

Syllabus

B.Sc. (Hons.) Agriculture (4 Years)

Sri Dev Suman Uttarakhand Vishwavidhyalay

Tehri Grahwal, Uttarakhand

Dr. CP. SM

Semester wise Courses in B.Sc.(Hons.) Agriculture

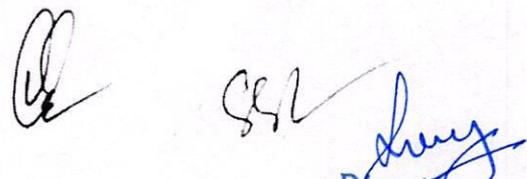
Semester I

S.No	Course Code	Course Title	Credit Distribution			MM
			T	P	Total	100
1.	BSAC-101	Fundamentals of Horticulture	1	1	2	100
	BSAC-102	Fundamentals of Plant Biochemistry and Biotechnology	2	1	3	100
2.	BSAC-103	Fundamentals of Soil Science	2	1	3	100
3.	BSAC-104	Introduction to Forestry	1	1	2	100
4.	BSAC-105	Comprehension & Communication Skills in English	1	1	2	100
5.	BSAC-106	Fundamentals of Agronomy	3	1	4	100
6.	BSAR-107	Introductory Biology*/Elementary	1/2	1/0	2/2	100
	BSAR-108	Mathematics*				
7.	BSAR-109	Agricultural Heritage*	1	0	1	100
8.	BSAC-110	Rural Sociology & Educational Psychology	2	0	2	100
9.	BSAN-111	Human Values & Ethics (non gradial)	1	0	1	100
10.	BSAN-112/	NSS/NCC/Physical Education & Yoga Practices**	0	2	2	100
	BSAN-113/					
	BSAN-114					
Total Number of Courses C:Core Courses(07) *R:Remedial Course(02);**N:Non gradial course(02)						Course wise Total credits C:18, R:03, N:03=24

Semester-II

S.No	Course Code	Course Title	Credit Distribution			MM
			T	P	Total	100
1.	BSAC-201	Fundamentals of Genetics	2	1	3	100
2.	BSAC-202	Agricultural Microbiology	1	1	2	100
3.	BSAC-203	Soil and Water Conservation Engineering	1	1	2	100
4.	BSAC-204	Fundamentals of Crop Physiology	1	1	2	100
5.	BSAC-205	Fundamentals of Agricultural Economics	2	0	2	100
6.	BSAC-206	Fundamentals of Plant Pathology	3	1	4	100
7.	BSAC-207	Fundamentals of Entomology	3	1	4	100
8.	BSAC-208	Fundamentals of Agricultural Extension Education	2	1	3	100
9.	BSAC-209	Communication Skills and Personality Development	1	1	2	100


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10.	BSAN-110/ NSS/NCC/Physical Education & Yoga BSAN-111/ Practices** BSAN-112	0	2	2	100
Total Number of Courses C:Core Courses(09) *R:Remedial Course(Nil);**N:Non gradial course(Nil)					Course wise Total credits C:24, R:02, N:Nil=26

Semester -III

S.No	Course Code	Course Title	Credit Distribution			
			T	P	Total	MM
1.	BSAC-301	Crop Production Technology - I (Kharif Crops)	1	1	2	
2.	BSAC-302	Fundamentals of Plant Breeding	2	1	3	
3.	BSAC-303	Agricultural Finance and Cooperation	2	1	3	
4.	BSAC-304	Agri- Informatics	1	1	2	
5.	BSAC-305	Farm Machinery and Power	1	1	2	
6.	BSAC-306	Production Technology for Vegetables and Spices	1	1	2	
7.	BSAC-307	Environmental Studies and Disaster Management	2	1	3	
8.	BSAC-308	Statistical Methods	1	1	2	
9.	BSAC-309	Livestock and Poultry Management	3	1	4	
Total Number of Courses C:Core Courses(09) *R:Remedial Course(Nil);**N:Non gradial course(Nil)					Course wise Total credits C:23, R:Nil, N:Nil	

