

AKS University Satna M.P.
 Department of Agriculture Science
Faculty of Agriculture Science and Technology
B.Sc. (Hons.) AG
Semester-I
Distribution of courses as per 5th Dean Committee

Sr.	Subject Code	Name of course	L (Hr)	P (Hr)	Credit
1.	21GP121	Fundamentals of Genetics	2	2	3
2.	21SC122	Fundamentals of Soil Science	2	2	3
3.	21FO123	Introduction to Forestry	1	2	2
4.	21SD124	Comprehension & Communication Skills in English	1	2	2
5.	21EV125	Fundamentals of Agronomy	3	2	4
Elective- Choose Any one of these					
6.	21BI126-A	Introductory Biology (<i>For Maths/Ag Students</i>)	1	2	2
	21MS126-B	Elementary Mathematics (<i>For Bio/Ag Students</i>)	2	–	2
7.	21AN127	Agriculture Heritage	1	–	1
8.	21EX128	Rural Sociology & Educational Psychology	2	–	2
Non Credit Subjects					
9.	21NC129	Human Values & Ethics	1	–	NC
10.	21NC177	NSS/Physical Education & Yoga Practices**	–	2	NC
Total credits			14/15	14/12	19

B.Sc. (Hons.) AG
Semester-II

Sr.	Subject Code	Name of course	Group	L (Hr)	P (Hr)	Credit
1.	21HO221	Fundamentals of Horticulture	Agriculture Sc	1	2	2
2.	21HO222	Fundamentals of Crop Physiology	Agriculture Sc	1	2	2
3.	21PP223	Fundamentals of Plant Pathology	Agriculture Sc	3	2	4
4.	21EN224	Fundamentals of Entomology	Agriculture Sc	3	2	4
5.	21SD225	Communication Skills and Personality Development	SSD (English)	1	2	2
6	21GP226	Fundamentals of Plant Breeding	Agriculture Sc	2	2	3
7	21EV227	Environmental Studies and Disaster Management	Environment	2	2	3
8	21MS228	Statistical Methods	Maths	1	2	2
9	21EC229	Fundamentals of Agricultural Economics	Agriculture Sc	2	–	2
		Total credits		16	16	24

**B.Sc. (Hons.) AG
Semester III**

Distribution of courses as per 5th Dean Committee

Sr. No.	Paper Code	Subject	L	P	Credits
1	21BT321	Agricultural Microbiology	1	2	2
2	21EX322	Fundamentals of Agricultural Extension Education	2	2	3
3	21AN323	Crop Production Technology-I (Kharif Crops)	1	2	2
4	21EC324	Agricultural Finance and Cooperation	2	2	3
5	21CS325	Agriculture Informatics	1	2	2
6	21AE326	Farm Machinery and Power	1	2	2
7	21HO327	Production Technology for Vegetables and Spices	1	2	2
8	21EN328	Principles of Integrated Pest and Disease Management	2	2	3
9	21GN329	Crop Improvement-I (Kharif Crops)	1	2	2
10	21AN380	Practical Crop Production-I (Kharif Crops)		4	2
		Tutorial	2		NC
		Total			23

B.Sc. (Hons.) AG**Semester-IV****Distribution of courses as per 5th Dean Committee**

Sr .	Subject Code	Name of course	Group	L (Hr)	P (Hr)	Credit
1.	21AE421	Soil and Water Conservation Engineering	Ag Engg.	1	2	3
2.	21AN422	Crop Production Technology –II (<i>Rabi Crops</i>)	Agriculture Sc	1	2	2
3.	21SC423	Manures, Fertilizers and Soil Fertility Management	Agriculture Sc	2	2	3
4.	21HO424	Production Technology for Ornamental Crops, MAP and Landscaping	Agriculture Sc	1	2	2
5.	21EN425	Pests of Crops and Stored Grain and their Management	Agriculture Sc	2	2	3
6	21HO426	Diseases of Field and Horticultural Crops and their Management -I	Agriculture Sc	2	2	3
7	21AN427	Rainfed Agriculture & Watershed Management	Agriculture Sc	1	2	2
8	21AE428	Protected Cultivation and Secondary Agriculture	Ag Engg.	1	2	2
9	21EC429	Farm Management, Production & Resource Economics	Agriculture Sc	1	2	2
10	21AN430	Introductory Agro-meteorology & Climate Change	Agriculture Sc	1	2	2
11	21AG431	Elective-1	Agriculture Sc			
		Total credits		13	20	26 (with Elective)

Elective-1: (Student can choose any one subject of the followings)

Subject Code	Subject Name	L	P	Credit
1- 21AG431-A	Agrochemicals	2	2	3
2- 21AG431-B	Agricultural Journalism	2	2	3
3- 21AG431-C	Micro Propagation Technologies	1	4	3

**B.Sc. (Hons.) AG
Semester-V**

Distribution of courses as per 5th Dean Committee

Sr .	Subject Code	Name of course	L (Hr)	P (Hr)	Credit
1.	21AH521	Livestock and Poultry Management	3	2	4
2.	21AE522	Renewable Energy and Green Technology	1	2	2
3.	21HO523	Production Technology for Fruit and Plantation Crops	1	2	2
4.	21AN524	Principles of Seed Technology	1	4	3
5	21EC525	Agricultural Marketing Trade & Prices	2	2	3
6	21AN526	Geoinformatics and Nano-technology and Precision Farming	1	2	2
7	21AG527	Intellectual Property Rights	1	–	1
8	21HO528	Diseases of Field and Horticultural Crops and their Management-II	2	2	3
10	21AG529	Elective			3
		Total credits	13	18	23 (with Elective)

Elective: (Student can choose any one subject of the followings)

Subject Code	Subject Name	L	P	Credit
4- 21AG529-A	Weed Management	2	2	3
5- 21AG529-B	Biopesticides & Biofertilizers	2	2	3
6- 21AG529-C	Protected Cultivation	2	2	3
7- 21AG529-D	Commercial Plant Breeding	1	4	3

**B.Sc. (Hons.) AG
Semester VI**

Sr. No.	Paper Code	Subject	L	P	Credits
1	21BT621	Fundamentals of Plant Biochemistry and Biotechnology	2	2	3
2	21AN622	Farming System & Sustainable Agriculture	1		1
3	21SC623	Problematic Soils and their Management	2		2
4	21MT624	Entrepreneurship Development and Business Communication	1	2	2
5	21HO625	Post-harvest Management and Value Addition of Fruits and Vegetables	1	2	2
6	21EN626	Management of Beneficial Insects	1	2	2
7	21AN627	Crop Improvement-II (<i>Rabi crops</i>)	1	2	2
8	21AN628	Principles of Organic Farming	1	2	2
9	21FT629	Principles of Food Science and Nutrition	2		2
10		Elective			3
22	21AN677	Practical Crop Production –II (Rabi crops) (Lab)		4	2
13	21AG678	Educational Tour			2
		Tutorial	2		NC
		Total			23

Elective: (Student can choose any one subject of the followings)

Subject Code	Subject Name	L	P	Credit
8- 21HO630-A	Hi-tech. Horticulture	2	2	3
9- 21AB630-B	Agribusiness Management	2	2	3
10- 21HO630-C	Landscaping	2	2	3
11- 21AG630-D	System Simulation and Agro-advisory	2	2	3

B.Sc. (Hons) Ag. 1th Semester
Fundamentals of Genetics -3(2+1)

Unit 1- Pre and Post Mendelian concepts of heredity, Mendelian principles of heredity, Cell division – mitosis, meiosis, Probability and Chi-square. Dominance relationships, gene interaction.

Unit 2- Multiple alleles, pleiotropism and pseudoalleles, Sex determination and sex linkage, sex limited and sex influenced traits, Blood group genetics, Linkage and its estimation, crossing over mechanisms, chromosome mapping.

Unit 3- Structural changes in chromosome, Mutation, classification, Methods of inducing mutation & CIB technique, mutagenic agents and induction of mutation.

Unit 4- Qualitative & Quantitative traits, Polygenes and continuous variations, multiple factor hypothesis, Epistatic interactions with examples.

Unit 5- Cytoplasmic inheritance. Genetic disorders,. Nature, structure & replication of genetic material. Protein synthesis, Transcription and translational mechanism of genetic material, Gene concept: Gene structure, function and regulation, Lac and Trp operons.

Practical

1. Study of microscope.
2. Study of cell structure.
3. Experiments on monohybrid, dihybrid, trihybrid, test cross and back cross,
4. Experiments on epistatic interactions including test cross and back cross,
5. Practice on mitotic and meiotic cell division,
6. Experiments on probability and Chi-square test.
7. Determination of linkage and cross over analysis
8. Study on sex linked inheritance in Drosophila.
9. Study of models on DNA and RNA structure.

References:

1. Gupta P.K.2004. Cytology, Genetics and Evolution. Rastogi Publications, Meerut. (Hindi Edition)
2. Klug, W.W. and Cummings, M.R.2005. Concepts of Genetics. Pearson Education (Singapore) pvt. Ltd., Indian Branch, Pratap Ganj, New Delhi.
3. Singh, B.D. 2001. Genetics. Kalyani Publishing House, New Delhi.
4. Strickberger, M.W.2001. Genetics. Prentice Hall of india. Pvt. Ltd., New Delhi.
5. Sharma, A. K. and Sharma, R. A. 2013. Crop Improvement and Mutagenesis. Scientific Publishers, Jodhpur.

B.Sc. (Hons) Ag. 1th Semester
Fundamentals of Soil Science -3(2+1)

Unit 1- Soil as a natural body, Pedological and edaphological concepts of soil; Soil genesis: soil forming rocks and minerals; weathering, processes and factors of soil formation; Soil Profile, components of soil

Unit 2- Soil physical properties: soil-texture, structure, density and porosity, soil colour, consistence and plasticity; Elementary knowledge of soil taxonomy classification and soils of India

Unit 3- Soil water retention, movement and availability; soil air, composition, gaseous exchange, problem and plant growth; source, amount and flow of heat in soil; soil temperature and plant growth

Unit 4- Soil reaction-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability; soil colloids - inorganic and organic; silicate clays: constitution and properties; sources of charge ion exchange, cation exchange capacity, base saturation

Unit 5- Soil organic matter: composition, properties and its influence on soil properties; humic substances - nature and properties; soil organisms: macro and micro organisms, their beneficial and harmful effects; Soil pollution - behaviour of pesticides and inorganic contaminants, prevention and mitigation of soil pollution.

Practical

1. Study of soil profile in field.
2. Study of soil sampling tools, collection of representative soil sample, its processing and storage.
3. Study of soil forming rocks and minerals.
4. Determination of soil density, moisture content and porosity.
5. Determination of soil texture by feel and Bouyoucos Methods.
6. Studies of capillary rise phenomenon of water in soil column and water movement in soil.
7. Determination of soil pH and electrical conductivity.
8. Study of soil map.
9. Determination of soil colour.
10. Estimation of organic matter content of soil.

References:-

1. Boul S.W., Hole R.D., McCracken and Southard R.J. (1998). Soil genesis and classification Fourth Ed Panima Publishing corporation, New delhi.
2. .Baver, L.D. Gardener, W.H. and gardener W.R.(1976) Soil Physics Wiley Eastern Ltd, New Delhi
3. Biswas, T.D. and Mukherjee, S.K. (2006) Text book of soil science. Tata McGraw Hill publishing Co. Ltd, New Delhi
4. Brady, N.C. and Weil, R.R. (2002) The nature and properties of soils, prentice hall of India Pvt. Ltd, M-97, Connaught Circus, New Delhi
5. Das, D.K. (2002) Introductory Soil Science, Kalyani publisher, New Delhi

B.Sc. (Hons) Ag. 1th Semester
Introduction to Forestry -2(1+1)

Unit 1- Introduction – definitions of basic terms related to forestry, objectives of silviculture, forest classification, salient features of Indian Forest Policies. Forest regeneration, Natural regeneration - natural regeneration from seed and vegetative parts, coppicing, pollarding, root suckers

Unit 2- Artificial regeneration – objectives, choice between natural and artificial regeneration, essential preliminary considerations. Crown classification. Tending operations – weeding, cleaning, thinning – mechanical, ordinary, crown and advance thinning. Forest mensuration – objectives, diameter measurement, instruments used in diameter measurement

Unit 3- Non instrumental methods of height measurement - shadow and single pole method; Instrumental methods of height measurement - geometric and trigonometric principles, instruments used in height measurement; tree stem form, form factor, form quotient, measurement of volume of felled and standing trees, age determination of trees

Unit 4- Agroforestry – definitions, importance, criteria of selection of trees in agroforestry, different agroforestry systems prevalent in the country, shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens

Unit 5- Cultivation practices of two important fast growing tree species of the region.

Practical

1. Identification of tree-species.
2. Diameter measurements using calipers and tape, diameter measurements of forked, buttressed, fluted and leaning trees.
3. Height measurement of standing trees by shadow method, single pole method and hypsometer.
4. Volume measurement of logs using various formulae.
5. Nursery lay out, seed sowing, vegetative propagation techniques.
6. Forest plantations and their management.
7. Visits of nearby forest based industries.

Text Book:

- 1-Agroforestry Principle and Practices By A.P.Dwivedi
- 2-Indian Forestry By K.Manikand and S.Prabhu.
- 3-Introduction to Forestry By S.R.Reddy and C.Nagamani

B.Sc. (Hons) Ag. 1th Semester

Comprehension and Communication Skills in English- 2(1+1)

Unit 1- G.B. Shaw: Spoken English and Broken English, Nissim Ezekiel: Night of The Scorpion, George Orwell: Animal Farm

Unit 2- Reading Comprehension, Vocabulary- Antonyms, Synonyms, Homophones, Homonyms, often confused words, Homographs.

Unit 3- Introduction to Modal Auxiliaries (Form and Use), May and Can for permission and Possibility, Could for permission in past, May and Might for Possibility, Can and be able for Ability. Ought, Should, Must, have to had to, Need for Obligation. Vocabulary based on TOEFL and other competitive examinations.

Unit 4- Functional English: Articles, Prepositions, Verbs, Subject verb Agreement, Transformations, Direct and Indirect Narration. The Passive Voice.

Unit 5- Writing Skills: Paragraph writing, Precise writing, Report writing and Proposal writing. The Style: Importance of professional writing, Preparation of Curriculum Vitae and Job applications, Synopsis writing. Interviews: kinds, Importance and process.

Practical

1. Listening Comprehension: Listening to short talk lectures, Speeches.
2. Oral Communication: Phonetics, Stress and Intonation, Conversation practice.
3. Conversation: Rate of speech, Clarity of voice, Speaking and Listening, Politeness.
4. Reading Skills: Reading dialogues, Rapid reading, Improving reading skills.

References:

1. Sandhu, A. S. (1999). Textbook on Agricultural Communication; process and methods oxford RIBH Publishing co. Pvt. Ltd. New Delhi.
2. Berlo, David K. (1960). The process of Communication. Nw Yark, Holt, Rinehart and Winston Inc.
3. Dahama, O. P. and Bhatnagar, O.P., 1998, *Education and Communication for Development*, Oxford and IBH publishing Co. Pvt. Ltd., New Delhi.
4. Jalihal, K. A. and Veerabhadraiah, V., 2007, *Fundamentals of Extension Education and Management in Extension*, Concept publishing company, New Delhi.
5. Ray, G. L., 1991 (1st Edition), *Extension Communication and Management*, Kalyani Publishers, Ludhiana {7th revised edition - 2010}.

B.Sc. (Hons) Ag. 1th Semester
Fundamentals of Agronomy-4(3+1)

Unit 1- Agronomy and its scope, seeds and sowing, tillage and tilth, crop density and geometry, Crop nutrition, manures and fertilizers, nutrient use efficiency,

Unit 2-Water resources, soil plant water relationship, crop water requirement, water use efficiency, irrigation- scheduling criteria and methods, quality of irrigation water, water logging.

Unit 3- Weeds- importance, classification, crop weed competition, concepts of weed management- principles and methods. Herbicides- classification, selectivity and resistance, allelopathy.

Unit 4- Growth and development of crops. Factors affecting growth and development, plant ideotypes, crop rotation and its principles.

Unit 5- Adaptation and distribution of crops, crop management technologies in problematic areas, harvesting and threshing of crops.

Practical

1. Identification of crops, seeds, fertilizers, pesticides and tillage implements
2. Effect of sowing depth on germination and seedling vigour
3. Identification of weeds in crops, Methods of herbicide and fertilizer application
4. Study of yield contributing characters and yield estimation
5. Seed germination and viability test
6. Numerical exercises on fertilizer requirement, plant population, herbicides and water requirement
7. Use of tillage implements-reversible plough, one way plough, harrow, leveler, seed drill
8. Study of soil moisture measuring devices
9. Measurement of field capacity
10. bulk density and infiltration rate
11. Measurement of irrigation water.

Text Books:

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

Reference Books:

1. ICAR. 2010. Handbook of Agriculture (6th edition), Indian Council of Agricultural Research, New Delhi.
2. Panda, S.C. 2012. Modern Concepts and Advance Principles in Crop Production. Agrobios (India), Jodhpur
3. Balasubramaniyan, P. and Palaniappan, S.P.2016. Principles and Practices of Agronomy (2nd edition), Agrobios (India), Jodhpur
4. Reddy, T.Yellamanda and Reddy, G.H. Sankara. 2016. Principles of Agronomy (2nd edition) , Kalyani Publishers, Ludhiana
5. Reddy, S.R.2012. Principles of Crop Production (4th edition), Kalyani Publishers, Ludhiana

B.Sc. (Hons) Ag. 1th Semester

Introductory Biology -2(1+1)*

(For Ag&Math group)

- Unit-I** **Living world-** Characters of living non living classification of living beings characters of phylum (Protozoa, Porifera, Coelentrata, Platyhelminthes, Annelida, Arthropoda, Mollusca, Echinodermata, Chordata), origin of life (Miller concept)
- Unit-II** **Evolution** – history (Micro-Macro evolution), eugenics techniques, binomial system, natural classification, cell-mitosis and meiosis cell divisions.
- Unit-III** **Morphology of flowering plant-** Parts of plants and types of root, leaf, stem; types of venation; Flower (Description of a flower parts), definition and structure of seed, types, germination.
- Unit-IV** **Plant systemics** – Brassicaceae, Solanaceae, Fabaceae, Poaceae.
- Unit-V** **Role of Animals in Agriculture** – Earth worm, honey bee, lac insect, silk moth, snail slugh, birds & cattles.

