on ORYZA rice model
- Hands on experience on CROPGRO models of peanut and soybean
- Hands on experience on CROPGRO models of peanut and soybean
- Hands on experience on CROPGRO models of peanut and soybean
- Hands on experience on CROPCAST model for maize and soybean
- Hands on experience on CROPCAST model for maize and soybean
- Hands on experience on WTGROW model for wheat.
- Hands on experience on WTGROW model for wheat

B.Sc.(Ag) Hons.

VIII SEM MODULE
CROP PROTECTION
Integrated pests and disease management (Pest disease scouting) 4(2+2)

Unit I: Pest status and pest concept. Types of pests. Population and damage levels, loss assessment. Biodiversity- concept and importance.

Unit II: Concept of agro-ecosystem in pest management – community, ecosystem and agro-ecosystem. Principles of agro-ecosystem based pest management.

Unit III: IPM for major pests of crops. Concept of plant disease - definition – classification of plant diseases – types of diseases based on symptom – general study of diseases with symptomatology, etiology, epiphytology, physiology of parasitism & pathogen.

Unit IV: Physiology of Damping off and seedling blight of root and fruit diseases, blight, spot, anthracnose, downy mildew, powdery mildew, rust, smut, bunt diseases. The leaf curl, mosaic, yellows, galls, witches broom, scab, post harvest diseases.

Unit V: Management of plant diseases through chemical, cultural, biological and other means.

Practical

- Agro ecosystem analysis.
- Recording of data on weather parameters.
- Factors contributing to yield and yield attributes
- Finalizing and adoption of the pest management strategies in major crops.
- Study of the different types of symptoms of diseases– host parasite relationships and their management.

B.Sc.(Ag) Hons.

Management of post harvest insect pests and diseases 3(1+2)

Objective- The knowledge of insects and diseases of storage grain , fruits and vegetables and how post harvest losses can be minimized.

Unit I: Causes of storage losses - losses caused by storage pests. Studies on the pests of stored products – biology, nature of damage, management- prophylactic, curative methods.

Unit II: Methods of domestic and commercial management of insect infestation on stored commodities. Storage structures- underground and above ground structures- rural, improved and modern.

Unit III: Post harvest management of field crop pests- fruit flies, stone weevil etc. Post harvest diseases of important vegetable crops – brinjal, bhindi, tomato, carrot, cucurbits, chillies, beans – soft rot, dry rot.

Unit IV: Spices – changes induced by bacterial and fungal pathogens under storage conditions. Post harvest diseases of banana, mango, papaya, apple, grapes, guava, sapota, etc.

Unit V: Types of storage of post harvest agricultural products and their management. Seed born diseases of crop plants, identification and management of seed born diseases. Loss of nutrients due to post harvest diseases.

Practical

- Types of damage caused by pests of stored products.
- Identification of pests of stored products.
- Types of storage structures.
- Different methods of pest management.
- Visit to FCI Godown
- Biotic and abiotic factors responsible for deterioration of fruits, vegetables and seeds.
- Nature of damage. Collection and identification of pathogens associated with various vegetables, seeds and fruits – from different storage conditions
- Isolation of pathogens – isolation of seed born pathogens – identification
- Techniques of storage
- Control of storage pathogens

B.Sc.(Ag) Hons.

Non insect pests and their management 2(1+1)

Objective- There are some non – insects like birds, rodents, animals etc also damage crops. Therefore, students should familiar with them .

Unit I: General characters of important non insect pest species. Plant parasitic nematodes- field identification and management.

Unit II: Phytophagous mites - important species, nature and symptoms of damage on crops.Management of important mite pests of crops.

Unit III: Snails and slugs. - biology, habits, economic importance and management.

Unit IV: Rodents- biology, habits, economic importance and management. Rodent control campaign. Birds and other vertebrate pests - nature of damage, management.

Unit V: Rodenticides, acaricides and molluscicides - formulations and applications.

Practical

- Identification of important plant parasitic nematodes.
- Identification of important mite species- symptoms of damage.
- Identification of important rodent species.
- Aquaintance with burrow patterns.
- Field practice of recommended rodent management techniques.
- Identification of snails, slugs,
- Birds and other vertebrate pests and the symptoms of damage caused by them.
- Field practice of management measures.
- Formulations and application of acaricides and rodenticides.
- Preparation of poison baits

B.Sc.(Ag) Hons.

Productive insects 3(1+2)

Unit I: Bee keeping – history and development. Honey bees-kinds of bees, anatomy, biology-Hiving and domestication. Seasonal management of bees. Bee pasturage.

Unit II: Bee products- extraction, uses, composition and preservation. Diseases and enemies of honey bees and their control. Bee poisoning . Scope of apiculture in Madhya Pradesh. Recent advances in apiculture research.

Unit III: Sericulture – history and development. Types of silkworms in India – morphology, biology, rearing of silkworms. Host plants and their cultivation. Diseases and enemies of silkworm and their control. Use of biotechnology in sericulture. Scope of sericulture in M.P. Recent advances in sericulture research.

Unit IV: Lac culture –behaviour and development of lac insects. Different strains and their host plants. Inoculation, harvesting and processing of lac.

Unit V: Lac and its uses. Enemies of lac insect and their control. Scope for cultivating lac in M.P. Recent advances in lac culture research.

Practical

- Different types of bees and bee equipment.
- Handling of bee colonies.
- Diseases and enemies of bees.
- Extraction and processing of honey.
- Visit to apiaries.
- Study and identification of silkworms.
- Rearing of mulberry s.

B.Sc.(Ag) Hons.