Semester-IV

S.No	Course Code	Course Title	Credit Distribution			
			T	P	Total	MM
1.	BSAC-401	Crop Production Technology -II (Rabi Crops)	1	1	2	100
2.	BSAC-402	Production Technology for Ornamental Crops, MAP and Landscaping	1	1	2	100
3.	BSAC-403	Renewable Energy and Green Technology	1	1	2	100
4.	BSAC-404	Problematic Soils and their Management	2	0	2	100
5.	BSAC-405	Production Technology for Fruit and Plantation Crops	1	1	2	100
6.	BSAC-406	Principles of Seed Technology	2	1	3	100
7.	BSAC-407	Farming System & Sustainable Agriculture	1	0	1	100


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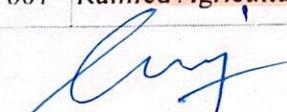
8.	BSAC-408	Agricultural Marketing Trade & Prices	2	1	3	100
9.	BSAC-409	Introductory Agro-meteorology & Climate Change	1	1	2	100
10.	Given in the list	Elective Course(one course can be selected from the list of Elective Courses)	2	1	3	100
Total Number of Courses C:Core Courses(09) *R:Remedial Course(Nil);**N:Non gradial course(Nil); Elective Course:01					Course wise Total credits C:19, R:Nil, N:Nil,E:03=22	

Semester-V

S.No	Course Code	Course Title	Credit Distribution			
			T	P	Total	MM
1.	BSAC-501	Principles of Integrated Pest and Disease Management	2	1	3	100
2.	BSAC-502	Manures, Fertilizers and Soil Fertility Management	2	1	3	100
3.	BSAC-503	Pests of Crops and Stored Grain and their Management	2	1	3	100
4.	BSAC-504	Diseases of Field and Horticultural Crops and their Management -I	2	1	3	100
5.	BSAC-505	Crop Improvement-I (<i>Kharif Crops</i>)	1	1	2	100
6.	BSAC-506	Entrepreneurship Development and Business Communication	1	1	2	100
7.	BSAC-507	Geoinformatics and Nano-technology and Precision Farming	1	1	2	100
8.	BSAC-508	Practical Crop Production – I (<i>Kharif crops</i>)	0	2	2	100
9.	BSAC-509	Intellectual Property Rights	1	0	1	100
10.	Given in the list	Elective Course(one course can be selected from the list of Elective Courses)	2	1	3	100
Total Number of Courses C:Core Courses(09) *R:Remedial Course(nil);**N:Non gradial course(Nil); Elective Course:01					Course wise Total credits C:21, R:Nil, N:Nil,E:03=24	

Semestee-VI

.No	Course Code	Course Title	Credit Distribution			
			T	P	Total	MM
1.	BSAC-601	Rainfed Agriculture & Watershed Management	1	1	2	100


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2.	BSAC -602	Protected Cultivation and Secondary Agriculture	1	1	2	100
3.	BSAC -603	Diseases of Field and Horticultural Crops and their Management-II	2	1	3	100
4.	BSAC -604	Post-harvest Management and Value Addition of Fruits and Vegetables	1	1	2	100
5.	BSAC -605	Management of Beneficial Insects	1	1	2	100
6.	BSAC -606	Crop Improvement-II (Rabi crops)	1	1	2	100
7.	BSAC -607	Practical Crop Production II (Rabi crops)	0	2	2	100
8.	BSAC -608	Principles of Organic Farming	1	1	2	100
9.	BSAC -609	Farm Management, Production & Resource Economics	1	1	2	100
10.	BSAC -610	Principles of Food Science and Nutrition	2	0	2	100
11.	Given in the Elective Course(one course can be selected from the list of Elective Courses)		2	1	3	100
Total Number of Courses C:Core Courses(10) *R:Remedial Course(Nil);**N:Non gradial course(Nil); Elective Course:01			Course wise Total credits C:21, R:Nil, N:Nil,E:03=24			

Semester -VII

Rural Agricultural Work Experience and Agro-industrial Attachment(RAWE &AIA)

Course Code: BSAW-701 20(0+20)

SN. Rural Agricultural Work Experience and Agro-industrial Attachment (RAWE &AIA)

	Activities	No. of weeks	Total Credits
1	General orientation & On campus training by different faculties	1	10
2	Village attachment	4	
3	Unit attachment in Univ./ College. KVK/ Research Station Attachment	1	
4	Plant clinic	4	
	Total	10	10
5	Agro-Industrial Attachment	3	
6	Field Visit	5	

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Project Report Preparation and Evaluation	2	
Total weeks for RAWF & AIA	10+10=20	10+10=20