Practical

1. Morphology of flowering plants – root, stem and leaf and their modifications.
2. Inflorescence, flower and fruits. Cell, tissues & cell division.
3. Internal structure of root, stem and leaf.
4. Description of plants – Brassicaceae, Fabaceae and Poaceae.
5. Study of slides (Phylum - protozoa)
6. Study of specimens of phylum Poritera, Coelentrata, Platyhelminthes.
7. Study of specimen of phylum (Nemathelminthes, Annelid, Arthropoda)
8. Study of specimens of phylum (Mollusca, Echinodermata, Chordata)
9. Study of alimentary canal, reproductive system of earth worm.

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. (Hons) Ag. 1th Semester
Elementary Mathematics -2(2+0)*
(For Ag & Bio group)

Unit 1- Straight lines : Distance formula, section formula (internal and external division), Change of axes (only origin changed), Equation of co-ordinate axes, Equation of lines parallel to axes, Slope-intercept form of equation of line, Slope-point form of equation of line, Two point form of equation of line, Intercept form of equation of line, Normal form of equation of line, General form of equation of line, Point of intersection of two st. lines, Angles between two straight lines, Parallel lines, Perpendicular lines, Angle of bisectors between two lines, Area of triangle and quadrilateral.

Unit 2- Circle: Equation of circle whose centre and radius is known, General equation of a circle, Equation of circle passing through three given points, Equation of circle whose diameters is line joining two points (x_1, y_1) & (x_2, y_2) , Tangent and Normal to a given circle at given point (Simple problems), Condition of tangency of a line $y = mx + c$ to the given circle $x^2 + y^2 = a^2$.

Unit 3- Differential Calculus : Definition of function, limit and continuity, Simple problems on limit, Differentiation of x^n , e^x , $\sin x$ & $\cos x$ from first principle, Derivatives of sum, difference, product and quotient of two functions, Differentiation of functions of functions (Simple problem based on it), Logarithmic differentiation (Simple problem based on it), Differentiation by substitution method and simple problems based on it, Differentiation of Inverse Trigonometric functions. Maxima and Minima of the functions of the form $y=f(x)$

Unit 4- Integral Calculus : Integration of simple functions, Integration of Product of two functions, Integration by substitution method, Definite Integral (simple problems based on it), Area under simple well-known curves

Unit 5- Matrices and Determinants: Definition of Matrices, Addition, Subtraction, Multiplication, Transpose and Inverse up to 3rd order, Properties of determinants up to 3rd order and their evaluation.

References

1. Krishi Ganita by Gokhroo and Jain
2. Differential Calculus by Gokhroo.
3. Integral Calculus by Gokhroo.

B.Sc. (Hons) Ag. 1th Semester

Agriculture Heritage -1(1+0)*

Unit 1- Introduction of Indian agricultural heritage, status of farmers in society; advice by sages to kings on their duties towards farmers

Unit 2- soil management in ancient, medieval & pre-modern India and its relevance in modern day sustainable agriculture, heritage of crop & water management

Unit 3- plant growth and development & plant protection through vrikshayurveda and traditional knowledge.

Unit 4- Heritage of medicinal plants and their relevance today, seed health in ancient & medieval history and its relevance to present day agriculture, description of Indian civilization and agriculture by travelers from China, Europe and United States,

Unit 5- our journey in agriculture, green revolution and its impact and concerns, vision for the future.

References:

1. ICAR 1989 Handbook of Agriculture, Indian Council of Agricultural Research, New-Delhi
2. Nene, Y.L. 2007. Glimpses of the Agricultural Heritage of India. Asian AgriHistory Foundation, Secunderabad, Andhra Pradesh.
3. Nene, Y.L., Saxena, R.C. and Choudhary, S.L. 2009. A Textbook on Ancient History of Indian Agriculture, Munshiram Manoharial Publishers Pvt. Ltd,
4. Nene, Y.L., Choudhary, S.L. and Saxena, R.C. 2010. Textbook on Ancient History of Indian Agriculture, Asian Agri-History Foundation.
5. D. Kumari, Manimuthu Veeral. 2014. Text Book on Agricultural Heritage of India. Agrotech Publishing.

B.Sc. (Hons) Ag. 1th Semester
Rural Sociology & Educational Psychology -2(2+0)

- UNIT-1** Sociology and Rural Sociology -Meaning and definition of sociology and rural sociology. Scope of sociology and rural sociology. Importance of rural sociology in agricultural extension & interrelationship with agricultural extension
- UNIT-2** Indian rural society and its important characteristics. Differences and relationship between rural and urban societies. Social Groups - meaning and definition, classification of groups Factors considered in formation and organization of groups, motivation in group formation, role of social groups in agricultural extension Meaning, definition & functions of social stratification Basis for stratification, forms of stratification Difference between class and caste system.
- UNIT-3** Meaning and definition of cultural concepts (Culture, Customs, Folkways, Mores, Taboos, Rituals and Traditions), Role of cultural concepts in agricultural extension. Meaning and definition of social values and attitudes. Types and role of social values and attitudes in agricultural extension. Meaning and definition of social institution. Major institutions in rural society, functions and their role in agricultural extension. Meaning, definition and nature of social change. Dimensions & factors of social change.
- UNIT-4** Psychology and educational psychology – meaning and definition. Scope and importance of educational psychology in agricultural extension.
- UNIT-5** Intelligence – meaning , definition, types. Factors affecting intelligence and importance of intelligence in agricultural extension. Personality – meaning, definition and types. Factors influencing the personality and role of personality in agricultural extension. Extension teaching – meaning, definition and steps. Learning and learning experience – meaning and definition. Learning situation - meaning, definition, elements and characteristics.

References:

1. Chitambar, J.B. 1973. Introductory rural sociology. New York, John Wiley and Sons.
2. Desai, A.R. 1978. Rural sociology in India. Bombay, Popular Prakashan, 5th Rev. ed.
3. Doshi, S.L. 2007. Rural sociology. Rawat Publishers, Delhi.
4. Jayapalan, N. 2002. Rural sociology. Altanic Publishers, New Delhi.
5. Sharma, K.L. 1997. Rural society in India. Rawat Publishers, Delhi.
6. Bhatia, H.R. 1965. A Text Book of Educational Psychology, Asia Publishing House, New Delhi.

B.Sc. (Hons) Ag. 1th Semester
Human Values and Ethics-1(1+0)**

UNIT-1 Values and Ethics-An Introduction. Goal and Mission of Life. Vision of Life. Principles and Philosophy. Introduction of Gita and Quran

UNIT-2 Self Exploration. Self Awareness. Self Satisfaction.

UNIT-3 Decision Making. Motivation. Sensitivity.

UNIT-4 Success. Selfless Service. Case Study of Ethical Lives.

UNIT-5 Positive Spirit. Body, Mind and Soul. Attachment and Detachment. Spirituality Quotient. Examination.

References:

Gaur RR, Sangal R & Bagaria GP. 2011. *A Foundation Course in Human Values and Professional Ethics*. Excel Books.

Mathur SS. 2010. *Education for Values, Environment and Human Rights*. RSA International.

Sharma RA. 2011. *Human Values and Education -Axiology, Inculcation and Research*. R. Lall Book Depot.

Sharma RP & Sharma M. 2011. *Value Education and Professional Ethics*. Kanishka Publishers.

Srivastava S. 2011. *Human Values and Professional Ethics*. S K Kataria & Sons.

Srivastava S. 2011. *Environmental Science*. S K Kataria & Sons.

Tripathi A.N. 2009. *Human Values*. New Age International (P) Ltd Publishers.

B.Sc. (Hons) Ag. 1th Semester
Physical Education & Yoga Practices-2(0+2)**

Course aims at evoking social consciousness among students through various activities viz., working together, constructive and creative social work, to be skilful in executing democratic leadership, developing skill in programme development to be able for self employment, reducing gap between educated and uneducated, increasing awareness and desire to help sections of society.

Physical Education and Yoga Practices

1. Teaching of skills of Football – demonstration, practice of the skills, correction, involvement in game situation (For girls teaching of Tennikoit)
2. Teaching of different skills of Football – demonstration, practice of the skills, correction, involvement in game situation (For girls teaching of Tennikoit)
3. Teaching of advance skills of Football – involvement of all the skills in game situation with teaching of rules of the game
4. Teaching of skills of Basketball – demonstration, practice of the skills, correction of skills, involvement in game situation
5. Teaching of skills of Basketball – demonstration, practice of the skills, involvement in game situation
6. Teaching of skills of Basketball – involvement of all the skills in game situation with teaching of rule of the game
7. Teaching of skills of Kabaddi – demonstration, practice of the skills, correction of skills, involvement in game situation
8. Teaching of skills of Kabaddi – demonstration, practice of the skills, correction of skills, involvement in game situation
9. Teaching of advance skills of Kabaddi – involvement of all the skills in game situation with teaching of rule of the game
10. Teaching of skills of Ball Badminton – demonstration, practice of the skills, correction of skills, involvement in game situation
11. Teaching of skills of Ball Badminton – involvement of all the skills in game situation with teaching of rule of the game
12. Teaching of some of Asanas – demonstration, practice, correction and practice
13. Teaching of some more of Asanas – demonstration, practice, correction and practice
14. Teaching of skills of Table Tennis – demonstration, practice of skills, correction and practice and involvement in game situation
15. Teaching of skills of Table Tennis – demonstration, practice of skills, correction and practice and involvement in game situation
16. Teaching of skills of Table Tennis – involvement of all the skills in game situation with teaching of rule of the game
17. Teaching – Meaning, Scope and importance of Physical Education
18. Teaching – Definition, Type of Tournaments
19. Teaching – Physical Fitness and Health Education
20. Construction and laying out of the track and field (*The girls will have Tennikoit and Throw Ball).

B.Sc. (Hons) Ag. 2nd Semester

Communication Skills and Personality Development-2(1+1)

Unit 1- Communication Skills:

Structural and functional grammar; Meaning and Process of Communication, Verbal and Non-Verbal Communication, Objective of Communication, Listening and note taking, Process of listening.

Unit 2- Writing skills, Oral presentation Skills, field diary and lab record, indexing, footnote and Bibliographic procedure, Barriers to communication, How to overcome barriers to Communication.

Indian writing in English: R K Narayan An Astrologers Day
 Mahesh Dattani Tara

Unit 3- Reading and Comprehension of general and technical articles, precise writing, Summarizing, abstracting, Conjunction: Coordinating and Subordinating.

Unit 4- Individual and group presentations, impromptu presentation, Public speaking. Letter writing: Enquiry, Order, Complaint and Tender Notice.

Unit 5- Group discussion, Do's and Don'ts of GD, Debate, Organizing seminars and conferences, speech, advertising.

Practical:

1. Listening and note taking.
2. Writing skills, Oral presentation skills, field diary and lab record.
3. Indexing, footnote and bibliographic procedure.
4. Reading and comprehension of general and technical articles.
5. Precise writing, summarizing, abstracting, individual and group presentation.

Text Book:

1-How to write correct English By R.P.Sinha.

2-A Practical guide of English grammar By K.P.Thakur.

3-Indian writing in English By Iyengar.

B.Sc. (Hons) Ag. 2nd Semester

Fundamentals of Agricultural Economics-2(2+0)

Unit 1- Economics: Meaning, scope and subject matter, definitions, activities, approaches to economic analysis; micro and macro economics, positive and normative analysis. Nature of economic theory; rationality assumption, concept of equilibrium, economic laws as generalization of human behavior. Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare. Agricultural economics: meaning, definition, characteristics of agriculture, importance and its role in economic development. Agricultural planning and development in the country.

Unit 2- Demand: meaning, law of demand, demand schedule and demand curve, determinants, utility theory; law of diminishing marginal utility, equi-marginal utility principle. Consumer's equilibrium and derivation of demand curve, concept of consumer surplus. Elasticity of demand: concept and measurement of price elasticity, income elasticity and cross elasticity. Supply: Stock v/s supply, law of supply, supply schedule, supply curve, determinants of supply, elasticity of supply.

Unit 3- Production: process, creation of utility, factors of production, input output relationship. *Laws of returns:* Law of variable proportions and law of returns to scale. *Cost:* Cost concepts, short run and long run cost curves. Market structure: meaning and types of market, basic features of perfectly competitive and imperfect markets. Price determination under perfect competition; short run and long run equilibrium of firm and industry, shut down and break even points. Distribution theory: meaning, factor market and pricing of factors of production. Concepts of rent, wage, interest and profit.

Unit 4- National income: Meaning and importance, circular flow, concepts of national income accounting and approaches to measurement, difficulties in measurement. Population: Importance, Malthusian and Optimum population theories, natural and socio-economic determinants, current policies and programmes on population control.

Unit 5- Money: Barter system of exchange and its problems, evolution, meaning and functions of money, classification of money, money supply, general price index, inflation and deflation. Banking: Role in modern economy, types of banks, functions of commercial and central bank, credit creation policy. Public finance: meaning, micro v/s macro finance, need for agricultural finance, public revenue and public expenditure. *Tax:* meaning, direct and indirect taxes, agricultural taxation, VAT.

References:

1. Dominick Salvatore, 2011, Outline of Microeconomics, Schaum's Outline Series.
2. Bhavani Devi, P. Raghu Ram, S. Subba Reddy, T.V. Neelakanta Sastry, 2009, Agricultural economics, Oxford and IBH Co. Pvt. Ltd., New Delhi.
3. K. K. Dewett and J. D. Varma, 1986, Elementary Economic Theory, S. Chand & Company, New Delhi.
4. Latika Sharma *et al* (2014) Principles of agricultural economics, Agrotech publishers, Udaipur.
5. M.L. Jhingan, 2004, Micro Economic Theory, Vikas Publishing House Pvt. Ltd., New Delhi.

B.Sc. (Hons) Ag. 2nd Semester

Fundamentals of Plant Breeding-3(2+1)

Unit 1- Historical development, objectives, concept, nature and role of plant breeding, major achievements and future prospects; Genetics in relation to plant breeding, modes of reproduction and apomixes, self – incompatibility and male sterility- genetic consequences, cultivar options.

Unit 2- Domestication, Acclimatization, introduction; Centre of origin/diversity, component of Genetic variation; Heritability and genetic advance; Genetic basis and breeding methods in self-pollinated crops-mass and pure line selection, hybridization techniques and handling of segregating population; Multiline concept.

Unit 3- Concepts of population genetics and Hardy-Weinberg Law, Genetic basis and methods of breeding cross pollinated crops, modes of selection; Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties.

Unit 4- Breeding methods in asexually propagated crops, clonal selection and hybridization; Wide hybridization and pre-breeding; Polyploidy in relation to plant breeding, mutation breeding-methods and uses.

Unit 5- Breeding for important biotic and abiotic stresses; Biotechnological tools-DNA markers and marker assisted selection. Participatory plant breeding; Intellectual Property Rights, Patenting, Plant Breeders and & Farmer's Rights.

Practical:

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

References:

1. Alard, R.W. 2000. Principles of Plant Breeding. John Willey & Sons, New York.
2. Chahel, G.S. and S.S. Ghosal. 2002. Principles and Procedures of Plant Breeding, Biotechnological and Conventional Approaches. Narosa Publishing House, New Delhi.
3. Singh, B.D. 2005. Plant Breeding. Kalyani Publishing House, New Delhi.
4. Singh, P. 2001. Essentials of Plant Breeding-Principles and Methods. Kalyani Publishing House, New Delhi.
5. Jain, H.K. and M.C. Kharkwal. 2004. Plant Breeding- Mendelian to Molecular Approach. Narosa Publishing House, New Delhi.
6. Sharma, A.K. 2005. Breeding Technology of Crop Plants (Edt.). Yash Publishing House, Bikaner.
7. Shekhawat, S. S. (ed) (2016). Advances and Current Issues in Agriculture, Vol. III. Shiksha Prakashan, S. M. S. Highway, Jaipur.

B.Sc. (Hons) Ag. 2nd Semester

Fundamentals of Entomology-4(3+1)

Unit 1- History of Entomology in India. Major points related to dominance of Insecta in Animal kingdom. Classification of phylum Arthropoda upto classes. Relationship of class Insecta with other classes of Arthropoda. Morphology: Structure and functions of insect cuticle and molting. Body segmentation. Structure of Head, thorax and abdomen. Structure and modifications of insect antennae, mouth parts, legs, Wing venation, modifications and wing coupling apparatus. Structure of male and female genital organ. Metamorphosis and diapause in insects. Types of larvae and pupae.

Unit 2- Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretory (Endocrine) and reproductive system, in insects. Types of reproduction in insects.

Unit 3- 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. Causes for outbreak of pests in agro-ecosystem.

Unit 4- Pest surveillance and pest forecasting. Categories of pests. Cultural, Mechanical, Physical. Legislative. Biological (parasites, predators & transgenic plant pathogens such as bacteria, fungi and viruses) methods of control. Chemical control-importance, hazards and limitations. Classification of insecticides, toxicity of insecticides and formulations of insecticides. Recent methods of pest control, repellents, antifeedants, hormones, attractants, gamma radiation and genetic control. Practices, scope and limitations of IPM. . Application techniques of spray fluids. Phytotoxicity of insecticides. Symptoms of poisoning, first aid and antidotes. Important species of pollinators, weed killers and scavengers, their importance.

Unit 5- Systematics: Taxonomy –importance, history and development and binomial nomenclature. Classification of class Insecta upto Orders, basic groups of present day insects with special emphasis to orders and families of Agricultural importance like Orthoptera: Acrididae, Gryllidae, Dictyoptera: Mantidae, Blattidae; Odonata; Isoptera: Termitidae; Thysanoptera: Thripidae; Hemiptera: Pentatomidae, Coreidae, Pyrrhocoridae, Aphididae, Coccidae, Neuroptera: Chrysopidae; Lepidoptera, Papilionidae, Noctuidae, Pyralidae, Gelechiidae, Arctiidae, Bombycidae; Coleoptera, Chrysomelidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera: Tenthredinidae, Apidae. Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Tephritidae.

Practical :-

1. Methods of collection and preservation of insects including immature stages; External features of Grasshopper.
2. Types of insect antennae.
3. Types of mouthparts.
4. Types of legs.
5. Types of wings , wing coupling apparatus and Wing venation.
6. Types of insect larvae and pupae.
7. Dissection of digestive system in insects (Grasshopper).
8. Dissection of male and female reproductive systems in insects (Grasshopper).
9. Study of characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance.