Mushroom cultivation (0+2)

Unit I: Importance of mushroom cultivation – definition of mushroom - its importance – present scenario of mushroom cultivation – general morphological features, taxonomy and identification of different mushrooms-poisonous, hallucinogenic and medicinal mushrooms.

Unit II: Pure culture of mushrooms and their nutritional requirements. Definition of spawn, substrate for spawn, types of spawn, methods of spawn production, characteristic of a good spawn, storage of spawn.

Unit III: Cultivation of *Agaricus* species – composting – its formulation, casing, preparation of casing mixture, sterilization, cultivation of *Pleurotus, Volvariella, Lentinus, Calocybe and Auricularia.*

Unit IV: Different types of substrates, substrate preparation and sterilization, Spawning, methods of spawning, spawn run phase, cropping. Identification and management of different pests and diseases of mushrooms.

Unit V: Methods of harvesting mushrooms, post harvest treatments and preservation of mushrooms. Packing and processing – Different methods of processing, canning and dehydration. Nutritive value of mushrooms and preparation of different recipes.

Practical

- Techniques used in Agaricology.
- Identification of edible and poisonous mushroom.
- Preparation of spore print and preparation of spore culture.
- Isolation of different mushrooms in pure culture.
- Preparation of spawn.
- Preparation of substrates and cultivation of mushroom.
- Harvesting, processing and packing for marketing.
- Preparation of different recipes.

B.Sc.(Ag) Hons.

Bio-control agents and bio-pesticides (Mass production and uses) 3(1+2)

Objective- To know the bio control agents of pests and disease management and also to minimize environmental pollution due to chemical pesticides.

Unit I: Biological balance – attributes of successful pathogen and parasites- concepts and components of biocontrol of plant pathogens. Organic amendments and botanicals for plant disease management. Myco herbicides and their role in weed management.

Unit II: Isolation, identification, purification and pure culturing of recognized biocontrol organisms with commercial potential for crop disease management and growth promotion – *Pseudomonas spp*., *Bacillus spp*., *Trichoderma spp.* and Actinomycetes.

Unit III: Pilot scale mass production in laboratory . Nutritional requirement and designing of media for commercial production of biocontrol agents. Carrier materials and their importance in maintaining the shelf life of wettable powder formulations. Different types of biocontrol formulation and their efficacy under field level.

Unit IV: Legislature Acts in the production and marketing of biocontrol agents and biopesticides. Mass production – pilot and commercial scale production of microbial insecticides – *Beauveria spp*., *Metarhizium,spp*, *Fusarium pallidoroseum.* Designing of media for fermentation of biocontrol agents – different types of fermentors and fermentation process– solid, semi solid and liquid fermentation – optimization of fermentation process.

Unit V: Processing, formulation and quality testing of biocontrol agents. Different methods of application of various biocontrol agents in different cropping systems and soil condition. Mass production and field evaluation of parasitoid (*Trichogramma spp*) and predator (*Chrysoperta carnea*).

Practical

- Isolation of antagonists from phyllosphere, rhizosphere, spermosphere
- In vitro and in vivo evaluation for biocontrol potential.
- Isolation, purification, pure culture and multiplication of biocontrol agents, *Pseudomonas spp., Bacillus spp., Trichoderma spp.Actinomycetes, Beauveria spp., Metarhiziumsp, Fusarium pallidoroseum.*
- Laboratory multiplication of *Trichogramma spp*. and *Chrysoperla carnea*.
- In vitro efficiency testing, mass production and product formulation in laboratory.
- Working of different types of commercial fermenters.
- Liquid and solid fermentation for commercial production, processing and formulation and packing of biocontrol agent.
- Quality evaluation of products.
- Field application of biocontrol agents in different cropping systems against different diseases and pests.
- Use of various organic amendments in the management of plant diseases.

B.Sc.(Ag) Hons.

Pesticides and plant protection equipment 3(1+2)

Unit I: History, principles and scope of insect toxicology – Classification and chemistry of pesticides. Mode of action and metabolism of major insecticides and new molecules. Factors affecting toxicity of insecticides. Insecticidal pollution – pathways of environmental contamination. Pesticide resistance.

Unit II: Bio-accumulation and susceptibility of biological materials to insecticides. Insecticidal poisoning – symptoms and treatment. Residue problems caused by insecticides – methods of estimation of residues – management of residue.

Unit III: Plant protection equipments- classification and working principles. Parts of plant protection equipment. Importance of fungicides in plant disease management – familiarization with common terminologies – groups and classification of fungicides – fungicides formulation – spray adjuvant/ auxiliary spray materials.

Unit IV: Methods of preparation of Bordeaux mixture – Bordeaux paste, Chestnut compound etc. Methods of application of fungicides – foliar spray, dust – pouring, soil drenching, and fumigation – seed dressing etc. Dosage calculation of fungicides – application equipment-

Unit V: Rules and registration of fungicides. Phytotoxicity and compatibility of fungicides – safe use of fungicides, hazards. Bioassay of fungicides- assay of fungicide resistance.

Practical

- Biological evaluation of toxicity of pesticides.
- Studies on the effect on target and non-target organisms.
- Methods of residue analysis from plant and environmental samples.
- Plant protection equipments- parts and working.
- Study on the different symptoms of plant diseases.
- Familiarization with common fungicides.
- Preparation of Bordeaux mixture – Bordeaux paste, Chestnut compound Storage
- Application of fungicides – application of seed dosage calculation
- Study of Plant Protection equipments.
- Bioassay of fungicide- Assay on the residue of fungicide.

B.Sc.(Ag) Hons.