**RAWF Component-I
Village Attachment Training Programme**

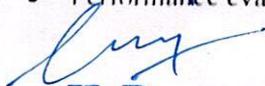
Sl. No.	Activity	Duration
1	Orientation and Survey of Village	
2	Agronomical Interventions	
3	Plant Protection Interventions	2 Week
4	Soil Improvement Interventions (Soil sampling and testing)	
5	Fruit and Vegetable production interventions	
6	Food Processing and Storage interventions	2 Week
7	Animal Production Interventions	
8	Extension and Transfer of Technology activities	

**RAWF Component -II
Agro Industrial Attachment**

- Students shall be placed in Agro-and Cottage industries and Commodities Boards for 03 weeks.
- Industries include Seed/Sapling production, Pesticides-insecticides, Post harvest-processing-value addition, Agri-finance institutions, etc.

Activities and Tasks during Agro-Industrial Attachment Programme

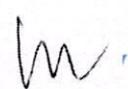
- Acquaintance with industry and staff
- Study of structure, functioning, objective and mandates of the industry
- Study of various processing units and hands-on trainings under supervision of industry staff
- Ethics of industry
- Employment generated by the industry
- Contribution of the industry promoting environment
- Learning business network including outlets of the industry
- Skill development in all crucial tasks of the industry
- Documentation of the activities and task performed by the students
- Performance evaluation, appraisal and ranking of students


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Evaluation pattern & distribution of Marks for RAWE & AIA:

Type of attachment	Daily observation Notes((20))	Report Writing(20)	Presentation/Viva(20)	Written Test(20)	Regularity(20)	Maximum Marks
Village	10	10	10.	10	10	50
Agro-Industry	10	10	10.	10	10	50
Grand Total						100

Semester VIII

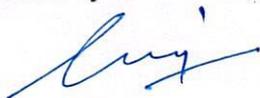
Course Code: BSAL-801

20(0+20)

Modules for Experiential Learning Programme (ELP) 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 ELP modules in the VIII Semester from the list provided below:

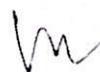
Sr.	Title of the ELP module	Credits(T+P)
1.	Production Technology for Bioagents and Biofertilizer	0+10
2.	Seed Production and Technology	0+10
3.	Mushroom Cultivation Technology	0+10
4.	Soil, Plant, Water and Seed Testing	0+10
5.	Commercial Beekeeping	0+10
6.	Poultry Production Technology	0+10
7.	Commercial 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 the University



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Evaluation pattern & distribution of Marks for ELP:

Sl.No.	Parameters	Max. Marks
1.	Project Planning and Writing	10
2.	Presentation	10
3.	Regularity	10
4.	Monthly Assessment	10
5.	Output delivery	10
6.	Technical Skill Development	10
7.	Entrepreneurship Skills	10
8.	Business networking skills	10
9.	Report Writing Skills	10
10.	Final Presentation	10
	Total	100

Elective Courses : A student can select three elective courses out of the following and offer during 4th, 5th and 6th semesters.

S.N.	Course Code	Courses	Credit Hours
1.	BSAE-101	Agribusiness Management	3(2+1)
2.	BSAE-102	Agrochemicals	3(2+1)
3.	BSAE-103	Commercial Plant Breeding	3(1+2)
4.	BSAE-104	Landscaping	3(2+1)
5.	BSAE-105	Food Safety and Standards	3(2+1)
6.	BSAE-106	Biopesticides & Biofertilizers	3(2+1)
7.	BSAE-107	Protected Cultivation	3(2+1)
8.	BSAE-108	Micro propagation Technologies	3(1+2)
9.	BSAE-109	Hi-tech. Horticulture	3(2+1)
10.	BSAE-110	Weed Management	3(2+1)
11.	BSAE-111	System Simulation and Agro-advisory	3(2+1)
12.	BSAE-112	Agricultural Journalism	3(2+1)


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Semester-I

1. Fundamentals of Horticulture Code BSAC-101

2(1+1)

Theory

Horticulture - Its definition and branches, importance and scope; horticultural and botanical classification; climate and soil for horticultural crops; Plant propagation-methods and propagating structures; Seed dormancy, Seed germination, principles of orchard establishment; Principles and methods of training and pruning, juvenility and flower bud differentiation; unfruitfulness; pollination, pollinizers and pollinators; fertilization and parthenocarpy; medicinal and aromatic plants; importance of plant bio-regulators in horticulture. Irrigation – methods, Fertilizer application in horticultural crops.