References:

1. Chapman .R.F.1981. Insect Structure and Function, ELBS Publishers New Delhi.
2. David B.V. and Ananthkrishnan .T.N. 2003. General and Applied Entomology, 2nd Ed. Mc graw Hill publishing Co. Ltd. New Delhi.
3. Mathur and Upadhyay, 2005. A Text Book of Entomology, Aman Publishing House, Meerut.
4. Pant. N.C. and Ghai, S. 1981. Insect Physiology and Anatomy, ICAR, New Delhi.
5. Richards O.W. and Davies R.G. 1977. Imm's General Text Book of Entomology, Vol. I & II. Chapman and Hall, London.

B.Sc. (Hons) Ag. 2nd Semester

Environmental Studies & Disaster management-3(2+1)

Unit:1- Natural Resources

Multidisciplinary nature of environmental science, Natural resources- Definition, Types, Forest, Water, Mineral, food, land & energy resources.

Unit:2- Ecosystem & Biodiversity

Ecosystem- Definition, Types & components, Food chain, food web, energy flow & Ecological succession.

Biodiversity-Definition, types, Biodiversity Hotspots, values, threats & Conservation of biodiversity.

Unit:3- Environmental Pollution

Air, water, soil, noise & thermal pollution. Solid waste management- definition, types, sources of municipal solid waste, MSWM strategies.

Unit:4- Sustainable development (SD)

concept & issues of SD, urban problem related to energy, water conservation, rain water harvesting & watershed management, Environment Protection acts, human population & Family Welfare Programme, HIV/AIDS, Women & Child welfare.

Unit:5-Disaster Management

Definition, types of disaster, Floods, cyclone, earthquakes, drought etc.

Forest fires, oil fires, pollutions. Rail, air & sea accidents. Disaster Management- international Strategy, National Disaster Management Frame work, Role of NGOs, Armed forces in Disaster response.

Practical:

- Visit to local polluted sites and collection of water/soil sample.
- Determination of total dissolved solids (TDS) and total solid (TS) in effluents/water.
- Determination of hardness in given water sample.
- Determination of alkalinity in given water sample.
- Determination of acidity in given water sample.
- Determination of dissolved oxygen (DO) in given water sample.
- Identification of plant species in university campus.
- Determination of soil moisture content in given soil sample.
- Determination of carbonate content in given soil sample .
- Determination of nitrate content in given soil sample.
- Study of rain water harvesting system and its importance.

References:

1. Ecology and Environment- P D Sharma, 2010, Rastogi publication, Meerut- New Delhi
2. Environmental Science: A New Approach- Pushpa Dahiya, Manisha Ahlawat, 2013, Alpha Science
3. Fundamentals of environmental Sciences, Bamanayha B. R. Verma L. N. and Verma A., 2005, Yash publishing house, Bikaner
4. Disaster Management and Risk Reduction: *Role of Environmental Knowledge*, Editor(s): Anil K. Gupta, Sreeja S. Nair, Florian Bemmerlein-Lux, Sandhya Chatterji, 2013, Alpha Science
5. Environmental Biology, Agarwal K C, 1999, Agro Botanica, Bikaner

B.Sc. (Hons) Ag. 2nd Semester

Statistical Methods-2(1+1)

Unit 1- Introduction to Statistics and its Applications in Agriculture, Graphical Representation of Data, Measures of Central Tendency & Dispersion.

Unit 2- Definition of Probability, Addition and Multiplication Theorem (without proof). Simple Problems Based on Probability. Binomial & Poisson Distributions.

Unit 3- Definition of Correlation, Scatter Diagram. Karl Pearson's Coefficient of Correlation. Linear Regression Equations.

Unit 4- Introduction to Test of Significance, One sample & two sample test t for Means, Chi-Square Test of Independence of Attributes in 2×2 Contingency Table.

Unit 5- Introduction to Analysis of Variance, Analysis of One Way Classification. Introduction to Sampling Methods, Sampling versus Complete Enumeration, Simple Random Sampling with and without replacement, Use of Random Number Tables for selection of Simple Random Sample.

Practical :-

- 1- Graphical Representation of Data.
- 2- Measures of Central Tendency (Ungrouped data) with Calculation of Quartiles, Deciles & Percentiles.
- 3- Measures of Central Tendency (Grouped data) with Calculation of Quartiles, Deciles & Percentiles.
- 4- Measures of Dispersion (Ungrouped Data). Measures of Dispersion (Grouped Data).
- 5- Moments, Measures of Skewness & Kurtosis (Ungrouped Data).
- 6- Correlation & Regression Analysis.
- 7- Application of One Sample t-test. Application of Two Sample Fisher's t-test.
- 8- Chi-Square test of Goodness of Fit. Chi-Square test of Independence of Attributes for 2×2 contingency table.
- 9- Analysis of Variance One Way Classification. Analysis of Variance Two Way Classification.

• References:

1. Cochran.W.G. (1989) Sampling Techniques. Oxford and IBH Publishing Co.
2. Fisher.R.A. and Yates (1948) Statistical Tables for Biological, Agricultural and Medical Research. Oliver & Boyd, Edinburg.
3. Ferrol H. Zar. (2005) Biostatistical Analysis. Fourth Edition, Pearson Education, India.
4. Chandel, S.R.S. 1998. Handbook of Agril. Statistics. Achal Prakashan Mandir, Kanpur.
5. Gupta S.P. 2002. Statistical Methods. Sultan Chand & Sons, New Delhi.
6. Agarwal B.L. 1991. Basic Statistics Wiley Eastern, New Delhi.

B.Sc. (Hons) Ag. 2nd Semester

Fundamentals of Horticulture-2(1+1)

Unit 1- Horticulture-Its definition and branches, importance and scope; horticultural and botanical classification; climate and soil for horticultural crops.

Unit 2- Plant propagation-methods and propagating structures; principles of orchard establishment; Principles and methods of training and pruning, juvenility and flower bud differentiation.

Unit 3- unfruitfulness; pollination, pollinizers and pollinators; fertilization and parthenocarpy.

Unit 4- kitchen gardening; garden types and parts; lawn making; medicinal and aromatic plants; species and condiments.

Unit 5- use of plant bio-regulators in horticulture. Irrigation & fertilizers application-method and quantity.

Practical :-

- 1- Identification of garden tools.
- 2- Identification of horticultural crops.
- 3- Preparation of seed bed/nursery bed.
- 4- Practice of sexual and asexual methods of propagation.
- 5- Layout and planting of orchard plants.
- 6- Training and pruning of fruit trees.
- 7- Transplanting and care of vegetable seedlings.
- 8- Making of herbaceous and shrubby borders.
- 9- Preparation of potting mixture, potting and repotting.
- 10- Fertilizer application in different crops.
- 11- Visits to commercial nurseries/orchard.

Reference:

1. Chadha, K.L. Handbook of Horticulture (2002) ICAR, NewDelhi
2. D.K. Salunkhe and S.S. Kadam A handbook of Fruit Science and Technology (2013) CRC Press
3. Jitendra Singh Basic Horticulture (2011) Kalyani Publications, New Delhi
4. K.V.Peter Basics Horticulture (2009) New India Publishing Agency
5. Kausal Kumar Misra and Rajesh Kumar Fundamentals of Horticulture 2014 Biotech Books

B.Sc. (Hons) Ag. 2nd Semester

Fundamentals of Crop Physiology-2(1+1)

Unit 1- Introduction to crop physiology and its importance in Agriculture; Plant cell: an Overview; Diffusion and osmosis; Absorption of water, transpiration and Stomatal Physiology; Mineral nutrition of Plants.

Unit 2- Functions and deficiency symptoms of nutrients, nutrient uptake mechanisms; Photosynthesis.

Unit 3- Light and Dark reactions, C₃, C₄ and CAM plants; Respiration: Glycolysis, TCA cycle and electron transport chain; Fat Metabolism: Fatty acid synthesis and Breakdown.

Unit 4- Plant growth regulators: Physiological roles and agricultural uses.

Unit 5- Physiological aspects of growth and development of major crops: Growth analysis, Role of Physiological growth parameters in crop productivity.

Practical :-

- 1- Study of plant cells.
- 2- structure and distribution of stomata, imbibitions, osmosis and plasmolysis.
- 3- measurement of root pressure.
- 4- measurement of rate of transpiration.
- 5- Separation of photosynthetic pigments through paper chromatography.
- 6- Rate of transpiration.
- 7- Rate of photosynthesis.
- 8- Rate of respiration.
- 9- Tissue test for mineral nutrients, estimation of relative water content.
- 10- Measurement of photosynthetic CO₂ assimilation by Infra Red Gas Analyser (IRGA).

References:

1. N. K. Gupta & Sunita Gupta, 2004. Plant Physiology. Oxford and IBH publication, New Delhi.
2. S. N. Pandey and B. K. Sinha (1995). Vikas Publishing House Pvt. Ltd., new Delhi
3. J. B. Salisbury and C.W. Ross (1992). Plant Physiology, Wadswar Publishing Company, Belmont, California
4. L. Taiz and E. Zieger (2006). Plant Physiology. 4th Ed. Sinauer Associates.

B.Sc. (Hons) Ag. 2nd Semester

Fundamentals of Plant Pathology-4(3+1)

- Unit 1-** Introduction: Importance of plant diseases, scope and objectives of Plant Pathology. History of Plant Pathology with special reference to Indian work. Terms and concepts in Plant Pathology. Pathogenesis. Cause and classification of plant diseases. Important plant pathogenic organisms, different groups: fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasmas, viruses, viroids, algae, protozoa, phanerogamic parasites and nematodes with examples of diseases caused by them. Diseases and symptoms due to abiotic causes.
- Unit 2-** Fungi: general characters, definition of fungus, somatic structures, types of fungal thalli, fungal tissues, modifications of thallus, reproduction (asexual and sexual). Nomenclature, Binomial system of nomenclature, rules of nomenclature, classification of fungi. Key to divisions, sub-divisions, orders and classes.
- Unit 3-** Bacteria and mollicutes: general morphological characters. Basic methods of classification and reproduction.
- Unit 4-** Viruses: nature, architecture, multiplication and transmission. Study of phanerogamic plant parasites.
- Unit 5-** Nematodes: General morphology and reproduction, classification, symptoms and nature of damage caused by plant nematodes (Heterodera, Meloidogyne, *Anguina* etc.) Principles and methods of plant disease management. Nature, chemical combination, classification, mode of action and formulations of fungicides and antibiotics.

Practical :-

1. Acquaintance with various laboratory equipments and microscopy.
2. Preparation of media, isolation and Koch's postulates.
3. General study of different structures of fungi.
4. Study of symptoms of various plant diseases.
5. Study of representative fungal genera.
6. Staining and identification of plant pathogenic bacteria.
7. Transmission of plant viruses.
8. Study of phanerogamic plant parasites.
9. Study of morphological features and identification of plant parasitic nematodes.
10. Extraction of nematodes from soil.
11. Study of fungicides and their formulations.
12. Methods of pesticide application and their safe use.
13. Calculation of fungicide sprays concentrations.

References:

1. Agrios GN. 2005. *Plant Pathology*. 5th Ed. Academic Press, New York. (Indian Ed.)
2. Mehrotra, R.S. and Aggarawal, A. 2007. *Plant Pathology*. Tata McGraw Hill Publishing Co. Ltd., New Delhi
3. Singh, R.S. 2005. 4th ed. *Principles of Plant Pathology*. Oxford & IBH, New Delhi.
4. Nene, Y.L. 2015. *Fungicides in Plant Diseases Control*. Oxford & IBH published Co. Pvt. Ltd., New Delhi
5. Vander plank, J.E. (2014) *Host Pathogen Interactions in Plant Diseases*. A.P.

B.Sc. (Hons) Ag. 3rd Semester

Agricultural Microbiology-2(1+1)

Unit 1-Introduction. Microbial world: Prokaryotic and eukaryotic microbes. Bacteria: cell structure, chemoautotrophy, photo autotrophy, growth.

Unit 2- Bacterial genetics: Genetic recombination-transformation, conjugation and transduction, plasmids, transposon.

Unit 3-Role of microbes in soil fertility and crop production: Carbon, Nitrogen, Phosphorus and Sulphur cycles.

Unit 4- Biological nitrogen fixation- symbiotic, associative and asymbiotic. Azolla, blue green algae and mycorrhiza. Rhizosphere and phyllosphere.

Unit 5- Microbes in human welfare: silage production, biofertilizers, biopesticides, biofuel production and biodegradation of agro-waste.

Practical

- 1-Introduction to microbiology laboratory and its equipments
- 2- Microscope- parts,
- 3- principles of microscopy, resolving power and numerical aperture.
- 4- Methods of sterilization.
- 5- Nutritional media and their preparations.
- 6- Enumeration of microbial population in soil- bacteria, fungi, actinomycetes.
- 7-Methods of isolation and purification of microbial cultures.
- 8-Isolation of Rhizobium from legume root nodule.
- 9- Isolation of Azotobacter from soil.
- 10-Isolation of Azospirillum from roots.
- 11-Isolation of BGA.
- 12-Staining and microscopic examination of microbes.

References:

1. Biswas, T.D. and Mukherjee, S.K. 1990. Text Book of Soil Sciences, Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. Mukherjee, N. and Ghosh T. 1998. Agricultural Microbiology, Kalyani Publishers, New Delhi.
3. Pelczar, Jr. Michel J. Chan, E.C.S. and Krieg, Noel R. 1997. Microbiology. Tata McGraw -Hill Edition, 1993. India.
4. Rangaswami, G. and Bagyaraj, D.J. 2010. IInd ed. Agricultural Microbiology. Prentice Hall of India Pvt. Limited, New Delhi.
5. Mehrotra, R.S. and Aggarawal, A. 2012. I2th ed. Plant Pathology. Tata McGraw Hill Publishing Co. Ltd., New Delhi

B.Sc. (Hons) Ag. 3rd Semester

Fundamentals of Agricultural Extension Education-3(2+1)

Unit 1-Education: Meaning, definition & Types; Extension Education- meaning, definition, scope and process; objectives and principles of Extension Education; Extension Programme planning-Meaning, Process, Principles and Steps in Programme Development.

Unit 2- Extension systems in India: extension efforts in pre-independence era (Sriniketan, Marthandam, Firka Development Scheme, Gurgaon Experiment, etc.) and post-independence era (Etawah Pilot Project, Nilokheri Experiment, etc.); various extension/ agriculture development programmes launched by ICAR/Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND,NATP, NAIP, etc.). New trends in agriculture extension: privatization extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems, etc.

Unit 3-Rural Development: concept, meaning, definition; various rural development programmes launched by Govt. of India. Community Dev.-meaning, definition, concept & principles,Philosophy of C.D.

Unit 4-Rural Leadership: concept and definition, types of leaders in rural context; extension administration: meaning and concept, principles and functions. Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programmes; transfer of technology: concept and models, capacity building of extension personnel; extension teaching methods: meaning, classification, individual, group and mass contact methods, ICT Applications in TOT (New and Social Media), media mix strategies.

Unit 5- communication: meaning and definition;Principles and Functions of Communication, models and barriers to communication. Agriculture journalism; diffusion and adoption of innovation: concept and meaning, process and stages of adoption, adopter categories.

Practical

- 1-To get acquainted with university extension system.
- 2- Group discussion- exercise; handling and use of audio visual equipments and digital camera and LCD projector; preparation and use of AV aids, preparation of extension literature – leaflet, booklet, folder, pamphlet news stories and success stories.
- 3-Presentation skills exercise.
- 4- micro teaching exercise.
- 5- A visit to village to understand the problems being encountered by the villagers/ farmers; to study organization and functioning of DRDA and other development departments at district level.
- 6- visit to NGO and learning from their experience in rural development.
- 7-understanding PRA techniques and their application in village development planning; exposure to mass media.
- 8- visit to community radio and television studio for understanding the process of programme production.
- 9-script writing, writing for print and electronic media, developing script for radio and television.

References:

1. Adivi Reddy, A., 2001, *Extension Education*, Sree Lakshmi press, Bapatla.
2. Dahama, O. P. and Bhatnagar, O. P., 1998, *Education and Communication for Development*, Oxford and IBH publishing Co. Pvt. Ltd., New Delhi.
3. Jalihal, K. A. and Veerabhadraiah, V., 2007, *Fundamentals of Extension Education and Management in Extension*, Concept publishing company, New Delhi.
4. Muthaiah Manoraharan, P. and Arunachalam, R., *Agricultural Extension*, Himalaya Publishing House (Mumbai).
5. Rathore, O. S. *et al.*, 2012, *Handbook of Extension Education*, Agrotech Publishing Academy, Udaipur.

B.Sc. (Hons) Ag. 3rd Semester

Crop Production Technology-I (Kharif Crops) -2(1+1)

Unit 1-Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Kharif crops.

Unit 2- Cereals – rice, maize, sorghum, pearl millet and finger millet,

Unit 3- pulses-pigeonpea, mungbean and urdbean;

Unit 4- oilseeds- groundnut, and soybean.

Unit 5-fibre crops- cotton & jute; forage crops-sorghum, cowpea, cluster bean and napier.

Practical

- 1-Rice nursery preparation, transplanting of rice,
- 2-Sowing of soybean, pigeonpea, mungbean, maize, groundnut and cotton,
- 3-Effect of seed size on germination and seedling vigour of kharif season crops,
- 4- Effect of sowing depth on germination of kharif crops,
- 4- Identification of weeds in kharif season crops,
- 5- Top dressing and foliar feeding of nutrients,
- 6-Study of yield contributing characters and yield calculation of kharif season crops,
- 7-Study of crop varieties and important agronomic experiments at experimental farm.
- 8- Study of forage experiments, morphological description of kharif season crops,
- 9- Visit to research centres of related crops.

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. New York.
- Field crops. Rajendra Prasad
- A textbook of Agronomy- B. Chandrasekaran. New Age International Publishers.

B.Sc. (Hons) Ag. 3rd Semester

Agricultural Finance and Co-Operation-3(2+1)

Unit 1-Agricultural Finance- meaning, scope and significance, credit needs and its role in Indian agriculture. Agricultural credit: meaning, definition, need, classification. Credit analysis: 4 R's, and 3C's of credits.

Unit 2- Sources of agricultural finance: institutional and non-institutional sources, commercial banks, social control and nationalization of commercial banks, Micro financing including KCC.