VIII SEM MODULE

Horticulture
Commercial vegetable production 3(1+2)

UNIT I: Definitions of vegetables, Economic, nutritive and aesthetic value of vegetables, Methods of classification

UNIT II: Types of vegetable growing and vegetable forcing structures.

UNIT III: Role of macro and micronutrients, growth regulators in vegetable production.

UNIT IV: Plant protection – identification and control of important pest and disease problems of vegetables.

UNIT V: Vegetable seed production –General principles. Post harvest handling, grading and marketing of vegetables.

Practical

1. Familiarisation of characters of different varieties of vegetable crops
2. Seed and soil treatments- chemical treatments
3. Soil sterilisation
4. Preparation of nursery bed, sowing and aftercare of transplanted vegetables.
5. Preparation of calendar of operations
6. Calculation of fertilizer requirement, application by different methods
7. Top dressing of fertilizers and earthing up operation.
8. Preparation of growth regulator solutions and application
9. Preparation and application of pesticides/ fungicides/ botanicals
10. Inter cultural operations- training and pruning, staking.
11. Maturity indices and harvesting of vegetables for vegetable purpose
12. Seed extraction methods in tomato
13. Economics of vegetable cultivation

B.Sc.(Ag) Hons.

Commercial floriculture 3(1+2)

UNIT I: Status and prospects of commercial cultivation of flowers. Varieties, planting systems, spacing, manuring, irrigiation, pruning, mulching, plant protection, harvesting, postharvest handling and marketing of major traditional and cut flowers - jasmine, marigold, gomphrena, tuberose, gladiolous, etc.

UNIT II: Protected cultivation of rose, gerbera, chrysanthemum etc.- general concepts and practices. Commercial cultivation of orchids. Status and prospects of Madhya Pradesh.

UNIT III: Classification and varieties, planting material production, methods of planting, media components and management, shade regulation, irrigation, nutrition,

UNIT IV: Plant protection, stage and method of harvest, postharvest handling and marketing. Economics of cultivation.

UNIT V: Pot plant and cut foliage production - species and varieties, propagation, media, shade and water requirement, nutrition, pruning, plant protection, harvesting, postharvest handling and marketing.

Practical

1. Selection of varieties, cultural practices and propagation and post harvest handling techniques in rose.
2. Selection of varieties, cultural practices and propagation and post harvest handling techniques in gladiolus.
3. Selection of varieties, cultural practices and propagation and post harvest handling techniques in gerbera.
4. Selection of varieties, cultural practices and propagation and post harvest handling techniques in marigold.
5 Seed production in annual flower crops
6. Harvesting and post harvest handling techniques in important cut foliage.
7. Integrated pest and disease management practices in cut flowers and foliage.
8. Value addition in cut flowers and loose flowers, hands on training in preparation of garlands, bouquet, flower arrangements etc.
9. Production techniques of dry flowers
10. Preparation of projects for starting a commercial unit of cut flowers and Foliage

B.Sc.(Ag) Hons.

Commercial fruit production 3(1+2)

THEORY:

UNIT I: Importance and scope of commercial fruit production– Global scenario of fruit production and export - Present status of fruit production in the state and in the country – problems and prospects.

UNIT II: Ecophysiological requirements. Propagation and production of elite planting materials. Root stock– scion relationship. Planting systems and cropping systems.

UNIT III: Crop management practices –selection and preparation of planting materials, field preparation and planting, manuring, irrigation, weed management, use of bio-regulators,

UNIT IV: organic farming practices, intercropping, pest and disease control, root zone and canopy management, other cultural operations. Physiological and nutritional disorders-causes and remedies. Cultural practices for quality improvement.

UNIT V: Maturity indices, harvesting, grading, packing, storage and ripening techniques. Industrial and export potential. Crops–Banana, mango, pineapple and papaya

Practical

1. Different planting systems and layout
2. Propagation methods - sexual propagation
3. viability test
4. Layering - different methods
5. Propagation structures - mist chamber, green house, hot beds etc.
6. Growth regulators - preparation and application of important bioregulators
7. Banana - Selection of suckers - sucker treatments
8. Manuring practices, fertigation
9. Irrigation - conventional and recent practices including drip irrigation.
10. Maturity indices, harvesting, grading and packing.

B.Sc.(Ag) Hons.

Nursery management of horticultural crops 3(1+2)

THEORY:

UNIT I: Importance of plant propagation. Sexual and asexual methods– advantages and disadvantages. Propagation through seeds – seed formation, maturation, dormancy, treatments for breaking dormancy, germination, viability.

UNIT II: Vegetative propagation – cuttings, layering, budding and grafting – different methods. Other plant parts used for propagation – bulbs, tubers, runners, stolons etc.

UNIT III: Factors affecting rooting – physiological, anatomical, external factors. Root stock production, use of rootstocks for imparting high yield. Rootstock-scion relations.

UNIT IV: Use of growth regulators in plant propagation. Plant growing structures for propagation – design, construction and maintenance. Care and handling of nursery plants. Rapid production of uniform and good quality planting materials. Plant protection in nurseries – control of pests and diseases.

UNIT V: Types of nurseries, Factors to be considered in the establishment of commercial nurseries. Importance of polythene in the nursery. Packing, storage and transport of nursery plants. Hardening of the nursery plants.

Practical

1. Practice in propagation of plants through seeds
2. Familiarization with media, implements and containers for plant propagation
3. Studies on seed testing, certification and storage
4. Use of growth regulators for plant propagation
5. Identification of common pests and diseases in nursery plants and their control
6. Visit to different types of nurseries
7. Selection of site-factors to be commercial in establishment
8. Familiarization with components of nurseries handling-display and sales of plants

B.Sc.(Ag) Hons.