Practical

Identification of garden tools. Identification of horticultural crops. Preparation of seed bed/nursery bed. Practice of sexual and asexual methods of propagation including micro-propagation. Layout and planting of orchard. Training and pruning of fruit trees. Preparation of potting mixture. Fertilizer application in different crops. Visits to commercial nurseries/orchard.

2-Fundamentals of Plant Biochemistry and Biotechnology

3(2+1)

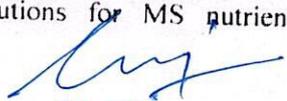
Course Code BSAC-102

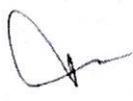
Theory

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 Polysaccharides. Lipid: Importance and classification; Structures and properties of fatty acids; storage lipids and membrane lipids. Proteins: Importance of proteins and classification; Structures, titration and zwitterions nature of amino acids; Structural organization of proteins. 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. 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; 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

Preparation of solution, pH & buffers, Qualitative tests of carbohydrates and amino acids. Quantitative estimation of glucose/ proteins. Titration methods for estimation of amino acids/lipids, Effect of pH, temperature and substrate concentration on enzyme action, Paper chromatography/ TLC demonstration for separation of amino acids/ Monosaccharides. Sterilization techniques. Composition of various tissue culture media and preparation of stock solutions for MS nutrient medium. Callus induction from various explants. Micro-


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propagation, hardening and acclimatization. Demonstration on isolation of DNA. Demonstration of gel electrophoresis techniques and DNA finger printing.

3-Fundamentals of Soil Science

Course Code-BSAC -103

2(1+1)

Theory

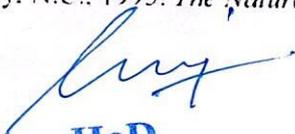
Composition of earth's crust, soil as a natural body – major components. Eluviations and alleviations formation of various soils. Physical parameters: texture – definition, methods of textural analysis, stock's law, assumption, limitations, textural classes, use of textural triangle; absolute specific gravity/particle density, definition, apparent specific gravity/bulk density – factors influencing, field bulk density. Relation between BD (bulk density), AD – practical problems. Pore space – definition, factors affecting capillary and non-capillary porosity, soil colour – definition, its significance, colour variable, value hue and chroma. Munsell colour chart, factors influencing, parent material, soil moisture, organic matter, soil structure, definition, classification, clay prism like structure, factors influencing genesis of soil structure, soil consistency, plasticity, Atterberg's constants. Soil air, air capacity, composition, factors influencing, amount of air space, soil air renewal, soil temperature, sources and distribution of heat, factors influencing, measurement, chemical properties, soil colloids, organic, humus, inorganic, secondary silicate, clay, hydrous oxides. Ion exchange, cation-anion importance, soil water, forms, hygroscopic, capillary and gravitational, soil moisture constants, hygroscopic coefficient, wilting point, field capacity, moisture equivalent, maximum water holding capacity, energy concepts, PF scale, measurement, gravimetric – electric and tensiometer methods – pressure plate and pressure membrane apparatus – Neutron probe – soil water movement – classification – aerial photography – satellite of soil features – their interpretation; soil orders; land capability classification; soil of different eco-systems and their properties, Rock & Minerals classification, Pedogenic process. Objectives of soil science research institute in India (NBSS&LUP, ISSS, LTFE & NSSTL). Management of Soil Crusting, Soil Compaction and Soil Compression. Soil Biology benefits and harmful effects. Methods and objective of soil survey, Remote sensing application in soil and plant Studies, Soil degradation.

Practical

Collection and preparation of soil samples, estimation of moisture, EC, pH and bulk density. Textural analysis of soil by Robinson's pipette method. Description of soil profile in the field. Quantification of minerals and their abundance. Determination of Soil colour using Munsell Chart. Estimation of water holding capacity and hydraulic conductivity of soils. Estimation of Infiltration rate using double ring infiltrometer method. Estimation of soil moisture using gypsum block and neutron probe method. Soil compaction measurement with Pentrometer. Determination of pore space of soil. Determination of field capacity and permanent wilting point of soil. Determination of soil water potential characteristic curves by tensiometer and pressure plate apparatus. Aggregate size distribution analysis of soil. Air capacity of soil by field method.