Unit 3- Lead bank scheme, RRBs, Scale of finance and unit cost. An introduction to higher financing institutions – RBI, NABARD, ADB, IMF, world bank, Insurance and Credit Guarantee Corporation of India. Cost of credit. Recent development in agricultural credit.

Unit 4-Preparation and analysis of financial statements – Balance Sheet and Income Statement. Basic guidelines for preparation of project reports- Bank norms – SWOT analysis.

Unit 5-Agricultural Cooperation – Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significance of cooperatives in Indian agriculture. Agricultural Cooperation in India- credit, marketing, consumer and multi-purpose cooperatives, farmers' service cooperative societies, processing cooperatives, farming cooperatives, cooperative warehousing; role of ICA, NCUI, NCDC, NAFED.

Practicals

- 1-Determination of most profitable level of capital use.
- 2- Optimum allocation of limited amount of capital among different enterprise.
- 3- Analysis of progress and performance of cooperatives using published data.
- 4-Analysis of progress and performance of commercial banks and RRBs using published data.
- 5-Visit to a commercial bank, cooperative bank and cooperative society to acquire firsthand knowledge of their management, schemes and procedures.
- 6- Estimation of credit requirement of farm business – A case study.
- 7- Preparation and analysis of balance sheet – A case study.
- 8-Preparation and analysis of income statement – A case study.
- 9- Appraisal of a loan proposal

References:

1. S. Subba Reddy, P. Raghu Ram, 1996, Agricultural finance and management, Oxford & IBH Pub. Co, New Delhi
2. Kamat, G.S., 1978, New Dimensions of Cooperative Management, Himalyan Publishing House, Mumbai.
3. Nelson and Murray, 1988. Agricultural Finance. Kalyani Publishers, New Delhi.
4. Pandey, U.K. 1990. An Introduction to Agricultural Finance, Kalyani Publishers, New Delhi.
5. Singh, J.P., 1988, Agricultural Finance Theory and Practices, Ashish Publishing House, New Delhi.

B.Sc. (Hons) Ag. 3rd Semester

Agri-Informatics-2(1+1)

Unit I- Introduction to Computers, hardware and software; input and output devices; Operating systems (OS) - Definition, Basic Concepts, Types, Introduction to Windows and LINUX Operating Systems; Computer Network, LAN, WAN, Algorithms, Flowcharts, Introduction to Programming Languages, Types and Comparison.

Unit II- Introduction to MS Office – MS-Word, MS-Excel, MS-Power Point, MS-Access, Applications of MS Office for document creation & Editing, Data presentation, interpretation and graph creation, statistical analysis, mathematical expressions, Database, Concepts and types, uses of DBMS in Agriculture.

Unit III- Audio visual aids - Definition, advantages, classification and choice of A.V aids; cone of experience and criteria for selection and evaluation of A.V aids; video conferencing. Communication process, Berlo's model, feedback and barriers to communication.

Unit IV- World Wide Web: Internet, WWW, HTML and IP, e-Agriculture, concepts and applications, Use of ICT in Agriculture. Computer Models for understanding plant processes.

Unit V- IT and its importance, IT tools, IT-enabled services and their impact on society; IT application for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management, Smartphone Apps in Agriculture for farm advisory, e-banking markets market price, postharvest management etc; Geospatial technology for generating valuable agri-information. Decision support systems, concepts, and applications in Agriculture, Agriculture Expert System, Soil Information Systems for supporting Farm decisions. Preparation of contingent crop-planning using IT tools.

Practical

1. Study of Computer Components, Practice of important DOS Commands. Introduction of different operating systems such as windows, Unix/ Linux, Creating, Files & Folders, Exercises on Number System, algorithm and flow chart
2. Use of MS-WORD and MS Power-point for creating, editing and presenting a scientific Document. MS-EXCEL - Creating a spreadsheet, use of statistical tools, writing expressions, creating graphs, analysis of scientific data.
3. MS-ACCESS: Creating Database, preparing queries and reports, demonstration of Agri-information system.
4. Internet applications: Web Browsing, Creation and operation of Email account; Analysis of fisheries data using MS Excel. Handling of audio visual equipments. Organization of an audio visual programme, Planning, preparation, presentation of posters, charts, overhead transparencies and slides.
5. Hands on Crop Simulation Models (CSM) such as DSSAT/Crop-Info/CropSyst/Wofost; Computation of water and nutrient requirements of crop using CSM and IT tools. Introduction of Geospatial Technology for generating valuable information for Agriculture. Hands on Decision Support System. Preparation of contingent crop planning. Forecasting and early warning.

Text & Reference Books:

- Computers Today, By S.K Basandra, Galgotia Publications.
- Fundamentals Of Information Technology Alexis Leon & Mathews Leon, , Vikas Publishing
- Anurag Seetha, "Introduction to Computers and Information Technology", Ram Prasad & Sons, Bhopal.
- MS-Office, Dr. S.S. Srivastava, Firewall Media, 2008
- Agricultural Systems Modeling And Simulation, Robert M. Peart, W. David Shoup, CRC Press

B.Sc. (Hons) Ag. 3rd Semester

Farm Machinery and Power-2(1+1)

Unit 1-Status of Farm Power in India, Sources of Farm Power , I.C. engines, working principles of I C engines, comparison of two stroke and four stroke cycle engines .

Unit 2- Study of different components of I.C. engine, I.C. engine terminology and solved problems, Familiarization with different systems of I.C. engines: Air cleaning, cooling, lubrication ,fuel supply and hydraulic control system of a tractor.

Unit 3- Familiarization with Power transmission system : clutch, gear box, differential and final drive of a tractor , Tractor types, Cost analysis of tractor power and attached implement.

Unit 4- Familiarization with Primary and Secondary Tillage implement, Implement for hill agriculture,implement for intercultural operations.

Unit 5-Familiarization with sowing and planting equipment,calibration of a seed drill and solved examples, Familiarization with Plant Protection equipment,Familiarization with harvesting and threshing equipment.

Practicals

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

References:

1. Principles of Agricultural Engineering. Vol. I. 2012. Michael, A.M. and T.P. Ojha. Jain Brothers, Jodhpur.
2. Farm Tractors, Maintenance and Repair.1989. Rai and Jain. Tata Mc Graw Hill Publ. New Delhi.
3. Elements of Farm Machinery.1989. Srivastava, A.C. Oxford IBH Publ. Company, New Delhi.
4. Elements of Agricultural Engineering, Vol. I & III. 1989. Singhal, O.P. Suraj Prakashan, Allahabad.
5. Element of Agricultural Engineering. 1990. Sahay, Jagdishwar. Agro. Book Agency, New Chitragupta Nagar, Patna.

B.Sc. (Hons) Ag. 3rd Semester

Production Technology for Vegetables and Spices-2(1+1)

Unit 1-Importance of vegetables & spices in human nutrition and national economy, kitchen gardening, brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation,

Unit 2-weed management, harvesting and yield, physiological disorders, of important vegetable and spices (Tomato, Brinjal, Chilli, Capsicum, Cucumber, Melons, Gourds, Pumpkin, French bean.

Unit 3-Peas; Cole crops such as Cabbage, Cauliflower, Knol-khol;

Unit 4- Bulb crops such as Onion, Garlic; Root crops such as Carrot, Raddish, Beetroot; Tuber crops such as Potato.

Unit 5-Leafy vegetables such as Amaranth, Palak. Perennial vegetables).

Practical

- 1-Identification of vegetables & spice crops and their seeds.
- 2- Nursery raising.
- 3- Direct seed sowing and transplanting.
- 4- Study of morphological characters of different vegetables & spices.
- 5- Fertilizers applications.
- 6- Harvesting & preparation for market.
- 7- Economics of vegetables and spices cultivation.

References:

- 1 B.R.Choudhary A Text book on production technology of vegetables (2009) Kalyani Publishers
- 2 K S Yawalkar Vegetable crops in India (2008) Agri-Horticultural Pub. House. Nagpur
- 3 K.V.Kamath Vegetable Crop Production (2007) Oxford Book Company
- 4 M.K.Rana Olericulture in India (2008) Kalyani Publishers
- 5 M.S.Dhaliwal Handbook of Vegetable Crops (2008) Kalyani Publishers

B.Sc. (Hons) Ag. 3rd Semester
Principles of Integrated Pest and Disease Management-3(2+1)

Unit 1-Categories of insect pests and diseases, IPM: Introduction, history, importance, concepts, principles and tools of IPM.

Unit 2- Economic importance of insect pests, diseases and pest risk analysis. Methods of detection and diagnosis of insect pest and diseases. Calculation and dynamics of economic injury level and importance of Economic threshold level.

Unit 3- Methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control.

Unit 4- Ecological management of crop environment. Introduction to conventional pesticides for the insect pests and disease management. Survey surveillance and forecasting of Insect pest and diseases. Development and validation of IPM module.

Unit 5- Implementation and impact of IPM (IPM module for Insect pest and disease. Safety issues in pesticide uses. Political, social and legal implication of IPM. Case histories of important IPM programmes. Case histories of important IPM programmes.

Practical

- 1- Methods of diagnosis and detection of various insect pests, and plant diseases.
- 2- Methods of insect pests and plant disease measurement.
- 3- Assessment of crop yield losses.
- 4- calculations based on economics of IPM.
- 5- Identification of biocontrol agents, different predators and natural enemies.
- 6- Mass multiplication of Trichoderma, Pseudomonas, Trichogramma, NPV etc.
- 7- Identification and nature of damage of important insect pests and diseases and their management.
- 8- Crop (agroecosystem) dynamics of a selected insect pest and diseases.
- 9- Plan & assess preventive strategies (IPM module) and decision making.
- 10- crop monitoring attacked by insect, pest and diseases .
- 11- Awareness campaign at farmers fields.

Text Book:

- Agriculture Entomology - By Mathur and Uppadhyay Kalyani publication
- A Text Book of Entomology - By Mathur and Uppadhyay 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
- Vertebrate Zoology - By R L Kotpal

B.Sc. (Hons) Ag. 3rd Semester

Crop Improvement – I (Kharif)- 2(1+1)

Unit 1-Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds;fibres; fodders and cash crops; vegetable and horticultural crops.

Unit 2- Plant genetic resources, its utilization and conservation, study of genetics of qualitative and quantitative characters.

Unit 3- Important concepts of breeding self pollinated, cross pollinated and vegetatively propagated crops.

Unit 4- Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional).

Unit 5- Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeonpea, etc. Ideotype concept and climate resilient crop varieties for future.

Practical

1-Floral biology, emasculation and hybridization techniques in different crop species; viz., Rice,Jute, Maize, Sorghum, Pearl millet, Ragi, Pigeonpea, Urdbean, Mungbean, Soybean, Groundnut,Seasame, Caster, Cotton, Cowpea, Tobacco, Brinjal, Okra and Cucurbitaceous crops.

2- Maintenance breeding of different kharif crops.

3- Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods.

4- Study of field techniques for seed production and hybrid seeds production in Kharif crops. 5- Estimation of heterosis, inbreeding depression and heritability.

6- Layout of field experiments.

7- Study of quality characters, donor parents for different characters.

8-Visit to seed production plots; Visit to AICRP plots of different field crops.

References:

1. Chopra, V.L. 2000. Breeding of Field Crops (Edt.). Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Chaddha. K.L. and Rajendra Gupta. 1995. Vol. II Medicinal and Aromatic Plant. Malhotra Publishing House, New Delhi.
3. Mandal, A. K., P.K. Ganguli and S.P. Banerjee. 1991. Advances in Plant Breeding. Vol. I and II. CBS Publishers and Distributors, New Delhi.
4. Manjit S. Kang 2004. Crop Improvement: Challenges in the Twenty-First Century (Edt). International Book Distributing Co. Lucknow.
5. Poehlman, J.M. 1987. Breeding of Field Crops. AVI Publishing Co. INC, East Port, Conneacticut, USA.

B.Sc. (Hons) Ag. 3rd Semester

Practical Crop Production-I (Kharif Crops)- 2(0+2)

Practical

1-Crop planning, raising field crops in multiple cropping systems.

2- Field preparation, seed,treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce.

3- The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies.

4- Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.

References:

1. Yawalkar, K.S., Agarwal, J.P. and Bokde, S. 2008. Manures and Fertilizers (10th edition), Agri-Horticultural Publishing House, Nagpur.
2. Balasubramaniyan, P. and Palaniappan, S.P. 2016. Principles and Practices of AgronomyAgrobios (India), Jodhpur.
3. Reddy, S. R., 2016. Principles of Agronomy (5th edition), Kalyani Publishers, Ludhiana.
4. Singh, S.S. and Singh, Rajesh. 2015. Principles and Practices of Agronomy (5th Re-set), Kalyani Publishers, New Delhi, Kalyani Publishers, Ludhiana.

B.Sc. (Hons) Ag. 4th Semester

Introductory Soil and Water Conservation Engineering -2(1+1)

Unit-1 Introduction to Soil and Water Conservation, causes of soil erosion. Definition and agents of soil erosion,

Unit-2 Water erosion: Forms of water erosion. Gully classification and control measures. Soil loss estimation by universal Loss Soil Equation. Soil loss measurement techniques.

Unit-3 Principles of erosion control: Introduction to contouring, strip cropping. Contour bund. Graded bund and bench terracing. Grassed water ways and their design.

Unit-4 Water harvesting and its techniques. Wind erosion: mechanics of wind erosion, types of soil movement.

Unit-5 Principles of wind erosion control and its control measures.

Practical

1-General status of soil conservation in India.

2- Calculation of erosion index.

3- Estimation of soil loss.

4-Measurement of soil loss.

5-Preparation of contour maps.

6-Design of grassed water ways.

7- Design of contour bunds.

8-Design of graded bunds.

9-Design of bench terracing system.

10- Problem on wind erosion.

References:

1. Land and Water Management Engineering. 1982. Murthy V.V.N. Kalyani Pubhliers, New Delhi.
2. Irrigation: Theory and Practices.2012. Michael A.M. Vikas Publishing House Pvt. Ltd., New Delhi.
3. Principles of Agricultural. Engineering. Vol. II. 2012. Michael A.M. and T.P. Ojha. Jain Brothers, New Delhi.
4. Soil and Water Conservation Water Management. 2010. Mahnot, S.C., Singh P.K. and Chaplot, P.C., Apex Publication House, Udaipur.

B.Sc. (Hons) Ag. 4th Semester

Crop Production Technology-II (Rabi crops)- 2(1+1)

Unit-1 Origin, geographical distribution, economic importance, soil and climatic requirements, varieties,

cultural practices and yield of Rabi crops; cereals –wheat and barley,

Unit-2 Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Rabi crops; pulses-chickpea, lentil, peas.

Unit-3 Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops; oilseeds-rapeseed, mustard and sunflower.

Unit-4 Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops; sugar crops-sugarcane; medicinal.

Unit-5 Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Rabi crops ;aromatic crops- mentha , lemon grass and citronella, Forage crops-berseem, lucerne and oat.

Practical

- 1-Sowing methods of wheat and sugarcane,
- 2-Identification of weeds in rabi season crops,
- 3-Study of morphological characteristics of rabi crops,
- 4- Study of yield contributing characters of rabi season crops,
- 5-Yield and juice quality analysis of sugarcane,
- 6-Study of important agronomic experiments of rabi crops at experimental farms.
- 7-Study of rabi forage experiments,
- 8- Oil extraction of medicinal crops,
- 9- Visit to research stations of related crops.

References:

1. Singh, Chhidda, Singh, Prem and Singh, Rajbir.2003. Modern Techniques of Raising Field Crops, Oxford & IBH Publishing Co., New Delhi.
2. Singh, S.S.1998. Crop Management Under Irrigated and Rainfed Conditions. Kalyani Publishers, New Delhi.
3. Panda, S.C.2012. Modern Concepts and Advance Principles in Crop Production. Agrobios (India), Jodhpur
4. Singh, S.S.and Singh, Rajesh. 2013. Crop Management Under Irrigated and Rainfed Conditions. Kalyani Publishers, New Delhi.
5. Rathore, P.S. 2000. Techniques and Management of Field Crop Production, Agrobios (India), Jodhpur.
6. Prasad, Rajendra. 2002. Text Book of Field Crops Production, ICAR, New Delhi

B.Sc. (Hons) Ag. 4th Semester

Manures, Fertilizers and Soil Fertility Management-3(2+1)

- Unit-1** Introduction and importance of organic manures, properties and methods of preparation of bulky and concentrated manures. Green/leaf manuring. Fertilizer recommendation approaches.
- Unit-2** Integrated nutrient management. Chemical fertilizers: classification, composition and properties of major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, Complex fertilizers, Soil amendments, Fertilizer Storage, Fertilizer Control Order.
- Unit-3** History of soil fertility and plant nutrition. criteria of essentiality. role, deficiency and toxicity symptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants.
- Unit-4** Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients. Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil. Forms of nutrients in soil, plant analysis, rapid plant tissue tests. Indicator plants.
- Unit-5** Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions.

Practical

- 1-Introduction of analytical instruments and their principles.
- 2-Colorimetry and flame photometry.
- 3- Estimation of soil organic carbon.
- 4- Estimation of alkaline hydrolysable N in soils.
- 5- Estimation of soil extractable P in soils.
- 6- Estimation of exchangeable K; Ca and Mg in soils .
- 7- Estimation of soil extractable S in soils.
- 8- Estimation of DTPA extractable Zn in soils.
- 9- Estimation of N in plants.
- 10-Estimation of P in plants.
- 11- Estimation of K in plants.

References:-

1. Biswas, T.D. and Mukherjee, S.K. (2006) Text book of soil science. Tata McGraw Hill publishing Co. Ltd, New Delhi
2. Das, D.K. (2002) Introductory Soil Science, Kalyani publisher, New Delhi
3. Rai, M.M. (2002) Principal of Soil Science, Mac Millan India Ltd, New Delhi
4. Mehra R.K. (2004) Text book of Soil Science, ICAR New Delhi
5. ISSS (2002) Fundamental of Soil Science Div. of Soil Science, IARI, New Delhi

B.Sc. (Hons) Ag. 4th Semester

Protected Cultivation and Secondary Agriculture-2(1+1)

- Unit-1** Green house technology: Introduction, Types of Green Houses; Plant response to Green house environment, Planning and design of greenhouses, Design criteria of green house for cooling and heating purposes.
- Unit-2** Green house equipments, materials of construction for traditional and low cost green houses. 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.
- Unit-3** Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation.
- Unit-4** Drying and dehydration; moisture measurement, EMC, drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, recirculatory dryer and solar dryer).
- Unit-5** Material handling equipment; conveyer and elevators, their principle, working and selection.