Protected cultivation of horticultural crops 3(1+2)

THEORY:

UNIT I: Introduction – scope and importance – problems andprospects of protected culture in India

UNIT II: Growing structures – green house– polyhouse – net house – basic considerations in establishment and operation of green houses – maintenance – advantages of growing plants in a green house –functioning and maintenance.

UNIT III: Manipulation of environmental factors – environmental control systems in green house – containers – substrate culture – soil decontamination – water management– nutrient management.

UNIT IV: Crop regulation – special horticultural practices –harvesting methods –

UNIT V: postharvest handling – standards – grading – packing and marketing.

Practical

1. Study of structures utilized for protected culture.
2. Cost estimation of different growing structures.
3. Design and orientation of poly/green houses.
4. Study of various inputs utilized for protected culture.
5. Type of containers used in protected culture.
6. Use of substrate and preparation of substrate for protected floriculture.
7. Fertigation system in green house.
8. Maintenance of cooling and heating system in green houses.

B.Sc.(Ag) Hons.

Seed production of vegetables and flowers 2(1+1)

THEORY:

UNIT I: Scope and importance of seed production in vegetable and flower crops- seed demand and production- importance of quality seeds.

UNIT II: Classification of vegetables based on mode of pollination, pollinating agents- response to day length and other environmental factors on vegetables. Types of seeds- field standards, crop standards and seed standards for breeders, foundation and certified seeds, labeling of seeds etc.

UNIT III: Seed production techniques in tropical vegetables (tomato, chillies, bhindi, potato, cowpea, garden beans, cluster bean, pumpkin, bitter gourd, bottle gourd, cucumbers, etc.), important temperate vegetables (cabbage, cauliflower, carrot, peas etc.) and flowers (marigold, chrysanthemum, petunia, etc.)

UNIT IV: Economics of seed production in vegetable and ornamental plants, Harvesting indices-post harvest seed management techniques seed extraction-seed processing drying-cleaning-upgrading-seed treatment- packaging-storage and seed health management marketing etc.

UNIT V: Environmental factors affecting seed viability and longevity. Dormancy of seed, role of growth regulators in restoring seed viability, physical agents for increased seed germination, seed vigour etc. Seed legislation and seed law enforcement.

Practical

1. Identification of seeds of summer vegetables
2. Identification of seeds of cool season vegetables
3. Methods to improve seed storability
4. Seed extraction techniques
5. Estimation of economics of seed production
6. Germination of vegetable and flower seeds in different media
7. Field standards and certification in vegetables
8. Seed processing
9. Seed testing

B.Sc.(Ag) Hons.

Processing and value addition of horticultural crops 3(1+2)

THEORY:

UNIT I: Postharvest loss assessment of fruits and vegetables in marketing as a surveying and documentation, familiarization of harvesting indices of fruits and vegetables and harvesting devices.

UNIT II: Measurement of post harvest respiration rate under various situations, exposure to various storage structures in fruits and vegetables- cold storage, evaporative cool chamber and traditional field storage structures.

UNIT III: Packaging of various fruits and vegetables in different materials,

UNIT IV: spray drying of fruit juice powders, freeze drying of fruit and vegetable products,

UNIT V: fruit juice concentrates other products from fruits and vegetables like jam, candy, preserve jelly etc.

Practical

1. Familiarization of postharvest indices in various fruits and vegetables and record the observations
2. Familiarization on the various harvesting devices employed in fruits and vegetables
3. Exposure to various packaging materials in fruits and vegetables.
4. Exposure to various storage structures for the storage of horticultural crops.
5. Spray drying of fruit juice powders.
6. Freeze drying studies in fruit & vegetables
7. Vacuum drying of fruit and vegetables
8. Fermentation of fruit juices
9. Drying of ginger and turmeric
10. Wet processing

B.Sc.(Ag) Hons.

VIII SEM MODULE

POST HARVEST TECHNOLOGY AND VALUE ADDITION

POST HARVEST TECHNOLOGY OF HORTICULTURAL CROPS 3 (1+2)

Unit I: Importance of post-harvest technology in horticultural crops. Postharvest loss assessment of fruits and vegetables in marketing as a surveying and documentation,

Unit II: familiarization of harvesting indices of fruits and vegetables and harvesting devices, measurement of post harvest respiration rate under various situations,

Unit III: exposure to various storage structures in fruits and vegetables- cold storage, evaporative cool chamber and traditional field storage structures, packaging of various fruits and vegetables in different materials, spray drying of fruit juice powders,

Unit IV: freeze drying of fruit and vegetable products, fruit juice concentrates other products from fruits and vegetables like jam, candy, preserve jelly etc.

Unit V: Dry processing and wet processing processing and dehydration of pepper, ginger, turmeric, preparation of green pepper, preparation of spice oil and oleoresins.

Practical

1. Practice in judging the maturity of various horticultural produce, determination of physiological loss in weight and quality.
2. Grading of horticultural produce, post-harvest treatment of horticultural crops, physical and chemical methods.
3. Packaging studies in fruits, vegetables, plantation crops and cut flowers by using different packaging materials, methods of storage, post-harvest disorders in horticultural produce
4. Identification of storage pests and diseased in spices.
5. Visit to markets, packaging houses and cold storage units.
6. Identification of types of containers and cushioning materials.
7. Survey and collection of data on post harvest losses in fruits and vegetables
8. Documentation of data under various post harvest operations
9.Familiarization of postharvest indices in various fruits and vegetables and record the observations
10. Familiarization on the various harvesting devices employed in fruits and vegetables
11. Exposure to various packaging materials in fruits and vegetables.
12. Visit to a packaging unit
13. Packaging – storage studies in selected fruits and vegetables.
14. Exposure to various storage structures for the storage of horticultural crops.
15. Spray drying of fruit juice powders.
16. Freeze drying studies in fruit & vegetables
17.Vacuum drying of fruit and vegetables
18. Fermentation of fruit juices
19. Drying of pepper
20. Drying of ginger and turmeric