Suggested reading:

- Brady Nyle C and Ray R Well, 2014. *Nature and properties of soils*. Pearson Education Inc., New Delhi.
- Indian Society of Soil Science, 2002. *Fundamentals of Soil Science*. IARI, New Delhi.
- Sehgal J. A., 2005. *Textbook of Pedology Concepts and Applications*. Kalyani Publishers, New Delhi.
- Dilip Kumar Das, 2015. *Introductory Soil Science*. Kalyani Publishers, Ludhiana.
- Biswas, T.D. and Mukharjee, S.K., 2015. *Text Book of Soil science*. Tata Mc Graw Hill Publishing Co. Ltd., New Delhi.
- Brady, N.C., 1995. *The Nature and properties of Soils*. Macmillan Publishing Co, New York.


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- Ghildyal, B.P. and Tripathi, R.P., 1987. *Soil Physics*. Acad. Press. New York.
- Kolay, A.K., 1983. *Basic concepts of Soil Science*. Wiley Eastern Ltd., New Delhi
- Brady, N. C. and Weil, R. R., 2010. *Elements of the Nature and Properties of Soils* (3rd Edition), Pearson Education, New Delhi.
- Foth, H.D., 1991. *Fundamentals of Soil Science* (8th Edition), John Wiley & Sons, New Delhi.
- Das, D .K., 2011. *Introductory Soil Science* (3rd Edition), Kalyani publisher, Ludhiana (India).
- Khan, T. O. 2013 *Forest Soils: Properties and Management*. Springer International Publishing, Switzerland
- Pritchett and Fisher RF, 1987. *Properties and Management of Forest Soils*. John Wiley, New York.
- Gupta, P.K. 2009. *Soil, Plant, Water and Fertilizer Analysis* (2nd Edition), AGROBIOS, Jodhpur (India).
- Jaiswal, P.C. 2006. *Soil, Plant and Water Analysis* (2nd Edition), Kalyani Publishers, Ludhiana.
- Jackson, M. L. 2012. *Soil Chemical Analysis: Advanced Course*, Scientific Publisher

4-Introduction to Forestry Course Code BSAC-104

2 (1+1)

Theory

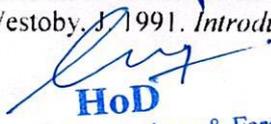
Definition of Forest and Forestry, importance, History, Forestry Education and Research in India. various branches in forestry. National Forest Policy of 1894, 1952, 1988: Indian Forest Act-1927: Karnataka Tree Preservation Act: Forest Conservation Act-1980: The Environment (Protection) Act-1986: Indian Wildlife Preservation Act-1972: Amendments to Environment (Protection) Act-1999. Forest wealth in India: Forest productivity. Deforestation: Various causes and implications, desertification, afforestation, reforestation. Indian wildlife and management. National parks and sanctuaries, endangered species; Forest ecosystem, natural forests and their formation, succession and zonation, limiting factors: climax vegetation, types of natural forests and their distribution. Food chain, natural forests, V/s man-made forest. Social forestry and its branches: Extension forestry, urban forestry, recreation forestry. Farm-forestry: Agro-forestry methods, woodlot system etc., and their management. windbreaks and shelterbelts: different types of waste lands and their reclamation through afforestation and joint forest management.

Practical

Identification of important trees, seeds and seedlings: Study of nursery techniques- Trench and mound plantation, pit plantation: Study of different types of plantations: Visit to agro-forestry and farm forestry plots: Measurement of volume of standing trees: Study of wood formation: study of wood specimens and non-timber forest products. Visit to a nearby National Park and forest.

Suggested Reading

- Beazley, M. 1981. *The International Book of Forest*. London
- Champion and Seth. 1968. *Forest types of India*.
- Grebner, D.L., Bettinger, P. and Siry, J.P. 2012. *Introduction to Forestry and Natural Resources*. Academic Press. 508p (Google eBook).
- Khanna, L.S. 1989. *Principles and Practice of Silviculture*. Khanna Bandhu, New Delhi.
- Mitchell Beazly.1981. *The International Book of the Forest*. Mitchell Beazly Publishers, London.
- Mather, A.S. 1990. *Global Forest Resources*. Belhaven, London
- Persson, R. 1992. *World Forest Resources*. Periodical Experts, New Delhi.
- Westoby, J 1991. *Introduction to World Forestry*. Wiley, 240p.