Practical

- 1-Study of different type of green houses based on shape.
- 2-Determine the rate of air exchange in an active summer winter cooling system.
- 3- Determination of drying rate of agricultural products inside green house.
- 4-Study of green house equipments.
- 5- Visit to various Post Harvest Laboratories.
- 6-Determination of Moisture content of various grains by oven drying & infrared moisture methods.
- 7- Determination of engineering properties (shape and size, bulk density and porosity of biomaterials).
- 8- Determination of Moisture content of various grains by moisture meter.
- 9- Field visit to seed processing plant.

References:

1. Green house: Science and Technology. 2016. Kothari S, S.C.Kaushic and A.N.Mathur. Himanshu Publication, Udaipur.
2. Green House Technology- Application and Practice. Sharma A and V.M.Salokhe. 2006. Agro Tech. publication, Udaipur
3. Principles of Agricultural Engineering, Vol. I. 2012. Michael, A.M. and T. P. Ojha . Jain Brothers, New Delhi.
4. Post Harvest Technology of Cereals, Pulses and Oil Seeds.1999. Chakravarty, A. Oxford and IBH Pub. New Delhi.
5. Agricultural Process Engineering. 1955. Henderson, S.M. and R.L. Perry. John Willy and Sons, New York.

B.Sc. (Hons) Ag. 4th Semester

Production Technology for Ornamental Crops, MAPs and Landscaping-2(1+1)

- Unit-1** Importance and scope of ornamental crops, medicinal and aromatic plants and landscaping. Principles of landscaping. Landscape uses of trees, shrubs and climbers.
- Unit-2** Production technology of important cut flowers like rose, gerbera, carnation, liliun and orchids under protected conditions and gladiolus, tuberose, chrysanthemum under open conditions.
- Unit-3** Package of practices for loose flowers like marigold and jasmine under open conditions.
- Unit-4** Production technology of important medicinal plants like ashwagandha, asparagus, aloe, costus, Cinnamomum, periwinkle, isabgol and aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, rose, geranium, vetiver.
- Unit-5** Processing and value addition in ornamental crops and MAPs produce.

Practical

- 1-Identification of Ornamental plants.
- 2-Identification of Medicinal and Aromatic Plants.
- 3- Nursery bed preparation and seed sowing.
- 4-Training and pruning of Ornamental plants.
- 5-Planning and layout of garden.
- 6-Bed preparation and planting of MAP.
- 7- Protected structures – care and maintenance.
- 8-Intercultural operations in flowers and MAP.
- 9- Harvesting and post harvest handling of cut and loose flowers.
- 10-Processing of MAP.
- 11-Visit to commercial flower/MAP unit.

References:

- 1 A.K. Tiwari and R. Kumar Fundamentals of ornamental horticulture and landscape gardening (2012) New India
- 2 Arora, J.S. Introductory Ornamental Horticulture (2006) Kalyani Publishers
- 3 Atal, E. K. and Kapur, B. Cultivation and Utilization of Medicinal and Aromatic plants (1982) CSIR, New Delhi
- 4 Azhar Ali Farooqui and Sreeramu, B.S. Cultivation of medicinal and aromatic plants (2001) United Press Limited
- 5 Bimaldas Chowdhury and Balai Lal Jana Flowering Garden trees (2014) Pointer publishers, Jaipur
- 6 Bose, T.K. Malti, R.G. Dhua, R.S. & Das, P. Floriculture and Landscaping (2004) Nayaprakash

B.Sc. (Hons) Ag. 4th Semester

Introductory Agrometeorology & Climate Change-2(1+1)

- Unit-1** Meaning and scope of agricultural meteorology; Earth atmosphere- its composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze;
- Unit-2** Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, longwave and thermal radiation, net radiation, albedo; Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature,
- Unit-3** Energy balance of earth; Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud; Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification; Artificial rainmaking.
- Unit-4** Monsoon- mechanism and importance in Indian agriculture, Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold-wave. Agriculture and weather relations; Modifications of crop microclimate, climatic normals for crop and livestock production.
- Unit-5** Weather forecasting- types of weather forecast and their uses. Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture.

Practical

- 1-Visit of Agrometeorological Observatory.
- 2-Site selection of observatory.
- 3-Exposure of instruments and weather data recording.
- 4-Measurement of total, shortwave and longwave radiation, and its estimation using Planck's intensity law.
- 5- Measurement of albedo and sunshine duration.
- 6-computation of Radiation Intensity using BSS.
- 7- Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis.
- 8-Measurement of soil temperature and computation of soil heat flux.
- 9-Determination of vapor pressure and relative humidity.
- 10-Determination of dew point temperature.
- 11- Measurement of atmospheric pressure and analysis of atmospheric conditions.
- 12-Measurement of wind speed and wind direction, preparation of wind rose.
- 13- Measurement, tabulation and analysis of rain.
- 14-Measurement of open pan evaporation and evapotranspiration.
- 15-Computation of PET and AET.

References:

1. Sacheti, A.K. 1985. Agricultural Meteorological Instructional Cum Practical Manual (Ed.) NCERT Publication, New Delhi.
2. Lal, D.S. 2005 Climatology, Sharda Pustak Bhawan, Allahabad..
3. Varshneya, M.C. and Balakrishna, Pillai, 2003. Text book of Agricultural Meteorology. ICAR, New-Delhi.
4. Sahu, D.D., 2007. Agrometeorology and Remote sensing: Principles and Practices , Agrobios (India) , Jodhpur.
5. Murithy, K, and Radha, V. 1995. Practical Manual on Agricultural Meteorology , Kalyani Publishers, New-Delhi

B.Sc. (Hons) Ag. 4th Semester

Rainfed Agriculture and Watershed Management-2(1+1)

- Unit-1** Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India; Problems and prospects of rainfed agriculture in India ;
- Unit-2** Soil and climatic conditions prevalent in rainfed areas; Soil and water conservation Techniques.
- Unit-3** Drought: types, effect of water deficit on physio-morphological characteristics of the plants, Crop adaptation and mitigation to drought;
- Unit-4** Water harvesting: importance, its techniques, Efficient utilization of water through soil and crop management practices, Management of crops in rainfed areas,
- Unit-5** Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management, factors affecting watershed management.

Practical

- 1-Studies on climate classification,
- 2- Studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons.
- 3- Studies on cropping pattern of different rainfed areas in the country and demarcation of rainfed area on map of India.
- 4- Interpretation of meteorological data and scheduling of supplemental irrigation on the basis of evapo-transpiration demand of crops.
- 5- Critical analysis of rainfall and possible drought period in the country, effective rainfall and its calculation.
- 6-Studies on cultural practices for mitigating moisture stress.
- 7- Characterization and delineation of model watershed.
- 8-Field demonstration on soil & moisture conservation measures.
- 9-Field demonstration on construction of water harvesting structures.
- 10- Visit to rainfed research station/watershed.

References:

1. Jayanthi, C. and Kalpana, R. 2016. Dryland Agriculture, Kalyani Publishers, Ludhiana.
2. Reddy, S.R. and Reddy, G. Prabhakara. 2015. Dryland Agriculture, Kalyani Publishers, Ludhiana.
3. Murthy, J. V. S. 1994. Watershed Management, Wiley Eastern Limited. New Age International Limited, New Delhi.
4. Dhruva Narayan, V.V. Singh, P.P., Bhardwaj, S.P., U. Sharma, Sikha, A.K., Vital, K.P.R. and Das, S.K. 1987. Watershed Management for Drought Mitigation, ICAR, New Delhi.
5. Singh, R.P., Sharma, S., Padmnabhan, N.V. , Das, S.K. and Mishra, P.K. 1990. A Field Manual on Watershed Management, ICAR (CRIDA), Hyderabad

B.Sc. (Hons) Ag. 4th Semester

Pests of Crops and Stored Grains and their Management -3(2+1)

- Unit-1** General account on nature and type of damage by different arthropods pests. Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage.
- Unit-2** Management of major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests of various field crop, vegetable crop, fruit crop, plantation crops, ornamental crops, spices and condiments.
- Unit-3** Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain.
- Unit-4** Insect pests, mites, rodents, birds and microorganisms associated with stored grain and their management.
- Unit-5** Storage structure and methods of grain storage and fundamental principles of grain store management.

Practical

- 1-Identification of different types of damage.
- 2- Identification and study of life cycle and seasonal
- 3-History of various insect pests attacking crops and their produce: (a) Field Crops; (b) Vegetable Crops; (c) Fruit Crops; (d) Plantation, gardens, Narcotics, spices & condiments.
- 4- Identification of insect pests and Mites associated with stored grain.
- 5- Determination of insect infestation by different methods.
- 6-Assessment of losses due to insects.
- 7- Calculations on the doses of insecticides application technique.
- 8- Fumigation of grain store / godown.
- 9-Identification of rodents and rodent control operations in godowns.
- 10- Identification of birds and bird control operations in godowns.
- 11-Determination of moisture content of grain.
- 12- Methods of grain sampling under storage condition.
- 13-Visit to Indian Storage Management and Research Institute, Hapur and Quality Laboratory.
- 14-Department of Food., Delhi. Visit to nearest FCI godowns.

References:

1. Atwal, A.S. and Dhaliwal, G.S. 2002. Agricultural Pests of South Asia and Their Management, Kalyani Publishers, New Delhi.
2. David, B.V. and Ramamurthy, V.V. 2016. Elements of Economic Entomology, 8th Ed. Popular Book Depot, Chennai.
3. Mathur and Upadhyay, 2005. A Text Book of Entomology, Aman Publishing House, Meerut.
4. Nayar, M.R.G.K. 1986. Insects and Mites of Crops in India, ICAR, New Delhi.
5. Srivastava, K.P. 2004. A Text Book of Entomology, Vol. I & II, Kalyani Publishers, New Delhi.

Diseases of Field & Horticultural Crops & their Management-II -3(2+1)

Unit-1 Symptoms, etiology, disease cycle and management of following diseases:Field Crops:Wheat: rusts, loose smut, karnal bunt, powdery mildew, alternaria blight, and ear cockle;

Unit-2 Sugarcane: red rot, smut, wilt, grassy shoot, ratoon stunting and Pokkah Boeng;Sunflower: Sclerotinia stem rot and Alternaria blight; Mustard: Alternaria blight, white rust,downy mildew and Sclerotinia stem rot;

Unit-3 Gram: wilt, grey mould and Ascochyta blight; Lentil: rust and wilt; Cotton: anthracnose, vascular wilt, and black arm; Pea: downy mildew, powdery mildew and rust.

Unit-4 Horticultural Crops:

Mango: anthracnose, malformation, bacterial blight and powdery mildew; Citrus: canker and gummosis; Grape vine: downy mildew, Powdery mildew and anthracnose; Apple: scab, powdery mildew, fire blight and crown gall; Peach: leaf curl.Strawberry: leaf spot Potato: early and late blight, black scurf, leaf roll, and mosaic.

Unit-5 Cucurbits: downy mildew, powdery mildew, wilt; Onion and garlic: purple blotch, and Stemphylium blight; Chillies: anthracnose and fruit rot, wilt and leaf curl; Turmeric: leaf spot Coriander: stem gall Marigold: Botrytis blight; Rose: dieback, powdery mildew and black leaf spot.

Practical

- 1-Identification and histopathological
- 2- Studies of selected diseases of field and horticultural crops covered in theory.
- 3-Field visit for the diagnosis of field problems.
- 4- Collection and preservation of plant diseased specimens for herbarium.

References:

1. Cook, A. A. 1981. Diseases of tropical and sub-tropical field fiber and oil plants. Mac Millan Publishing Co. New York.
2. Gupta V K and Paul, Y S 2008. IInd ed. Diseases of field crops. Kalyani Publishing Co. ND.
3. Mehrotra R S and Aggarwal A. 2012. 12th ed. Plant Pathology, Tata McGraw-Hill Publishing Co Ltd. ND.
4. Mishra A , Bohra A and Mishra , A. 2005. Plant Pathology. Agrobios. Jodhpur (India).
5. Rangaswamy,G and Mahadevan, A . 2012. 4th ed. Diseases of crop plants in India. Prentice hall of India Pvt Ltd, New Delhi.

B.Sc. (Hons) Ag. 4th Semester

Farm Management, Production and Resource Economics-2(1+1)

- Unit-1** Meaning and concept of farm management, objectives and relationship with other sciences. Meaning and definition of farms, its types and characteristics, factor determining types and size of farms. Principles of farm management: concept of production function and its type, use of production function in decision-making on a farm, factor-product, factor-factor and product-product relationship, law of equi-marginal/or principles of opportunity cost and law of comparative advantage.
- Unit-2** Meaning and concept of cost, types of costs and their interrelationship, importance of cost in managing farm business and estimation of gross farm income, net farm income, family labour income and farm business income.
- Unit-3** Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises. Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain on farm, farm inventory, balance sheet, profit and loss accounts.
- Unit-4** Meaning and importance of farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting-linear programming, appraisal of farm resources, selection of crops and livestock's enterprises. Concept of risk and uncertainty occurs in agriculture production, nature and sources of risks and its management strategies, Crop/livestock/machinery insurance – weather based crop insurance, features, determinants of compensation.
- Unit-5** Concepts of resource economics, differences between NRE and agricultural economics, unique properties of natural resources. Positive and negative externalities in agriculture, Inefficiency and welfare loss, solutions, Important issues in economics and management of common property resources of land, water, pasture and forest resources etc.

Practical

- 1-Preparation of farm layout.
- 2- Determination of cost of fencing of a farm.
- 3-Computation of depreciation cost of farm assets.
- 4-Application of equi-marginal returns/opportunity cost principle in allocation of farm resources.
- 5- Determination of most profitable level of inputs use in a farm production process.
- 6- Determination of least cost combination of inputs.
- 7- Selection of most profitable enterprise combination.
- 8- Application of cost principles including CACP concepts in the estimation of cost of crop and livestock enterprises.
- 9- Preparation of farm plan and budget, farm records and accounts and profit & loss accounts.
- 10- Collection and analysis of data on various resources in India.

References:

1. Dhondyal, S.P., "Farm Management – An Economic Analysis", Aman Publishing House, Madhu Market, Meerut (U.P.).
2. Bhavani Devi, P. Raghu Ram, S. Subba Reddy, T.V. Neelakanta Sastry, 2009, Agricultural economics, Oxford and IBH Co. Pvt. Ltd., New Delhi.
3. Johl, S.S. and T.R. Kapur, 1989, Fundamentals of Farm Business Management, Kalyani Publishers, Ludhiana.
4. Kerr, John M., et al., 1997, Natural Resource Economics: Theory and Applications in India, Oxford & IBH, New Delhi.
5. Raju, V. T. and D. V. S. Rao, 2002, "Economics of Farm Production and Management", Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

Livestock & Poultry Management-4(3+1)

Unit-1 Role of livestock in the national economy. Reproduction in farm animals and poultry. Housing principles, space requirements for different species of livestock and poultry.

Unit-2 Management of calves, growing heifers and milch animals. Management of sheep, goat and swine. Incubation, hatching and brooding. Management of growers and layers.

Unit-3 Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry. Improvement of farm animals and poultry. Digestion in livestock and poultry.

Unit-4 Classification of feedstuffs. Proximate principles of feed. Nutrients and their functions. Feed ingredients for ration for livestock and poultry.

Unit-5 Feed supplements and feed additives. Feeding of livestock and poultry. Introduction of livestock and poultry diseases. Prevention (including vaccination schedule) and control of important diseases of livestock and poultry.

Practical

- 1-External body parts of cattle, buffalo, sheep, goat, swine and poultry.
- 2-Handling and restraining of livestock.
- 3- Identification methods of farm animals and poultry.
- 4-Visit to IDF and IPF to study breeds of livestock and poultry and daily routine farm operations and farm records.
- 5- Judging of cattle, buffalo and poultry.
- 6- Culling of livestock and poultry. Planning and layout of housing for different types of livestock.
- 7-Computation of rations for livestock. Formulation of concentrate mixtures.
- 8- Clean milk production, milking methods. Hatchery operations, incubation and hatching equipments.
- 9-Management of chicks, growers and layers. Debeaking, dusting and vaccination.
- 10-Economics of cattle, buffalo, sheep, goat, swine and poultry 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..

Renewable Energy and Green Technology -2(1+1)

Unit-1 Classification of energy sources, contribution of these of sources in agricultural sector.

Unit-2 Familiarization with biomass utilization for biofuel production and their application.

Unit-3 Familiarization with types of biogas plants and gasifiers, biogas, bioalcohol, biodiesel and Biooil production and their utilization as bioenergy resource, introduction of solar energy, collection and their application.

Unit-4 Familiarization with solar energy gadgets: solar cooker, solar water heater application of solar energy.

Unit-5 Solar drying, solar pond, solar distillation, solar photovoltaic system and their application, introduction of wind energy and their application.

Practical

- 1-Familiarization with renewable energy gadgets.
- 2-To study biogas plants.
- 3-To study gasifier.
- 4-To study the production process of biodiesel.
- 5-To study briquetting machine.
- 6- To study the production process of bio-fuels.
- 7-Familiarization with different solar energy gadgets.
- 8-To study solar photovoltaic system: solar light, solar pumping, solar fencing.
- 9-To study solar cooker.
- 10-To study solar drying system.
- 11-To study solar distillation and solar pond.

Referenecs:

1. G.D. Rai. Non-Conventional Energy Sources, Kh Publishers, New Delhi.
2. N. S. Rathore. A.K. Kurchania, N.L. Panwar. (2007). Non Conventional Energy Sources, Himanshu Publications.
3. N.S. Rathore. A. K. Kurchania, N.L. Panwar. (2007). Renewable Energy, Theory and Practice, Himanshu Publications.
4. K.C. Khandelwal. & S.S. Mandi. (1990). Biogas Technology.

Production Technology for Fruit and Plantation Crops -2(1+1)

Unit-1 Importance and scope of fruit and plantation crop industry in India.

Unit-2 Importance of rootstocks.

Unit-3 Production technologies for the cultivation of major fruits-mango, banana, citrus, grape, guava, litchi, papaya, sapota, apple, pear, peach, walnut, almond.