Suggested Reading

Spices. E.V.Nybe, M.Miniraj and K.V. Peter. New India Publishing Company, NewDelhi.
Major Spices of India – crop management and Postharvest technology – J.S. Pruthi ICAR NewDelhi
Minor spices and condimens – Crop management and postharvest technology – J.S. Prithi, ICAR NewDelhi.
Preservation of fruits and vegetables. Giridhari Lal, G.S. Siddappa and G.L. Tandon ICAR, NewDelhi.
Fruit and vegetable preservation – principles and practices by R.P. Srivastava and Sanjeevkumar. International Book Distributing Co, Lucknow.

Unit operation for quality value addition processing and development of new products 4 (1+3)

Unit I: Unit operations involved in the post harvest management of quality fruits and vegetables-harvesting operations, equipments used for harvesting, washing, sorting and grading.

Unit II: Exposure to pasteurization, unit operation involved in canning, aseptic packaging of fruit and vegetable products, familiarization with various pasteurizers, plate heat exchanger and their operation in food processing

Unit III: Evaporation, familiarization with various evaporators, introduction to cannery equipment and layout. Unit operations involved in the manufacture of instant coffee powder, instant tea powder and instant fruit milk powders.

Unit IV: Freeze drying and preparation of freeze dried products. Role of osmotic dehydration, preparation of osmotically dehydrated pineapple slices, aonla.

Unit V: Exposure to packaging materials, packaging machine and their operations related to horticultural products, layout of processing unit, laws and regulations in establishing processing units.

Practical

Familiarization with various post harvest operations.

1. Familiarization with cannery equipments and trial runs for canning various horticultural products.
2. Familiarization with spray driers and trials for spray drying instant coffee, tea and cocoa powders.
3. Spray drying equipments for instant fruit milk shake powders.
4. Packaging and storage studies in dried products.
5. Exposure to various packaging machines and their functions.
6. Familiarization with quality testing equipments in food products including package testing instruments.
7. Evaporation concentration in fruit and vegetable juices

Suggested Readings

Preservation of fruits and vegetables. Giridhari Lal, G.S. Siddappa and G.L. Tandon ICAR, NewDelhi. Fruit and vegetable preservation – principles and practices by R.P. Srivastava and Sanjeevkumar. International Book Distributing Co, Lucknow. Principles of Agricultural Engineering Vol. II. Jain Brothers NewDelhi.

B.Sc.(Ag) Hons.

POST HARVEST TECHNOLOGY OF SPICES, PLANTATION, MEDICINAL AND AROMATIC CROPS 4 (1+3)

Unit I: Commercial uses of spices, processing of major spices, different methods of drying, examining the influence of temperature and time combination on active principles, extraction and analysis of active principles using HPLC technology,

Unit I: Essential oil extraction, various distillation techniques, exposure to super critical fluid extraction. Identification of different odour factors with GLC / GC – MS in essential oil in spices and aromatic plants.

Unit III: Commercial uses of spices, processing of major spices, different methods of drying, examining the influence of temperature and time combination on active principles, extraction and analysis of active principles using HPLC technology, essential oil extraction, various distillation techniques, exposure to super critical fluid extraction.

Unit IV: Identification of different odour factors with GLC / GC – MS in essential oil in spices and aromatic plants. Exposure to various grinding in spices powders, preparation of gravy mix and exposure to retort able pouch processing of gravy mixes.

Unit V: Processing of Turmeric – Harvesting – wet and dry methods processing, washing curing, drying, grinding, grading, and packaging. Exposure to important medicinal plants and their processing, drying, extraction, and packaging of these products.

Practical

1. Extraction of secondary metabolites,
2. Project preparation for commercially important medicinal crops,
3. Extraction of Essential oils
4. Project preparation for commercially important Aromatic crops,
5. Quality analysis and value addition of aromatic crops.
6. Phytochemical extraction techniques.
7. Processing and value addition in herbal products.
8. Exposure to various grinding in spices powders, preparation of gravy mix and exposure to retort able pouch processing of gravy mixes.

Suggested Readings

•Atal CK & Kanpur BM 1982. Cultivation and Utilization of Aromatic Plants. RRL, CSIR, Jammu.

• Atal CK & Kanpur BM. 1982. Cultivation and Utilization of Medicinal Plants RRL, CSIR, Jammu.

• Farooqu AA, Khan MM & Vasundhara M. 2001. Production Technology of Medicinal and Aromatic Crops. Natural Remedies Pvt. Ltd.

• Hota D. 2007. Bio Active Medicinal Plants. Gene Tech Books.

• Jain SK. 2000. Medicinal Plants. National Book Trust.

INTEGRATED STORAGE MANAGEMENT OF FRUITS AND VEGETABLES 3 (1+2)

Unit I: Postharvest management for quality produce . - Pre-storage treatments for quality retention using chemicals, application of skin coatings in fruits and vegetables,

Unit II: Applicationof irradiation to extend the shelf life, pre-cooling, forced air cooling, water cooling and vacuum cooling,

Unit III: Low temperature storage, modified atmosphere storage, modified atmosphere packaging, hypobaric storage, storage requirements evaporative cool chambers, storage disorders,

Unit IV: Package house operations, different types of packaging in fruit, vegetable and cut flowers.