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5-Comprehension and Communication Skills in English Course Code- BSAC-105
2(1+1)

Theory

War Minus Shooting- The sporting Spirit. A Dilemma- A layman looks at science Raymond B. Fosdick. You and Your English – Spoken English and broken English G.B. Shaw.
Reading Comprehension. Vocabulary- Antonym, Synonym, Homophones, Homonyms, often confused words. Exercises to Help the students in the enrichment of vocabulary based on TOEFL and other competitive examinations. Functional grammar: Articles, Prepositions, Verb, Subject verb Agreement, Transformation, Synthesis, Direct and Indirect Narration. Written 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

Listening Comprehension: Listening to short talks lectures, speeches (scientific, commercial and general in nature). Oral Communication: Phonetics, stress and intonation, Conversation practice. Conversation: rate of speech, clarity of voice, speaking and Listening, politeness & Reading skills: reading dialogues, rapid reading, intensive reading, improving reading skills. Mock Interviews: testing initiative, team spirit, leadership, intellectual ability. Group Discussions.

6-Fundamentals of Agronomy Course Code – BSAC- 106 4(3+1)

Theory

Agronomy and its scope, seeds and sowing, tillage and tilth, crop density and geometry. Crop nutrition, manures and fertilizers, nutrient use efficiency, water resources, soil-plant-water relationship, crop water requirement, water use efficiency, irrigation- scheduling criteria and methods, quality of irrigation water, water logging.
Weeds- importance, classification, crop weed competition, concepts of weed management- principles and methods, herbicides- classification, selectivity and resistance, allelopathy. Growth and development of crops, factors affecting growth and development, plant ideotypes, crop rotation and its principles, adaptation and distribution of crops, crop management technologies in problematic areas, harvesting and threshing of crops.

Practical

Identification of crops, seeds, fertilizers, pesticides and tillage implements, study of agro-climatic zones of India, Identification of weeds in crops. Methods of herbicide and fertilizer application. Study of yield contributing characters and yield estimation, Seed germination and viability test, Numerical exercises on fertilizer requirement, plant population, herbicides and water requirement, Use of tillage implements-reversible plough, one way plough, harrow, leveler, seed drill, Study of soil moisture measuring devices, Measurement of field capacity, bulk density and infiltration rate, Measurement of irrigation water.

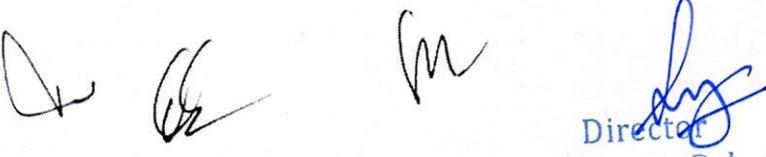
7.Introductory Biology Course Code-BSAR-107 2(1+1)

Theory

Introduction to the living world, diversity and characteristics of life, origin of life, Evolution and Eugenics. Binomial nomenclature and classification Cell and cell division. Morphology of flowering plants. Seed and seed germination. Plant systematic- viz; Brassicaceae, Fabaceae and Poaceae. Role of animals in agriculture.

Practical


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Morphology of flowering plants – root, stem and leaf and their modifications. Inflorescence, flower and fruits. Cell, tissues & cell division. Internal structure of root, stem and leaf. Study of specimens and slides. Description of plants - Brassicaceae, Fabaceae and Poaceae.

7. Elementary Mathematics Course Code –BSAR-108

2(2+0)

Theory

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 st. lines, Parallel lines, Perpendicular lines, Angle of bisectors between two lines, Area of triangle and quadrilateral. 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 $x^2 + y^2 = a^2$. Differential Calculus : Definition of function, limit and continuity, Simple problems on limit, Simple problems on continuity, 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 $y=f(x)$ (Simple problems based on it). 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 (simple problems based on it). 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.

8. Agricultural Heritage Course Code- BSAR-109

1(1+0)

Theory

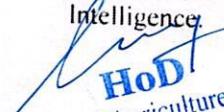
Introduction of Indian agricultural heritage; Ancient agricultural practices, Relevance of heritage to present day agriculture; Past and present status of agriculture and farmers in society; Journey of Indian agriculture and its development from past to modern era; Plant production and protection through indigenous traditional knowledge; Crop voyage in India and world; Agriculture scope; Importance of agriculture and agricultural resources available in India; Crop significance and classifications; National agriculture setup in India; Current scenario of Indian agriculture; Indian agricultural concerns and future prospects.