Unit-4 minor fruits- date, ber, pineapple, pomegranate, jackfruit and strawberry.

Unit-5 plantation crops-coconut, arecanut, cashew, tea, coffee & rubber.

Practical

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

References:

- 1 Bal, J.S. Fruit Growing (2010) Kalyani Publishers
- 2 Banday F.A. and Sharma M.K. Advances in Temperate Fruit Production (2010) Kalyani Publishers
- 3 Bose, T.K., Mitra, S.K. and Sanyal, D. Tropical and Sub-Tropical-Vol-I (2002) Nayaprakash, Kolkata
- 4 Chadha, T.R Text Book of Temperate Fruits (2001) ICAR Publication
- 5 Chattopadhyay T.K. A text book on Pomology-IV Devoted to Temperate fruits (2009) Kalyani Publishers

B.Sc. (Hons) Ag. 5th Semester
Agricultural Marketing, Trade and Prices-3(2+1)

Unit-1 Agricultural Marketing: Concepts and definitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation, classification and characteristics of agricultural markets; demand, supply and producer's surplus of agri-commodities: nature and determinants of demand and supply of farm products, producer's surplus – meaning and its types, marketable and marketed surplus, factors affecting marketable surplus of agri-commodities; product life cycle (PLC) and competitive strategies. Meaning and stages in PLC; characteristics of PLC; strategies in different stages of PLC.

Unit-2 Pricing and promotion strategies: pricing considerations and approaches – cost based and competition based pricing; market promotion – advertising, personal selling, sales promotion and publicity – their meaning and merits & demerits; marketing process and functions: Marketing process-concentration, dispersion and equalization.

Unit-3 Exchange functions – buying and selling; physical functions – storage, transport and processing; facilitating functions – packaging, branding, grading, quality control and labeling (Agmark) ; Market functionaries and marketing channels: Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel; number of channel levels; marketing channels for different farm products;

Unit-4 Integration, efficiency, costs and price spread: Meaning, definition and types of market integration; marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs; Role of Govt. in agricultural marketing: Public sector institutions- CWC, SWC, FCI, CACP & DMI – their objectives and functions; cooperative marketing in India;

Unit-5 Risk in marketing: Types of risk in marketing; speculation & hedging; an overview of futures trading; Agricultural prices and policy: Meaning and functions of price; administered prices; need for agricultural price policy; Trade: Concept of International Trade and its need, theories of absolute and comparative advantage. Present status and prospects of international trade in agri-commodities; GATT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR.

Practical

- 1-Plotting and study of demand and supply curves and calculation of elasticities.
- 2- Study of relationship between market arrivals and prices of some selected commodities.
- 3-Computation of marketable and marketed surplus of important commodities.
- 4- Study of price behaviour over time for some selected commodities; Construction of index numbers.
- 5-Visit to a local market to study various marketing functions performed by different agencies.
- 6-Identification of marketing channels for selected commodity, collection of data regarding marketing costs, margins and price spread and presentation of report in the class.
- 7-Visit to market institutions – NAFED, SWC, CWC, cooperative marketing society, etc. to study their organization and functioning.
- 8- Application of principles of comparative advantage of international trade.

References:

1. Acharya, S.S. and Agarwal, N.L., 1994, Agricultural Price Analysis and Price Policy, Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
2. Acharya, S.S. and Agarwal, N.L., 2004, Agricultural Marketing in India, Oxford and IBH Publishing Co. New Delhi.
3. G. L. Meena, S. S. Burark, D. C. Pant and Rajesh Sharma, 2017. Fundamentals of Agribusiness Management, Agrotech Publishing Academy, Udaipur, ISBN: 978-81-8321-418-6. First edition.
4. Kahlon, A.S. and George, M.V., 1985, Agricultural Marketing and Price Policy, Allied Publication Pvt. Ltd., New Delhi.
5. Kohls, Richard L. and Uhl, Joseph N., 1980, Marketing of Agricultural Products, Macmillan Publishing Co., Inc. New York

Principles of Seed Technology-3(1+2)

Unit-1 Seed and seed technology: introduction, definition and importance. Deterioration causes of crop varieties and their control; Maintenance of genetic purity during seed production, seed quality; Definition, Characters of good quality seed, different classes of seed.

Unit-2 Foundation and certified seed production of important **cereals, pulses, oilseeds, fodder and vegetables**. Seed certification, phases of certification, procedure for seed certification, field inspection. Seed Act and Seed Act enforcement. Duty and powers of seed inspector, offences and penalties. Seeds Control Order 1983, Varietal Identification through Grow Out Test and Electrophoresis, Molecular and Biochemical test.

Unit-3 Detection of genetically modified crops, Transgene contamination in non-GM crops, GM crops and organic seed production. Seed drying, processing and their steps, seed testing for quality assessment, seed treatment, its importance, method of application and seed packing. Seed storage;

Unit-4 General principles, stages and factors affecting seed longevity during storage. Measures for pest and disease control during storage. Seed marketing: structure and organization, sales generation activities, promotional media.

Unit-5 Factors affecting seed marketing, Role of WTO and OECD in seed marketing. Private and public sectors and their production and marketing strategies.

Practical

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

References:

1. Agarwal, R.L.1991.Seed Technology. Oxford & IBH Publishing Co. Delhi
2. Agarwal, P.K. 1999. Seed Technology. ICAR, New Delhi.
3. Subir Sen and Nabinanda Ghosh.1999. Seed Science and Technology. Kalyani Publishers. New Delhi. 4.
4. Dhirenra Khare and Mohan S. Bhale.2000. Seed Technology. Scientific Publishers (India), Jodhpur.
5. Maloo,S.R., Intodia, S.K. and Pratap Singh.2008. Beej Pradyogiki. Agrotech Publishing Academy.
6. A.K. Joshi and B.D. Singh.2005.Seed Technology. Kalyani Publishers, New Delhi.

Diseases of Field & Horticultural Crops & their Management-I-3(2+1)

Unit-1 Symptoms, etiology, disease cycle and management of major diseases of following crops:
Field Crops: Rice: blast, brown spot, bacterial blight, sheath blight, false smut, khaira and tungro; Maize: stalk rots, downy mildew, leaf spots; Sorghum: smuts, grain mold and anthracnose. Bajra :downy mildew and ergot.

Unit-2 Groundnut: early and late leaf spots, wilt Soybean:
Rhizoctonia blight, bacterial spot, seed and seedling rot and mosaic; Pigeonpea:
Phytophthora blight, wilt and sterility mosaic; Finger millet.Blast and leaf spot.

Unit-3 Black & green gram: Cercospora leaf spot and anthracnose, web blight and yellow mosaic; Castor: Phytophthora blight; Tobacco: black shank, black root rot and mosaic.

Unit-4 Horticultural Crops: Guava: wilt and anthracnose;
Banana: Panama wilt, bacterial wilt, Sigatoka and bunchy top; Papaya: foot rot, leaf curl and mosaic, Pomegranate: bacterial blight; Cruciferous vegetables: Alternaria leaf spot and black rot; Brinjal: Phomopsis blight and fruit rot and Sclerotinia blight.

Unit-5 Tomato: damping off,wilt, early and late blight, buck eye rot and leaf curl and mosaic;
Okra: Yellow Vein Mosaic; Beans: anthracnose and bacterial blight; Ginger: soft rot;
Colocasia: Phytophthora blight; Coconut: wilt and bud rot; Tea: blister blight; Coffee: rust.

Practical

- 1-Identification and histopathological
- 2-Studies of selected diseases of field and horticultural crops covered in theory.
- 3- Field visit for the diagnosis of field problems.
- 4- Collection and preservation of plant diseased specimens for Herbarium;

References:

1. Cook, A. A. 1981. Diseases of tropical and sub-tropical field fiber and oil plants. Mac Millan Publishing Co. New York.
2. Gupta V K and Paul, Y S 2008. IInd ed. Diseases of field crops. Kalyani Publishing Co. ND.
3. Mehrotra R S and Aggarwal A. 2012. 12th ed. Plant Pathology, Tata McGraw-Hill Publishing Co Ltd. ND.
4. Mishra A , Bohra A and Mishra , A. 2005. Plant Pathology. Agrobios. Jodhpur (India).
5. Rangaswamy,G and Mahadevan, A . 2012. 4th ed. Diseases of crop plants in India. Prentice hall of India Pvt Ltd, New Delhi.

Intellectual Property Rights -1(1+0)

Unit-1 Introduction and meaning of intellectual property, brief introduction to GATT, WTO, TRIPs and WIPO, Treaties for IPR protection: Madrid protocol, Berne Convention, Budapest treaty, etc. Types of Intellectual Property and legislations covering IPR in India:-Patents, Copyrights.

Unit-2 Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets. Patents Act 1970 and Patent system in India, patentability, process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement, Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database.

Unit-3 Origin and history including a brief introduction to UPOV for protection of plant varieties, Protection of plant varieties under UPOV and PPV&FR Act of India, Plant breeders rights.

Unit-4 Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights. Traditional knowledge-meaning and rights of TK holders.

Unit-5 Convention on Biological Diversity, International treaty on plant genetic resources for food and agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing.

Text Books

1-IPR and Plant Breeders Rights By P.Singh.

2-Plant Breeding: Principles and Method. By B.D.Singh.

Geoinformatics, Nano-technology and Precision Farming -2(1+1)

- Unit-1** Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture; Geo-informatics- definition, concepts, tool and techniques; their use in Precision Agriculture.
- Unit-2** Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies; Spatial data and their management in GIS; Remote sensing concepts and application in agriculture; Image processing and interpretation.
- Unit-3** Global positioning system (GPS), components and its functions; Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs.
- Unit-4** STCR approach for precision agriculture; Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors.
- Unit-5** Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.

Practical

- 1-Introduction to GIS software, spatial data creation and editing.
- 2-Introduction to image processing software.
- 3-Visual and digital interpretation of remote sensing images.
- 4- Generation of spectral profiles of different objects.
- 5-Supervised and unsupervised classification and acreage estimation.
- 6-Multispectral remote sensing for soil mapping.
- 7-Creation of thematic layers of soil fertility based on GIS.
- 8- Creation of productivity and management zones.
- 9-Fertilizers recommendations based of VRT and STCR techniques.
- 10- Crop stress (biotic/abiotic) monitoring using geospatial technology.
- 11- Use of GPS for agricultural survey.
- 12-Formulation, characterization and applications of nanoparticles in agriculture.
- 13-Projects formulation and execution related to precision farming.

References:

1. Krishna, K.K. 2013. Precision Farming: Soil Fertility and Productivity Aspects. Apple Academic Press
2. Srivastava, G.S. 2014. An Introduction to Geoinformatics. McGrew Hill Education (India) Pvt. Ltd. , New Delhi
3. Gupta, R.K. and Subhash Chander. 2008. Principles of Geoinformatics. Jain Brothers, New Delhi.
4. Choudhary, S. 2011. Applied Nanotechnology in Agriculture. Arise Publishers & Distributors
5. Sekhon, B.S. 2014. Nanotechnology in agri-food production: an overview. Nanotechnology, Science and Applications 7:31-532.

Elective course:-

B.Sc. (Hons) Ag. 6th Semester

Farming System and Sustainable Agriculture-1(1+0)

- Unit-1** Farming System-scope, importance, and concept, Types and systems of farming system and factors affecting types of farming, Farming system components and their maintenance.
- Unit-2** Cropping system and pattern, multiple cropping system, Efficient cropping system and their evaluation, Allied enterprises and their importance, Tools for determining production and efficiencies in cropping and farming system.
- Unit-3** Sustainable agriculture-problems and its impact on agriculture, indicators of sustainability, adaptation and mitigation, conservation agriculture strategies in agriculture, HEIA, LEIA and LEISA and its techniques for sustainability.
- Unit-4** Integrated farming system-historical background, objectives and characteristics, components of IFS and its advantages, Site specific development of IFS model for different agro-climatic zones, resource use efficiency and optimization techniques.
- Unit-5** Resource cycling and flow of energy in different farming system, farming system and environment, Visit of IFS model in different agro-climatic zones of nearby states University/ institutes and farmers field.

References:

1. Panda, S.C.2004. Cropping Systems and Farming Systems, Agrobios (India), Jodhpur.
2. Panda, S.C.2012. Modern Concepts and Advance Principles in Crop Production. Agrobios (India), Jodhpur .
3. Sharma, Arun K. 2002. A Handbook of Organic Farming, Agrobios (India) Ltd., Jodhpur
4. Balasubramaniyan, P. and Palaniappan, S.P.2016. Principles and Practices of Agronomy (2nd edition), Agrobios (India), Jodhpur.
5. Shukla, Rajeev K. 2004. Sustainable Agriculture, Surbhee Publications, Jaipur

Fundamentals of Plant Biochemistry and Biotechnology-3(2+1)

- Unit-1** Importance of Biochemistry. Properties of Water, pH and Buffer. Carbohydrate: Importance and classification. Structures of Monosaccharides, Reducing and oxidizing properties of Monosaccharides, Mutarotation; Structure of Disaccharides and Poly saccharides.
- Unit-2** Lipid: Importance and classification; Structures and properties of fatty acids; storage lipids and membranelipids. Proteins: Importance of proteins and classification; Structures, titration and zwitterions nature of amino acids; Structural organization of proteins.
- Unit-3** Enzymes: General properties; Classification; Mechanism of action; Michaelis & Menten and Line Weaver Burk equation & plots; Introduction to allosteric enzymes. Nucleic acids: Importance and classification; Structure of Nucleotides, A, B & Z DNA; RNA: Types and Secondary & Tertiary structure.
- Unit-4** Metabolism of carbohydrates: Glycolysis, TCA cycle, Glyoxylate cycle, Electron transport chain. Metabolism of lipids: Beta oxidation, Biosynthesis of fatty acids. Concepts and applications of plant biotechnology: Scope, organ culture, embryo culture, cell suspension culture, callus culture, anther culture, pollen culture and ovule culture and their applications;
- Unit-5** Micro-propagation methods; organogenesis and embryogenesis, Synthetic seeds and their significance; Embryo rescue and its significance; somatic hybridization and cybrids; Somaclonal variation and its use in crop improvement; cryo-preservation; Introduction to recombinant DNA methods: physical (Gene gun method), chemical (PEG mediated) and Agrobacterium mediated gene transfer methods; Transgenics and its importance in crop improvement; PCR techniques and its applications; RFLP, RAPD, SSR; Marker Assisted Breeding in crop improvement; Biotechnology regulations.

Practical

- 1-Preparation of solution, pH & buffers,
- 2- Qualitative tests of carbohydrates and amino acids.
- 3-Quantitative estimation of glucose/ proteins.
- 4- Titration methods for estimation of amino acids/lipids,
- 5- Effect of pH, temperature and substrate concentration on enzyme action,
- 6- Paper chromatography/ TLC demonstration for separation of amino acids/ Monosaccharides.
- 7-Sterilization techniques. Composition of various tissue culture media and preparation of stock solutions for MS nutrient medium.
- 8- Callus induction from various explants. Micro-propagation,
- 9-Hardening and acclimatization.
- 10- Demonstration on isolation of DNA. Demonstration of gel electrophoresis techniques and DNA finger printing.

References:

1. Plant Biochemistry- V. Arun Kumar, N. Senthil Kumar and K. Siva Kumar, 2010, APH Publishing Corporation, New Delhi.
2. Biotechnology-Expanding Horizons, B.D. Singh, 2014, Kalyani Publishers, Ludhiana
3. Principles and Techniques of Biochemistry and Molecular Biology, Eds. Keith Wilson and John Walker, 7th Edition, 2010, Cambridge University Press
4. A Textbook of Biotechnology, Revised Edition, 2014, R.C. Dubey, S. Chand Publishing Company, New Delhi
5. Lehninger Principles of Biochemistry by Albert Lehninger, David Nelson and Michael Cox, Seventh Edition, 2017 Macmillan Publishers.

B.Sc. (Hons) Ag. 6th Semester

Entrepreneurship Development and Business Communication-2(1+1)

- Unit-1** Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs; SWOT Analysis & achievement motivation.
- Unit-2** Government policy and programs and institutions for entrepreneurship development, Impact of economic reforms on Agribusiness/ Agrienterprises.
- Unit-3** Entrepreneurial Development Process; Business Leadership Skills; Developing organizational skill (controlling, supervising, problem solving, monitoring & evaluation).
- Unit-4** Developing Managerial skills, Business Leadership Skills (Communication, direction and motivation Skills), Problem solving skill, Supply chain management and Total quality management.
- Unit-5** Project Planning Formulation and report preparation; Financing of enterprise, Opportunities for agripreneurship and rural enterprise.

Practical

- 1-Assessing entrepreneurial traits.
- 2- Problem solving skills.
- 3- Managerial skills and achievement motivation.
- 4- Exercise in creativity.
- 5- Time audit through planning.
- 6-Monitoring and supervision.
- 7-Identification and selection of business idea.
- 8- Preparation of business plan and proposal writing.
- 9-Visit to entrepreneurship development institute and entrepreneurs.

References:

1. Harold Koontz & Heinz Weihrich. 2004. *Essentials of Management: An International Perspective*, 2nd Ed. Tata Mc-Graw Hill Publishing Pvt Ltd.
2. Chole, R. R. Kapse, P. S. and Deshmukh, P. R. 2012. *Entrepreneurship Development and Communication Skills* scientific Publisher (India), Jodhpur.
3. Bhaskaran, S. 2014. *Entrepreneurship Development and Management*. Aman Publishing House, Meerut.
4. Mancuso, J. 1974. *The Entrepreneurs Handbook* (Vol. 192), Artech House, Inc., USA.
5. Karthikeyan, C. et al. 2008.. *A Text Book of Agricultural Extension Management*. Atlantic Publishers, New Delhi.

B.Sc. (Hons) Ag. 6th Semester

Principles of Food Science and Nutrition -2(2+0)

Unit-1 Concepts of Food Science (definitions, measurements, density, phase change, pH, osmosis, surface tension, colloidal systems etc.).

Unit-2 Food composition and chemistry (water, carbohydrates, proteins, fats, vitamins, minerals, flavours, colours, miscellaneous bioactives, important reactions).

Unit-3 Food microbiology (bacteria, yeast, moulds, spoilage of fresh & processed foods, Production of fermented foods).

Unit-4 Principles and methods of food processing and preservation (use of heat, low temperature, chemicals, radiation, drying etc.); Food and nutrition, Malnutrition (over and under nutrition), nutritional disorders.