Unit V: Pre-treatments to extend vase life of cut flowers. Application of freeze drying in cut flowers and its storage stability, extraction of concrete and absolute from flowers, extraction of natural colours from flowers.

Practical

1. Determination of stage of maturity of fruits and vegetables.
2. estimation of sugar in fruits and vegetables ,
3. Treatment of fruits and vegetables for longer shelf life by chemical and physical methods
4. Identification of instruments and equipments.
5. Study of chemicals and preservatives used in the preservation laboratory, preparation of Juice, squash, cordials and pulp concentrate.
6. Preparation of Jam, Jelly and marmalade.
7. Sun drying and dehydration of fruits and vegetables.
8. Visit to cold storage units in the state.
9. Low temperature and zero energy cool chamber storing of fruits and vegetables.

Suggested Readings

1. Fruit and Vegetable Preservation, Principles and practices - R.P. Srivastava and S. Kumar.

2. Fruit and Vegetable preservation – G. Lal and Siddhapa.

3. Commercial fruits and vegetables products - W.V. Cruess.

4. Post harvest technology of Horticulture Crops - (Ed.) K.V. Peter

POST HARVEST HANDLING OF CUT AND DRY FLOWERS 3 (1+2)

Unit I: Factors affecting post harvest quality and vase life of cut flowers and foliage. Stage method and time of harvest. Postharvest handling - pre-cooling, pulsing, grading, bunching, packing and storage of important cut flowers.

Unit II: Types of packaging materials – methods of packaging for short term and long term transport and transit. Use of bud opening and holding solutions. Quality deterioration in the storage environment – sanitary procedures to be followed. Internal and global demand and consumption

Unit III: trends of cut flowers - standards – marketing systems in India and abroad – role of intermediaries – problems and prospects in production for export.

Unit IV: Postharvest handling of cut foliage. Value addition in flowers - garlands, bouquet, flower arrangements. Extraction of oil and pigment, use in aromatherapy.

Unit V: Preparation of dry flowers, dry flower arrangements and marketing of dry flowers. Storage and care of dried products.

Practical

1. Practice in harvesting and post harvest handling operations of different cut flowers (rose, chrysanthemum, carnation, gladiolus etc.).
2. Precooling, and pulsing - preparation of pulsing solutions and studying their effect on extension of post harvest longevity of cut flowers.
3. Grading of important cut flowers.
4. Packing and storage of cut flowers.
5. Study of different methods of transport.
6. Practice in post harvest handling operations of different cut foliage.
7. Study of different channels of marketing of cut flowers and foliage.
8. Sanitary and quarantine measures for export.
9. Value addition, practice in preparation of garlands.
10. Practice in preparation of bouquet.
11. Flower arrangement.
12. Practice in post harvest handling of cut foliage.
13. Dry flowers and plants - practicing different methods of drying.
14. Bleaching and dyeing, skeletonizing leaves, storage of dry flowers, arrangements, bouquets, wall hangings, greeting cards, pot pourri and other floral crafts.
14. Visit to commercial production units and post harvest handling units of cut flowers.
15.Visit to flower markets and auction centres.

Suggested Readings

Bhattacharjee SK. 2006. Advances in Ornamental Horticulture. Vols. I-VI. Pointer Publ.
Chadha KL.1995. Advances in Horticulture. Vol.XII. Malhotra Publ. House.
Lauria A & Victor HR. 2001. Floriculture – Fundamentals and Practices Agrobios.
Prasad S & Kumar U. 2003. Commercial Floriculture. Agrobios.
Reddy S, Janakiram B, Balaji T, Kulkarni S & Misra RL. 2007.Hightech Floriculture. Indian Society of Ornamental Horticulture, New Delhi

B.Sc.(Ag) Hons.

PROCESSING AND VALUE ADDITION OF CEREALS, PULSES AND OILSEED CROPS

3(1+2)

Unit I: Structure, composition and nutritional significance of cereals, pulses, and oilseesds that has relevance to MP.

Unit II: Presence of antinutritional factors, hazards and detoxification.

Unit III: Primary and secondary processing of cereals, pulses, and oilseeds – need and significance.

Unit IV: Preparation and processing of value added products and byproducts from rice, wheat. Their use and economic significance – cost benefit analysis.

Unit V: Preparation and processing of value added products and byproducts from common pulses, and oilseeds. Their use and economic significance – cost benefit analysis.

Practicals

1. Processing of cereals – milling, dehulling, parboiling, puffing, roasting, pulverization.
2. Processing of pulses – malting of pulses, preparation of fermented products from pulses –
3. preparation of milk substitutes.
4. Preparation of soy products.
5. Preparation of baked products.
6. Preparation of pastries and cakes.
7. Preparation of extruded products/ pasta products.
8. Preparation of processed other products from oilseeds.
9. Preparation of Beverages/ health mixes.
10. Visits to various food processing industries.

Book references:

C.F.T.R.I. Mysore Manuals on Rice and its Processing

N.N. Potter Food Science

Cereal Technology S.A.Matz Bakery Technology

B.Sc.(Ag) Hons.

VIII SEM MODULE

AGRI BUSENISS MANAGEMENT

Information and communication management 3(1+2)

Theory-

Unit I: Fundamentals of information and communication- solving agricultural problems with information systems- a managerial overview of information and communication Information- characteristics, Information Vs Knowledge,

Unit II:ABC nature of information, Information as a crucial resource, Processing of information, Analysis of information, Information retrieval. Types of information, communication technology, use of different channels and media.

Unit III: Multimedia information, formats, use of multimedia systems and standards.Computer system- input and out put devices, Multipurpose computer system,

Unit IV: Data base management system, Decision Support system, Information management System of organizations, Remote sensing, Geographical information system.