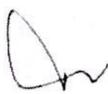
9. Rural Sociology & Educational Psychology Course Code-BSAC-110

2(2+0)

Theory

Sociology and Rural sociology: Definition and scope, its significance in agriculture extension, Social Ecology, Rural society, Social Groups, Social Stratification, Culture concept, Social Institution, Social Change & Development. Educational psychology: Meaning & its importance in agriculture extension. Behavior: Cognitive, affective, psychomotor domain, Personality, Learning, Motivation, Theories of Motivation, Intelligence.


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10. Human Value and Ethics

Course Code BSAN-111

1(1+0)

Theory

Values and Ethics-An Introduction. Goal and Mission of Life. Vision of Life. Principles and Philosophy. Self Exploration. Self Awareness. Self Satisfaction. Decision Making. Motivation. Sensitivity. Success. Selfless Service. Case Study of Ethical Lives. Positive Spirit. Body. Mind and Soul. Attachment and Detachment. Spirituality Quotient. Examination.

11. NSS/NCC/Physical Education & Yoga Practices

Course Code- BSAN-112

2(0+2)

Theory

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.

Following activities are to be taken up under the NSS course:

- Introduction and basic components of NSS: Orientation
- NSS programmes and activities
- Understanding youth
- Community mobilisation
- Social harmony and national integration
- Volunteerism and shramdan
- Citizenship, constitution and human rights
- Family and society
- Importance and role of youth leadership
- Life competencies
- Youth development programmes
- Health, hygiene and sanitation
- Youth health, lifestyle, HIV AIDS and first aid
- Youth and yoga
- Vocational skill development
- Issues related environment
- Disaster management
- Entrepreneurship development
- Formulation of production oriented project
- Documentation and data reporting
- Resource mobilization
- Additional life skills
- Activities directed by the Central and State Government

All the activities related to the National Service Scheme course is distributed under four different courses viz., National Service Scheme I, National Service Scheme II, National Service Scheme III and National Service Scheme IV each having one credit load. The entire four courses should be offered continuously for two years. A student enrolled in NSS course should put in at least 60 hours of social work in different activities in a semester other than


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five regular one day camp in a year and one special camp for duration of 7 days at any semester break period in the two year. Different activities will include orientation lectures and practical works. Activities directed by the Central and State Government have to be performed by all the volunteers of NSS as per direction.

National Service Scheme I

Introduction and basic components of NSS:

Orientation: history, objectives, principles, symbol, badge; regular programmes under NSS, organizational structure of NSS, code of conduct for NSS volunteers, points to be considered by NSS volunteers awareness about health

NSS programmes and activities

Concept of regular activities, special camping, day camps, basis of adoption of village/slums, conducting survey, analysing guiding financial patterns of scheme, youth programme/ schemes of GOI, coordination with different agencies and maintenance of diary

Understanding youth

Definition, profile, categories, issues and challenges of youth; and opportunities for youth who is agent of the social change

Community mobilisation

Mapping of community stakeholders, designing the message as per problems and their culture; identifying methods of mobilisation involving youth-adult partnership

Social harmony and national integration

Indian history and culture, role of youth in nation building, conflict resolution and peace-building

Volunteerism and shramdan

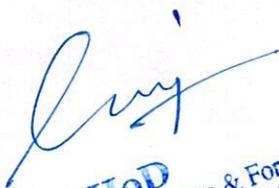
Indian tradition of volunteerism, its need, importance, motivation and constraints; shramdan as part of volunteerism

Citizenship, constitution and human rights

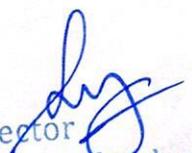
Basic features of constitution of India, fundamental rights and duties, human rights, consumer awareness and rights and rights to information

Family and society

Concept of family, community (PRIs and other community based organisations) and society