Unit-5 Energy metabolism (carbohydrate, fat, proteins); Balanced/modified diets, Menu planning, New trends in food science and nutrition.

References:

1 Srilakshmi, B. (2010). Text Book of Food Science. New age international (P) limited, publisher, New Delhi

2 Sehgal, S. and Raghuvanshi, R.S. (2007). Text Book of Community Nutrition, ICAR Publication

3 Khaddar V., (1999). Text Book of Food. Storage and Preservation. Kalyani Publishers, New Delhi.

4 Srilakshmi, B. (2010). Text Book of Nutrition Science. New age international (P) limited, publisher, New Delhi

5 Swaminathan. M. (1993). Advanced Textbook on Food and Nutrition. Volume I, Bappco, the Bangalore Press and Publishing Co. Ltd. Bangalore, p. 576.

B.Sc. (Hons) Ag. 6th Semester

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

- Unit-1** Importance of post-harvest processing of fruits and vegetables, extent and possible causes of post harvest losses.
- Unit-2** Pre-harvest factors affecting postharvest quality, maturity, ripening and changes occurring during ripening; Respiration and factors affecting respiration rate.
- Unit-3** Harvesting and field handling; Storage (ZECC, cold storage, CA, MA, and hypobaric); Value addition concept.
- Unit-4** Principles and methods of preservation; Intermediate moisture food- Jam, jelly, marmalade, preserve, candy – Concepts and Standards; Fermented and non-fermented beverages.
- Unit-5** Tomato products- Concepts and Standards; Drying/ Dehydration of fruits and vegetables – Concept and methods, osmotic drying. Canning -- Concepts and Standards, packaging of products.

Practical

- 1-Applications of different types of packaging.
- 2- Containers for shelf life extension.
- 3- Effect of temperature on shelf life and quality of produce.
- 4-Demonstration of chilling and freezing injury in vegetables and fruits.
- 5- Extraction and preservation of pulps and juices.
- 6- Preparation of jam, jelly, RTS, nectar, squash, osmotically dried products, fruit bar and candy and tomato products, canned products.
- 7 Quality evaluation of products -- physico-chemical and sensory.
- 8-Visit to processing unit/ industry.

References:

- 1 Battacharjee, S. K. and De, L. C Post Harvest Technology of Flowers and Ornamentals Plants (2005) Pointer Publisher
- 2 Jacob John, P A Handbook on Post Harvest management of Fruits and vegetables (2008) Daya Publishing House, Delhi
- 3 Manoranjan, K and Sangita, S. Food Preservation & Processing (1996) Kalyani Publishers
- 4 Mitra, S. K. Post Harvest Physiology and Storage of Tropical and Sub-tropical Fruits (1997) CAB International
- 5 Morris, T. N. Principles of Fruit Preservation (2006) Biotech Books, Delhi

B.Sc. (Hons) Ag. 6th Semester

Management of Beneficial Insects-2(1+1)

- Unit-1** Importance of beneficial Insects, Beekeeping and pollinators, bee biology, commercial methods of rearing, equipment used, seasonal management, bee enemies and disease.
- Unit-2** Bee pasturage, bee foraging and communication. Insect pests and diseases of honey bee. Role of pollinators in cross pollinated plants.
- Unit-3** Types of silkworm, voltinism and biology of silkworm. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Rearing, mounting and harvesting of cocoons. Pest and diseases of silkworm, management, rearing appliances of mulberry silkworm and methods of disinfection.
- Unit-4** Species of lac insect, morphology, biology, host plant, lac production – seed lac, button lac, shellac, lac- products. Identification of major parasitoids and predators commonly being used in biological control.
- Unit-5** Insect orders bearing predators and parasitoids used in pest control and their mass multiplication techniques. Important species of pollinator, weed killers and scavengers with their importance.

Practical

- 1-Honey bee species, castes of bees.
- 2- Beekeeping appliances and seasonal management.
- 3- Bee enemies and disease.
- 4- Bee pasturage, bee foraging and communication.
- 5- Types of silkworm.
- 6-Voltinism and biology of silkworm.
- 7- Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves.
- 8-Species of lac insect, host plant identification.
- 9- Identification of other important pollinators.
- 10-Weed killers and scavengers.
- 11- Visit to research and training institutions devoted to beekeeping, sericulture, lac culture and natural enemies.
- 12- Identification and techniques for mass multiplication of natural enemies.

References:

1. DeBach, P. 1974. Biological control by Natural enemies. Cambridge University Press.
2. Dhaliwal GS & Arora R. 2001. *Integrated Pest Management: Concepts and approaches*. Kalyani Publ., New Delhi.
3. Dhaliwal, GS & Koul O. 2007. *Biopesticides and Pest Management*. Kalyani Publ., New Delhi.
4. Gautam, R.D. Biological Pest Suppression, Westvill Publishing Co., New Delhi.
5. Manfred Mackaur, Laster E.Ehler and Jens Roland. 1990. Critical Issues in Biological control- Intercept Ltd. Project Directorate of Biological control. 1994. Technology for mass production of Natural enemies. Technical Bulletin -4.

B.Sc. (Hons) Ag. 6th Semester

Crop Improvement – II (*Rabi*)- 2(1+1)

- Unit-1** Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds, fodder crops and cash crops. Vegetable and horticultural crops.
- Unit-2** Plant genetic resources, its utilization and conservation. Study of genetics of qualitative and quantitative characters.
- Unit-3** Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional).
- Unit-4** Hybrid seed production technology of *rabi* crops.
- Unit-5** Ideotype concept and climate resilient crop varieties for future.

Practical

- 1-Floral biology.
- 2- Emasculation and hybridization techniques in different crop species namely Wheat, Oat, Barley, Chickpea, Lentil, Field pea, Rajma, Horse gram, Rapeseed Mustard, Sunflower, Safflower, Potato, Berseem. Sugarcane, Tomato, Chilli, Onion.
- 3- Handling of germplasm and segregating populations by different methods like pedigree. Bulk and single seed decent methods.
- 4- Study of field techniques for seed production and hybrid seeds production in *Rabi* crops.
- 5-Estimation of heterosis, inbreeding depression and heritability.
- 6-Layout of field experiments.
- 7-Study of quality characters, study of donor parents for different characters.
- 8-Visit to seed production plots.
- 9-Visit to AICRP plots of different field crops.

References:

1. Chopra, V.L. 2000. Breeding of Field Crops (Edt.). Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Chaddha. K.L. and Rajendra Gupta. 1995. Advances in Horticulture Vol. II Medicinal and Aromatic Plants. Malhotra Publishing House, New Delhi.
3. Mandal, A.K., P.K. Ganguli and S.P. Banerjee. 1991. Advances in Plant Breeding Vol. I and II. CBS Publishers and Distributors, New Delhi.
4. Manjit S. Kang 2004. Crop Improvement: Challenges in the Twenty-First Century (Edt). International Book Distributing Co. Lucknow.
5. Poehlman, J.M. 1987. Breeding of Field Crops. AVI Publishing Co.. INC, East Port, Connecticut, USA.

B.Sc. (Hons) Ag. 6th Semester

Practical Crop Production-II (*Rabi Crops*)- 2(0+2)

Unit-1 Crop planning, raising field crops in multiple cropping systems.

Unit-2 Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce.

Unit-3 The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies.

Unit-4 Preparation of balance sheet including cost of cultivation.

Unit-5 Net returns per student as well as per team of 8-10 students.

References:

1. Yawalkar, K.S., Agarwal, J.P. and Bokde, S. 2008. Manures and Fertilizers (10th edition), Agri-Horticultural Publishing House, Nagpur.
2. Balasubramanian, P. and Palaniappan, S.P. 2016. Principles and Practices of Agronomy (2nd edition), Agrobios (India), Jodhpur.
3. Reddy, S. R. 2016. Principles of Agronomy (5th edition), Kalyani Publishers, Ludhiana
4. Singh, S.S. and Singh, Rajesh. 2015. Principles and Practices of Agronomy (5th Re-set), Kalyani Publishers, New Delhi, Kalyani Publishers, Ludhiana.

B.Sc. (Hons) Ag. 6th Semester

Principles of Organic Farming-2(1+1)

- Unit-1** Organic farming, principles and its scope in India; Initiatives taken by Government (central/state), NGOs and other organizations for promotion of organic agriculture.
- Unit-2** Organic ecosystem and their concepts; Organic nutrient resources and its fortification; Restrictions to nutrient use in organic farming.
- Unit-3** Choice of crops and varieties in organic farming; Fundamentals of insect, pest, disease and weed management under organic mode of production.
- Unit-4** Operational structure of NPOP. Certification process and standards of organic farming.
- Unit-5** Processing, leveling, economic considerations and viability, marketing and export potential of organic products.

Practical

- 1-Visit of organic farms to study the various components and their utilization.
- 2- Preparation of enrich compost,
- 3-Vermicompost,
- 4- Bio-fertilizers/bio-inoculants and their quality analysis;
- 5-Indigenous technology knowledge (ITK) for nutrient, insect,pest disease and weed management.
- 6-Cost of organic production system.
- 7- Post harvest management.
- 8-Quality aspect, grading, packaging and handling.

Reference :-

1. Dhama, A.K. 2014. Organic Farming for Sustainable Agriculture (2nd edition), Agrobios (India), Jodhpur
2. . 2. Sharma, Arun K. 2013. A Handbook of Organic Farming, Agrobios (India), Jodhpur
3. 3. Palaniappan, S.P. and Anandurai, K.1999. Organic Farming – Theory and Practice. Scientific Pub. Jodhpur
4. 4. Thapa, U and Tripathy, P. 2006. Organic Farming in India, Problems and prospects, Agritech, Publishing Academy, Udaipur.
5. Singh, S.P. (ed.) 1994. *Technology for Production of Natural Enemies*, Project Directorate of Biological Control, Bangalore.
6. Veeresh, G.K., Shivashankar, K. and Singlachar, M.A. 1997. *Organic Farming and Sustainable Agriculture*, Association for Promotion of Organic Farming, Bangalore.

B.Sc. (Hons) Ag. 6th Semester

Problematic Soils and their Management -2(2+0)

Unit-1 Soil quality and health, Distribution of Waste land and problem soils in India. Their categorization based on properties.

Unit-2 Reclamation and management of Saline and sodic soils, Acid soils, Acid Sulphate soils, Eroded and Compacted soils, Flooded soils, Polluted soils.

Unit-3 Irrigation water – quality and standards, utilization of saline water in agriculture. Remote sensing and GIS in diagnosis and management of problem soils.

Unit-4 Multipurpose tree species, bio remediation through MPTs of soils, land capability and classification, land suitability classification.

Unit-5 Problematic soils under different Agro-ecosystems.

References:

1. Bear FE. 1964. *Chemistry of the Soil*. Oxford & IBH.
2. Jurinak JJ. 1978. *Salt-affected Soils*. Department of Soil Science & Biometeorology. Utah State Univ.
3. USDA Handbook No. 60. 1954. *Diagnosis and improvement of Saline and Alkali Soils*. Oxford & IBH.
4. Abrol, I.P. and Dhurva narayana, V.V. (1998) Technologies for wasteland development, ICAR, New Delhi-110012
5. Cirsan Paul, J.(1985) Principles of remote sensing. Longman, New York.

ELECTIVE COURSES

Agri-business Management 3 (2+1)

- Unit-1-** Transformation of agriculture into agribusiness, various stakeholders and components of agribusiness systems. Importance of agribusiness in the Indian economy and New Agricultural Policy. Distinctive features of Agribusiness Management: Importance and needs of agro-based industries, Classification of industries and types of agro based industries.
- Unit-2-** Institutional arrangement, procedures to set up agro based industries. Constraints in establishing agro-based industries. Agri-value chain: Understanding primary and support activities and their linkages.
- Unit-3-** Business environment: PEST & SWOT analysis. Management functions: Roles & activities, Organization culture. Planning, meaning, definition, types of plans. Purpose or mission, goals or objectives, Strategies, policies, procedures, rules, programs and budget. Components of a business plan, Steps in planning and implementation. Organization staffing, directing and motivation. Ordering, leading, supervision, communications, control.
- Unit-4-** Capital Management and Financial management of Agribusiness. Financial statements and their importance. Marketing Management: Segmentation, targeting & positioning. Marketing mix and marketing strategies. Consumer behaviour analysis, Product Life Cycle (PLC). Sales & Distribution Management.
- Unit-5-** Pricing policy, various pricing methods. Project Management definition, project cycle, identification, formulation, appraisal, implementation, monitoring and evaluation. Project Appraisal and evaluation techniques.

Practical

- 1- Study of agri-input markets: Seed, fertilizers, pesticides.
- 2- Study of output markets: grains, fruits, vegetables, flowers.
- 3- Study of product markets, retail trade commodity trading, and value added products.
- 4- Study of financing institutions- Cooperative, Commercial banks, RRBs, Agribusiness Finance Limited, NABARD.
- 5- Preparations of projects and Feasibility reports for agribusiness entrepreneur.
- 6- Appraisal/evaluation techniques of identifying viable project- Non-discounting techniques.
- 7- Case study of agro-based industries.
- 8- Trend and growth rate of prices of agricultural commodities.
- 9- Net present worth technique for selection of viable project.
- 10- Internal rate of return.

References:

1. G. L. Meena, S. S. Burark, D. C. Pant and Rajesh Sharma, 2017. Fundamentals of Agribusiness Management, Agrotech Publishing Academy, Udaipur, ISBN: 978-81-8321-418-6. First edition.
2. Gittinger, J.P, 1984, Economic Analysis of Agricultural Projects, John Hopkins University Press.
3. Kotler, Philip, 1999, Marketing Management, Prentice Hall of India, New Delhi,
4. L.L. Somani and G. L. Meena, 2017. Agribusiness & Farm Management at a Glance, Vol-2, Basic & Applied Fundamentals, Agrotech Publishing Academy, Udaipur, ISBN: 978-81-8321-429-2. Second edition.
5. Matoria, C. B., Joshi, R. L. and Mulla, N. I. 2005, Principles and Practices of Marketing in India, Kitab Mahal, Allahabad.

Agrochemicals 3 (2+1)

- Unit-1** An introduction to agrochemicals, their type and role in agriculture, effect on environment, soil, human and animal health, merits and demerits of their uses in agriculture, management of agrochemicals for sustainable agriculture.
- Unit-2** Herbicides-Major classes, properties and important herbicides. Fate of herbicides. Fungicides - Classification – Inorganic fungicides - characteristics, preparation and use of sulfur and copper, Mode of action-Bordeaux mixture and copper oxychloride. Organic fungicides- Mode of action- Dithiocarbamates-characteristics, preparation and use of Zineb and maneb.
- Unit-3** Systemic fungicides- Benomyl, carboxin, oxycarboxin, Metalaxyl, Carbendazim, characteristics and use. Introduction and classification of insecticides: inorganic and organic insecticides Organochlorine, Organophosphates, Carbamates, Synthetic pyrethroids Neonicotinoids, Biorationals, Insecticide Act and rules, Insecticides banned, withdrawn and restricted use, Fate of insecticides in soil & plant. IGRs Biopesticides, Reduced risk insecticides, Botanicals, plant and animal systemic insecticides their characteristics and uses. Fertilizers and their importance.
- Unit-4** Nitrogenous fertilizers: Feedstocks and Manufacturing of ammonium sulphate, ammonium nitrate, ammonium chloride, urea. Slow release N-fertilizers. Phosphatic fertilizers: feedstock and manufacturing of single superphosphate. Preparation of bone meal and basic slag. Potassic fertilizers: Natural sources of potash, manufacturing of potassium chloride, potassium sulphate and potassium nitrate.
- Unit-5** Mixed and complex fertilizers: Sources and compatibility—preparation of major, secondary and micronutrient mixtures. Complex fertilizers: Manufacturing of ammonium phosphates, nitrophosphates and NPK complexes. Fertilizer control order. Fertilizer logistics and marketing. Plant bio-pesticides for ecological agriculture, Bio-insect repellent.

Practical

- 1-Sampling of fertilizers and pesticides.
- 2-Pesticides application technology to study about various pesticides appliances.
- 3-Quick tests for identification of common fertilizers.
- 4-Identification of anion and cation in fertilizer.
- 5- Calculation of doses of insecticides to be used.
- 6-To study and identify various formulations of insecticide available in market.
- 7- Estimation of nitrogen in Urea.
- 8-Estimation of water soluble P₂O₅ and citrate soluble P₂O₅ in single super phosphate.
- 9-Estimation of potassium in Muriate of Potash/ Sulphate of Potash by flame photometer.
- 10-Determination of copper content in copper oxychloride.
- 11- Determination of sulphur content in sulphur fungicide.
- 12-Determination of thiram.
- 13- Determination of ziram content.

Text Books:-

- 1-Organic Farming By Dr.T.D.Pandey
- 2-Weed Management By T.K.Das.

Commercial Plant Breeding 3(1+2)

- Unit-1** Types of crops and modes of plant reproduction. Line development and maintenance breeding in self and cross pollinated crops (A/B/R and two line system) for development of hybrids and seed production.
- Unit-2** Genetic purity test of commercial hybrids. Advances in hybrid seed production of maize, rice, sorghum, pearl millet, castor, sunflower, cotton pigeon pea, Brassica etc.
- Unit-3** Quality seed production of vegetable crops under open and protected environment. Alternative strategies for the development of the line and cultivars: haploid inducer, tissue culture techniques and biotechnological tools.
- Unit-4** IPR issues in commercial plant breeding: DUS testing and registration of varieties under PPV & FR Act.
- Unit-5** Variety testing, release and notification systems in India. Principles and techniques of seed production, types of seeds, quality testing in self and cross pollinated crops.

Practical

- 1-Floral biology in self and cross pollinated species, selfing and crossing techniques.
- 2- Techniques of seed production in self and cross pollinated crops using A/B/R and two line system.
- 3- Learning techniques in hybrid seed production using male-sterility in field crops.
- 4-Understanding the difficulties in hybrid seed production, Tools and techniques for optimizing hybrid seed production.
- 5-Concept of rouging in seed production plot. Concept of line its multiplication and purification in hybrid seed production.
- 6- Role of pollinators in hybrid seed production.
- 7- Hybrid seed production techniques in sorghum, pearl millet, maize, rice, rapeseed-mustard, sunflower, castor,pigeon pea, cotton and vegetable crops.
- 8- Sampling and analytical procedures for purity testing and detection of spurious seed.
- 9- Seed drying and storage structure in quality seed management.
- 10-Screening techniques during seed processing viz., grading and packaging.
- 11-Visit to public private seed production and processing plants.