Unit V: Multimedia and their application. Satellite communication-VSAT application-CD ROM Techniques of teleconferencing, Video conference and its application to Transfer of technology, Bio informatics and its application.

Practical:

1. Fundamentals of information and communication- solving agricultural problems with information systems- a managerial overview of information and communication.
2. Information- characteristics, Information Vs Knowledge, ABC nature of information, Information as a crucial resource
3. Processing of information, Analysis of information, Information retrieval, Types of information, communication technology, use of different channels and media
4. Different channels of information – communication- Radio, TV, Video, E-mail
5. Network connecting devices-intranet, internet, Photography, basics –its uses, Digital Photography –its advantages
6. Print media- different types, role in transfer of technology, Role of modern communication devices in print media, Desk top publication system
7. Role of computer in information -communication - Data base management system,
8. Agricultural Information System – Agricultural databases – Definition and objectives, Decision Support system, Expert system
9. Video conferencing, Tele conferencing, Tele text, Videotext, Electronic Data Interchange
14. Searching and locating of agriculture literature – e- journals and technical reports, electronic publishing and e-books
16. Multimedia-concept and its advantages; applicability in transfer of technology, education & training, publication, interactive media.
17. Satellite communication, application in agriculture and rural development, its role in transfer of information
18. Bio informatics –Links between modern biology genomics and Bio-informatics, Use of bio-informatics in agriculture

B.Sc.(Ag) Hons.

Management of agro based industries 4(1+3)

Theory-

Unit I: Food processes industries- definition, scope, importance and history of food processing industry in India. International Scenario of food processing industries

Unit II: Classification of food processing industries- (Agriculture, Horticulture, Medicinal aromatics, plantation, Animal husbandry, Fisheries ,Dairies ,Food and vegetable processing, Grain processing Meat and poultry product processing, Packaging and other consumerable goods, packed consume foods, drinking waters etc.

Unit III: Management, definition of management, functions of management – planning, organizing, directing, coordination, controlling and budgeting, management at different levels of hierarchy in the industry.

Unit IV: Industries policy- Its meaning, industrial policy resolution of 1948 and 1956, salient feature of the industrial policy of 1956, industrial licensing policy 1970 and letters new industrial policy1991 with special reference to agro based industries.

Unit V: Raw material procurement, problems marketing of food processed food, distribution, logistic promotional tools, pricing technique branding, problems in marketing failure and reasons, success story of food industry, strategy to the followed govt. policies for food process industry.

Practical- 1. A study of the set up of new firms / plant.

2. Study /visit of integrated cold chain – Food Park.
3. Visit to export commodities processing industries.
4. Study of the management cattle feed manufacturing industries.
5. Case study of food processing industries.
7. Market survey of food process industries.
8. Economic analysis of food processing industries.
9. Prepare a project report on Agro based industries.
10. Study of the role of Nontraditional industries.
11. Frequent visit at a small scale and cottage agro based industries.
12. Study to assess the qualitative and quantitative post harvest losses of different Agricultural produce.

Suggested Readings:

1. M.C.Shukla, Business Organization and Management, S.Chand and Company, New Delhi.
2. Elkins, Management: Structure, functions and practices, Educational Publisher, Jaipur.

B.Sc.(Ag) Hons.

Marketing management 3(1+2)

Theory :-

Unit I: Market and marketing concept and definition, Objective and importance of marketing, value addition in term of marketing utility, demand and supply, factors affecting the demand and supply of horticultural produce.

Unit II: Market segment concept, definition, deferent criteria of market segment, marketing channel of deferent horticultural and agro based produce, market mix, market channel and effect the length of market channel. Marketing strategy.

Unit III: Production oriented and market oriented concept of marketing, Consumer behavior and psychology, factor affecting the behavior of consumer, Knowledge, attitude and emotion, image and symbolism, intention and motives. Buying motives, pricing decision, product life cycle,

Unit IV: Market functions and market functionaries, branding, grading and standardization, Distribution decision concept and kind of distribution channel. Product and product pricing method, pricing policies of agricultural product in India, step in product planning and development

Unit V: Concept sale promotion, promotional decision, concept of promotion planning and promotion mix, consumer sale promotion and dealer sale promotion, Advertising concept, media and selection of suitable media advertisement, Market potential assessment for Agro based input, launching of new product.

Practical:- 1 Frequent visit to nearest Govt. mandi / APMC to study how fixed the target Area and production by the Govt. mandi / APMC.
2. Frequent visit of a commercial agricultural farm and study how manage agricultural crop at farm level.
3. Frequent visit the wholesale market of agricultural product in different district of the state and study the buy and selling procedure of deferent agricultural commodities at wholesale and retail stage of marketing,
4. To estimate the price spread, marketable and marketed surplus for different Agricultural product
5. Visit to firms exporting agricultural product, 6. Study the export potential of measure Agricultural product.
6. Visit weekly mandy/vegetable market/ farmers fair.
7. A visit to Regulated market and study the function and practices in marketing of farm produce.
8. Estimate the marketable and marketed surplus of deferent farm produce.
9. Estimate the price spread of various farm product cereals, pulses and Agro based.
10. Estimate the market efficiency and market integration.
11. Study the time unit analysis of price- TCCI variation and study the Index number- construction and uses.

Suggested Readings:

1. Y.K.Bhushan, Fundamentals of Business Organization and Management, Sultan Chand and Sons, Delhi-6.
2. Kotler, Philip (1999). Marketing Management; Analysis Planning and Control, Prentice Hall, New Delhi.
3. M.C.Shukla, Business Organization and Management, S.Chand and Company, New Delhi.

B.Sc.(Ag) Hons.

Financial management of Agribusiness 4 (1+3)

Theory:-

Unit I: Introduction of Agribusiness, Agricultural Economics V/s Agribusiness, Origin of Agribusiness, Characteristics and scope of Agribusiness, relation of finance management to agribusiness, Definition, concept aim and importance of finance management in agribusiness

Unit II: Assessing and acquiring and allocating of finance. Impact of time on financial management, capital management, capital budgeting and working capital management (compounding and discounting, discounted and undiscounted measure)

Unit III: Financial tools management (Balance sheet, income statement and cash flow statement), its importance and component related to Agribusiness management, Farm record keeping, accounting, Business analysis, sources and uses of fund statement (SAUF),different financial test ratio and their comparative analysis.

Unit IV: Risk management, definition and type of Risk and uncertainty, risk evaluation and estimation, control and Adjustment of risk, selection of investment proposal.

Unit V: Credit and credit management, assessment of credit management 3Rs, 5Cs and 7Ps Repayment plan.

Practical:- 1.Exercise on compounding, discounting ,discounted and undiscounted measure for agribusiness.
2. Prepare the balance sheet, income statement and cash flow statement for agribusiness management.
3. Frequent visit on Agribusiness firms.
4. Prepare a proposal for establishing the agro based industries.
5. Prepare the loan proposal.
6. Estimating capital requirement for some major agribusiness firms
7. Prepare the deferent type of repayment plan.
8. Visit to farm for the study of credit needs, problems and suggestion in the uses of farm credit and agro based industries.
9. Analysis of deferent financial test ratio.
10. Estimation of crop yield and compensation in the crop insurance schemes for Agro based industries.
11. Prepare the budget and planning of an agro industries.
12. Visit to crop insurance implement agency.

Suggested Readings: Amaranth, J.S. and A.P.V.Samvel (2008) Agribusiness Management, Satish Serial Publishing House, Delhi.
Kahlon, A.S. and Karam Singh, Managing Agricultural Finance Allied Publishers Pvt., New Delhi.
Pandey, U.K. (1990) An Introduction to Agricultural Finance, Kalyani Publishers, New Delhi.

B.Sc.(Ag) Hons.

Natural Resources Economics and Management 3 (1+2)

Theory:

Unit I: Definition and characteristics of Natural Resources, importance of Natural Resources to India, factors that influence the scarcity of Natural Resources, policies and institutions for Natural Resources Management (NRM). A historical perspective, identifying and solving natural resources problems with economic analysis.

Unit II: Property rights and Tenures in Natural Resources. Assumption of micro economics about property rights, property rights: meaning, Evolution and rationale, types of property and property regimes, Alternative resource management system.

Unit III: Economics of Externalities- externalities as market failures, the optimum level of pollution abatement, measures to internalize externalities.

Unit IV: Market failures in Natural Resources Management. A simple taxonomy of market failure, implications of market failures, types of market failure, correcting market failures in Natural Resources Management.

Unit V: Pollution, type of pollution, causes, effect and control measures of air, water, soil, thermal and noise pollution, nuclear hazards. Rural and urban waste management, global warming, environmental act and related issue.

Practical

1.Resource inventory assessment technique.
2.Visit to industries to study pollution abatement techniques.
3.Working out depletion rate of fisheries and minerals.
4.Visit to area of resources degradation due to air.
5.Land and water pollution assessment
6.Willingness to pay concept and its qualification
7.Hedonic pricing analysis
8.Social benefit cost analysis
9.Principal of optimality to environment planning
10.Economic principal of optimality to environment sustainability in agricultural resource use.
11.Role of pollution agencies and strategies followed in India and P .R. A. in NRM

Suggested Readings: Hart wick J.M. and N.D. Olivier (1986) The Economics of Natural Resource Use, New York, Harper and Row.

Howe, C.W. (1979) Natural Resource Economics: Issues, Analysis and Policy, New York: Johns Wiley and sons.

B.Sc.(Ag) Hons.

Project Formulation, Evaluation and Monitoring 3 (1+2)

Unit I: The Project concept: meaning, definition, plans and projects, advantages and limitations of the project format. Aspects of project preparation and analysis. The project cycle.

Unit II: Identifying project cost and benefits**:** objectives, cost and benefits, with and without comparisons, costs of agricultural project, and Tangible and Intangible benefits of projects.

Unit III: Investment Analysis (capital budgeting)**:** comparing project cost and benefits, Time value of money – compounding and discounting, methods of project appraisal – discounted and undiscounted measures of project worth, sensitivity analysis.

Unit IV: Monitoring, introduction, basic elements, importance, monitoring and progress report monitoring techniques, indicators for monitoring, type of monitoring, monitoring risk and uncertainties.

Unit V: Project management bar chart, mile stone chart, network- PERT, network diagram.

Practical

1.Project formulation

2.Measuring of cost and benefits project

3.Appraisal of project using undercounting and discounted techniques

4.Use of sensitivity analysis

5.Selection method among mutually exclusive project

6.Preparation of case studies

7.Preparation of case study social cost benefit analysis

8.Network – PERT, diagram

9.PERT- CPM analysis, time- cost relation

Suggested Readings:

1. Gittinger, J price (1924). Economic Analysis of Agricultural Projects. The Johns Hopkins University Press. Baltimore and London

2. Pandey U.K. (1990) An Introduction to Agricultural Finance, Kalyani Publishers, New Delhi,.

3. Chandra P. (2005) Project Management, Tata Mc Graw Hill.

4. Ramamoortwy VE. (2005) Text Book of Project Management, MacMillan Publication.