References:

1. Chopra, V.L. 2000. Breeding of Field Crops (Edt.). Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Mandal, A.K., P.K. Ganguli and S.P. Banerjee. 1991. Advances in Plant Breeding. Vol. I and II. CBS Publishers and Distributors, New Delhi.
3. Manjit S. Kang 2004. Crop Improvement: Challenges in the Twenty-First Century (Edt). International Book Distributing Co. Lucknow.
4. Poehlman, J.M. 1987. Breeding of Field Crops. AVI Publishing Co.. INC, East Port, Conneacticut, USA. 51
5. Ram, H.H. and H.G. Singh. 1994. Crop Breeding and Genetics. Kalyani Publishers, New Delhi.
6. Sharma, A.K. 2005. Breeding Technology of Crop Plants (Edt.). Yash Publishing House, Bikaner.

Landscaping 3(2+1)

- Unit-1** Importance and scope of landscaping. Principles of landscaping, garden styles and types, terrace gardening, vertical gardening, garden components, adornments, lawn making, rockery, water garden, walk-paths, bridges, other constructed features etc. gardens for special purposes.
- Unit-2** Trees: selection, propagation, planting schemes, canopy management, shrubs and herbaceous perennials: selection, propagation, planting schemes, architecture. Climber and creepers: importance, selection, propagation, planting.
- Unit-3** Annuals: selection, propagation, planting scheme, Other garden plants: palms, ferns, grasses and cacti succulents. Pot plants: selection, arrangement, management.
- Unit-4** Bio-aesthetic planning: definition, need, planning; landscaping of urban and rural areas, Peri-urban landscaping, Landscaping of schools, public places like bus station, railway station, townships, river banks, hospitals, play grounds, airports, industries, institutions.
- Unit-5** Bonsai: principles and management, lawn: establishment and maintenance. CAD application.

Practical

- 1- Identification of trees, shrubs, annuals, pot plants;
- 2- Propagation of trees, shrubs and annuals, care and maintenance of plants, potting and repotting,
- 3- Identification of tools and implements used in landscape design,
- 4- Training and pruning of plants for special effects,
- 5- Lawn establishment and maintenance,
- 6- Layout of formal gardens,
- 7- Informal gardens,
- 8- Special type of gardens (sunken garden, terrace garden, rock garden) and designing of conservatory and lathe house.
- 9- Visit to important gardens/ parks/ institutes.

References:

1. Bose, T. Ornamental Plants and Garden Design in Tropics and subtropics, Vol-2 sets Daya
2. . Arora J. S. 2006 Introductory Ornamental Horticulture Kalyani Publishers, Ludhiana
3. Gopaldaswamiengar, K.S. The Complete Gardening in India. The Hosali Press, Bangalore .
4. Bose, T.K. Malti, R.G. Dhua, R.S. & Das, P. Floriculture and Landscaping (2004) Nayaprakash
5. Bose, T.K. and Mukherjee, D. Gardening in India (2004) Oxford & IBH Publishers

Food Safety and Standards 3(2+1)

- Unit-1** Food Safety – Definition, Importance, Scope and Factors affecting Food Safety. Hazards and Risks, Types of hazards - Biological, Chemical, Physical hazards. Management of hazards - Need.
- Unit-2** Control of parameters. Temperature control. Food storage. Product design. Hygiene and Sanitation in Food Service Establishments- Introduction. Sources of contamination and their control. Waste Disposal.
- Unit-3** Pest and Rodent Control. Personnel Hygiene. Food Safety Measures. Food Safety Management Tools- Basic concepts. PRPs, GHPs, GMPs, SSOPs etc. HACCP. ISO series. TQM
- concept and need for quality, components of TQM, Kaizen.
- Unit-4** Risk Analysis. Accreditation and Auditing, Water Analysis, Surface Sanitation and Personal Hygiene. Food laws and Standards- Indian Food Regulatory Regime, FSSAI. Global Scenario CAC. Other laws and standards related to food. Recent concerns- New and Emerging Pathogens.
- Unit-5** Packaging, Product labeling and Nutritional labeling. Genetically modified foods\ transgenics. Organic foods. Newer approaches to food safety. Recent Outbreaks. Indian and International Standards for food products.

Practical

- 1-Water quality analysis physico-chemical and microbiological.
- 2-Preparation of different types of media.
- 3- Microbiological Examination of different food samples.
- 4- Assessment of surface sanitation by swab/rinse method.
- 5- Assessment of personal hygiene.
- 6-Biochemical tests for identification of bacteria.
- 7-Scheme for the detection of food borne pathogens.
- 8- Preparation of plans for Implementation of FSMS - HACCP, ISO: 22000.

Biopesticides & Biofertilizers 3(2+1)

- Unit-1** History and concept of biopesticides. Importance, scope and potential of biopesticide. Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and biorationales. Botanicals and their uses.
- Unit-2** Mass production technology of bio-pesticides. Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes. Methods of application of biopesticides.
- Unit-3** Methods of quality control and Techniques of biopesticides. Impediments and limitation in production and use of biopesticide. Biofertilizers - Introduction, status and scope. Structure and characteristic features of bacterial biofertilizers- *Azospirillum*, *Azotobacter*, *Bacillus*, *Pseudomonas*, *Rhizobium* and *Frankia*;
- Unit-4** Cynobacterial biofertilizers- *Anabaena*, *Nostoc*, Hapalosiphon and fungal biofertilizers- AM mycorrhiza and ectomycorrhiza. Nitrogen fixation -Free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilization and phosphate mobilization, K solubilization. Production technology: Strain selection, sterilization.
- Unit-5** Growth and fermentation, mass production of carrier based and liquid biofertilizers. FCO specifications and quality control of biofertilizers. Application technology for seeds, seedlings, tubers, sets etc. Biofertilizers -Storage, shelf life, quality control and marketing. Factors influencing the efficacy of biofertilizers.

Practical

- 1-Isolation and purification of important biopesticides: *Trichoderma*, *Pseudomonas*, *Bacillus*, *Metarhizium* etc. and its production.
- 2- Identification of important botanicals.
- 3-Visit to biopesticide laboratory in nearby area.
- 4- Field visit to explore naturally infected cadavers.
- 5-Identification of entomopathogenic entities in field condition.
- 6-Quality control of biopesticides.
- 7-Isolation and purification of *Azospirillum*, *Azotobacter*, *Rhizobium*, P-solubilizers and cyanobacteria.
- 8- Mass multiplication and inoculum production of biofertilizers.
- 9-Isolation of AM fungi -Wet sieving method and sucrose gradient method.
- 10- Mass production of AM inoculants.

References:

1. Lakshman, H.C. (2014) Bio-fertilizers and Bio-pesticides. Pointer Publishers
2. Sylvia D.N. 2005; Principles and application of Soil Microbiology. Pearson Publisher.
3. Project Directorate of Biological control. 1994. Technology for mass production of natural enemies. Technical Bulletin-4.
4. Rabindra, R.J., Kennedy, J.S., Sathaiyah, N., Rajeshkharan, B. and Srinivasan, M.R. 2001. Microbial control of crop pests. TNAU.
5. Dhaliwal, GS & Koul O. 2007. Biopesticides and pest management. Kalyani Publ., New Delhi

Protected Cultivation 3(2+1)

- Unit-1** Protected cultivation- importance and scope, Status of protected cultivation in India and World types of protected structure based on site and climate. Cladding material involved in greenhouse/ poly house.
- Unit-2** Greenhouse design, environment control, artificial lights, Automation. Soil preparation and management, Substrate management. Types of benches and containers. Irrigation and fertigation management.
- Unit-3** Propagation and production of quality planting material of horticultural crops.
- Unit-4** Greenhouse cultivation of important horticultural crops – rose, carnation, chrysanthemum, gerbera, orchid, anthurium, lily, tulip, tomato, bell pepper, cucumber, strawberry, pot plants, etc.
- Unit-5** Cultivation of economically important medicinal and aromatic plants. Off-season production of flowers and vegetables. Insect pest and disease management.

Practical

- 1-Raising of seedlings and saplings under protected conditions,
- 2-Use of protrays in quality planting material production.
- 3- Bed preparation and planting of crop for production,
- 4- Inter cultural operations,
- 5-Regulation of irrigation and fertilizers through drip,
- 6-Fogging and misting.

Text Books:-

- 1-Green house technology-Arupratan Singh
- 2-Advance in Protected Cultivation By Brahma Singh, Balraj Singh and Naved Sabir.

Micro propagation Technologies 3(1+2)

Unit-1 Introduction, History, Advantages and limitations; Types of cultures (seed, embryo, organ, callus, cell),

Unit-2 Stages of micropropagation, Axillary bud proliferation (Shoot tip and meristem culture, bud culture),

Unit-3 Organogenesis (callus and direct organ formation),

Unit-4 Somatic embryogenesis, cell suspension cultures,

Unit-5 Production of secondary metabolites, Somaclonal variation, Cryopreservation

Practical

- 1-Identification and use of equipments in tissue culture Laboratory,
- 2-Nutrition media composition,
- 3-Sterilization techniques for media,
- 4-Containers and small instruments,
- 5-Sterilization techniques for explants,
- 6-Preparation of stocks and working solution,
- 7- Preparation of working medium,
- 8- Culturing of explants:
- 9-Seeds, shoot tip and single node,
- 10-Induction of somatic embryos regeneration of whole plants from different explants,
- 11-Hardening procedures.

References:

1. Chawala H S (2000). Introduction to Plant Biotechnology. Oxford & IBH, New Delhi
2. Gupta, P. K. (2008). Elements of Biotechnology. Rastogi Publications, Meerut
3. Ray V. Herren (2005). Introduction to Biotechnology (An Agricultural revolution)
4. Shekhawat, M. S. (2011) Plant Biotechnology, In vitro Principles, Techniques and Applications. MJP Publishers, Chennai
5. Mascarenhas, A. F. (2008). Hand Book of Plant Tissue Culture. ICAR, New Delhi
6. Singh BD. 2005. Biotechnology, Expanding Horizons. Kalyani Publishers, New Delhi.

Hi-tech. Horticulture 3(2+1)

- Unit-1** Introduction & importance; Nursery management and mechanization; micro propagation of horticultural crops; Modern field preparation and planting methods, Protected cultivation: advantages, controlled conditions, method and techniques,
- Unit-2** Micro irrigation systems and its components; EC, pH based fertilizer scheduling, canopy management, high density orcharding,
- Unit-3** Components of precision farming: Remote sensing, Geographical Information System (GIS),
- Unit-4** Differential Geo-positioning System (DGPS), Variable Rate applicator (VRA), application of precision farming in horticultural crops (fruits, vegetables and ornamental crops);
- Unit-5** mechanized harvesting of produce.

Practical

- 1-Types of polyhouses and shade net houses.
- 2-Intercultural operations.
- 3-Tools and equipments identification and application.
- 4- Micro propagation.
- 5-Nursery-protrays.
- 6- Micro-irrigation, EC, pH based fertilizer scheduling.
- 7- Canopy management.
- 8-Visit to hi-tech orchard/nursery.

References:

- 1 Hartman, HT and Kester, DE (1986). Plant propagation principles and practices. Prentice Hall of India Pvt. Ltd., Bombay
1. Gill, SS. Bal, JS and Sadhu, AS (1985). Raising Fruit Nursery, Kalyani Publishers, New Delhi.
 2. Chadha, K.L. Handbook of Horticulture (2002) ICAR, New Delhi
 3. Chadda K.L Advanced in Horticulture (2009) Malhotra Publishing House, New Delhi
 4. Anonymous 2003. *Proc. All India Seminar on Potential and Prospects for Protective Cultivation*. Organised by Institute of Engineers, Ahmednagar. Dec.12-13, 2003.
 5. Chandra, S & Som, V. 2000. *Cultivating Vegetables in Green House*. *Indian Horticulture* 45: 17-18.

Weed Management 3(2+1)

- Unit-1** Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem. Classification, reproduction and dissemination of weeds.
- Unit-2** Herbicide classification, concept of adjuvant, surfactant, herbicide formulation and their use. Introduction to mode of action of herbicides and selectivity.
- Unit-3** Allelopathy and its application for weed management. Bio-herbicides and their application in agriculture.
- Unit-4** Concept of herbicide mixture and utility in agriculture. Herbicide compatibility with agro-chemicals and their application.
- Unit-5** Integration of herbicides with non chemical methods of weed management. Herbicide Resistance and its management.

Practical

- 1-Techniques of weed preservation.
- 2- Weed identification and their losses study.
- 3-Biology of important weeds.
- 4- Study of herbicide formulations and mixture of herbicide.
- 5-Herbicide and agrochemicals study.
- 6- Shift of weed flora study in long term experiments.
- 7- Study of methods of herbicide application, spraying equipments.
- 8-Calculations of herbicide doses and weed control efficiency and weed index.

Reference:

1. Saraswat, V.N., Bhan, V.M. and Yaduraju, N.T. 2003. Weed Management , ICAR, NewDelhi.
2. Gupta, O.P. 2015. Weed Management: Principles and Practices (2nd Ed.), Agribios (India), Jodhpur.
3. Gupta, O.P. 2016. Modern Weed Management , Agribios (India), Jodhpur
4. Das, T.K. 2008. Weed Science : Basics and Applications , Jain Brothers, New-Delhi.
5. Rao, V.S. 2000. Principals of Weed Science (2nd edition), Oxford and IBH Publishing Co., New Delhi.

System Simulation and Agroadvisory 3(2+1)

- Unit-1** System Approach for representing soil-plant-atmospheric continuum, system boundaries, Crop models, concepts & techniques, types of crop models, data requirements, relational diagrams.
- Unit-2** Evaluation of crop responses to weather elements; Elementary crop growth models; calibration, validation, verification and sensitivity analysis.
- Unit-3** Potential and achievable crop production- concept and modelling techniques for their estimation. Crop production in moisture and nutrients limited conditions; components of soil water and nutrients balance.
- Unit-4** Weather forecasting, types, methods, tools & techniques, forecast verification; Value added weather forecast, ITK for weather forecast and its validity;
- Unit-5** Crop-Weather Calendars; Preparation of agro-advisory bulletin based on weather forecast. Use of crop simulation model for preparation of Agro-advisory and its effective dissemination.

Practical

- 1-Preparation of crop weather calendars.
- 2- Preparation of agro-advisories based on weather forecast using various approaches and synoptic charts.
- 3- Working with statistical and simulation models for crop growth.
- 4-Potential & achievable production; yield forecasting, insect & disease forecasting models.
- 5- Simulation with limitations of water and nutrient management options.
- 6-Sensitivity analysis of varying weather and crop management practices.
- 7-Use of statistical approaches in data analysis and preparation of historical,
- 8- Past and present meteorological data for medium range weather forecast.
- 9-Feedback from farmers about the agroadvisory.

Agricultural Journalism 3(2+1)

- Unit-1** Agricultural Journalism: The nature and scope of agricultural journalism characteristics and training of the agricultural journalist, how agricultural journalism is similar to and different from other types of journalism.
- Unit-2** Newspapers and magazines as communication media: Characteristics;kinds and functions of newspapers and magazines, characteristics of newspaper and magazine readers. Form and content of newspapers and magazines:
- Unit-3** Style and language of newspapers and magazines, parts of newspapers and magazines. The agricultural story: Types of agricultural stories,subject matter of the agricultural story, structure of the agricultural story. Gathering agricultural information.
- Unit-4** Sources of agricultural information, interviews, coverage of events, abstracting from research and scientific materials, wire services, other agricultural news sources. Writing the story:Organizing the material, treatment of the story, writing the news lead and the body, readability measures.
- Unit-5** Illustrating agricultural stories: Use of photographs, use of artwork (graphs, charts, maps, etc.), writing the captions. Editorial mechanics: Copy reading, headline and title writing, proofreading, lay outing.

Practical

- 1-Practice in interviewing.
- 2- Covering agricultural events.
- 3-Abstracting stories from research and scientific materials and from wire services.
- 4- Writing different types of agricultural stories.
- 5-Selecting pictures and artwork for the agricultural story.
- 6-Practice in editing, copy reading, headline and title writing, proofreading, layouting.
- 7-Testing copy with a readability formula.
- 8-Visit to a publishing office.

References:

1. Ray, G. L. and Mondal, S. 2005. Journalism including communication, Farm and Rural Journalism, Public Relations, Kalyani Publication, Ludhiana.
2. Bhaskaran et. Al. 2008. Farm Journalism and media management Agrotech Publishing Company.
3. Narayanaswamy V R. 1979. Strengthen your writing. Orient Longman, New Delhi.
4. Kamat,M.G., Writing for farm families.
5. Indu Grover. Mass media and Communication.

VII Semester			
No.	Rural Agricultural Work Experience and Agro-industrial Attachment (RAWE &AIA)		
	Activities	No. of weeks	Credit Hours
1	General orientation & On campus training by different faculties	1	14
2	Village attachment	8	
	Unit attachment in Univ./ College. KVK/ Research Station Attachment	5	
3	Plant clinic	2	02
	Agro-Industrial Attachment	3	04
4	Project Report Preparation, Presentation and Evaluation	1	
Total weeks for RAWE & AIA		20	20

- **Agro- Industrial Attachment:** The students would be attached with the agro-industries for a period of 3 weeks to get an experience of the industrial environment and working.
- Educational tour will be conducted in break between IV & V Semester or VI & VII Semester

Modules for Skill Development and Entrepreneurship: A student has to register 20 credits opting for two modules of (0+10) credits each (total 20 credits) from the package of modules in the VIII semester.

Sl. No.	Title of the module	Credits
1	Production Technology for Bioagents and Biofertilizer	0+10
2	Seed Production and Technology	0+10
3	Mushroom Cultivation Technology	0+10
4	Soil, Plant, Water and Seed Testing	0+10
5	Commercial Beekeeping	0+10
6	Poultry Production Technology	0+10
7	Commercial Horticulture	0+10
8	Floriculture and Landscaping	0+10
9	Food Processing	0+10
10	Agriculture Waste Management	0+10
11	Organic Production Technology	0+10
12	Commercial Sericulture	0+10

NOTE: In addition to above ELP modules other important modules may be given to the students by SAUs