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National Cadet Corps

1. Aims, objectives, organization of NCC and NCC song, DG's cardinals of discipline.
2. Drill- aim, general words of command, attention, stands at ease, stand easy and turning.
3. Sizing, numbering, forming in three ranks, open and close order march and dressing.
4. Saluting at the halt, getting on parade, dismissing and falling out.
5. Marching, length of pace, and time of marching in quick/slow time and halt. Side pace, pace forward and to the rear.
6. Turning on the march and wheeling, Saluting on the march.
7. Marking time, forward march and halt.
8. Changing step, formation of squad and squad drill.
9. Command and control, organization, badges of rank, honours and awards
10. Nation Building- cultural heritage, religions, traditions and customs of India. National integration.
11. Values and ethics, perception, communication, motivation, decision making, discipline and duties of good citizen.
12. Leadership traits, types of leadership. Character/personality development.
13. Civil defense organization, types of emergencies, fire fighting, protection.
14. Maintenance of essential services, disaster management, aid during development projects.
15. Basics of social service, weaker sections of society and their needs, NGO's and their contribution, contribution of youth towards social welfare and family planning.
16. Structure and function of human body, diet and exercise, hygiene and sanitation.
17. Preventable diseases including AIDS, safe blood donation, first aid, physical and mental health.
18. Adventure activities
19. Basic principles of ecology, environmental conservation, pollution and its control.
20. Precaution and general behaviour of girl cadets, prevention of untoward incidents, vulnerable parts of the body, self defense.

Physical Education and Yoga Practices**Course Code- BSAN-114****Credit hours: 2(0+2) (0+2)****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


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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).

Semester-II

1-Fundamentals of Genetics Course Code: BSAC-201 3(2+1)

Theory

Pre and Post Mendelian concepts of heredity, Mendelian principles of heredity, Architecture of chromosome; chromonemata, chromosome matrix, chromomeres, centromere, secondary constriction and telomere; special types of chromosomes. Chromosomal theory of inheritance- cell cycle and cell division- mitosis and meiosis. Probability and Chi-square. Dominance relationships, Epistatic interactions with example.

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. Structural and numerical variations in chromosome and their implications, Use of haploids, dihaploids and doubled haploids in Genetics. Mutation, classification, Methods of inducing mutations & CIB technique, mutagenic agents and induction of mutation. Qualitative & Quantitative traits, Polygenes and continuous variations, multiple factor hypothesis, 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

Study of microscope. Study of cell structure. Mitosis and Meiosis cell division. Experiments on monohybrid, dihybrid, trihybrid, test cross and back cross, Experiments on epistatic interactions including test cross and back cross, Practice on mitotic and meiotic cell division, Experiments on probability and Chi-square test. Determination of linkage and cross-over analysis (through two point test cross and three point test cross data). Study on sex linked inheritance in Drosophila. Study of models on DNA and RNA structures.

2-Agricultural Microbiology

Course Code- BSAC 202

2 (1+1)

Theory


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History of microbiology: Spontaneous generation theory, Germ theory of disease, Protection against infections, Metabolism in bacteria: ATP generation, chemoautotrophy, photo autotrophy, respiration, fermentation, Bacteriophages: structure and properties of Bacterial viruses – Lytic and Lysogenic cycles: viroids, prions, Bacterial genetics; Gene Expression: Genetic recombination: transformation, conjugation and transduction, genetic engineering, Plasmids, episomes, genetically modified organisms. Soil Microbiology: Microbial groups in soil, microbial transformations of carbon, nitrogen, phosphorus and sulphur, Biological nitrogen fixation, Microflora of Rhizosphere and Phyllosphere microflora, microbes in composting.

Practical

General instructions- Familiarization with instruments, materials, glassware etc., in a microbiology laboratory. Practice of aseptic methods- Evaluation of aseptic technique with Nutrient both tubes- Evaluation of aseptic technique with a Nutrient agar plate. Methods of sterilization and preparation of media, preparation of nutrient broth, nutrient agar plates, nutrient agar, slants and nutrient agar stablign- Sterilization of glassware by Dry heating- Sterilization of nutrient broth by Filtration. Planting methods for Isolation and Purification of bacteria- Isolation of bacteria by Enrichment using Streak plate method- Checking of purity of a bacteria by staining methods and Biochemical tests- Morphological examination of bacteria by simple and Differential staining- Different biochemical tests for identification of bacterial culture. Enumeration of bacteria- Enumeration of bacteria by Stain slide method- Enumeration of bacteria by Most Probable Number method- Enumeration of bacteria by Pour plate method and Spread plate method. Experiments in soil Microbiology- Study of rhizosphere and phyllosphere microflora- Isolation of Nitrogen fixing bacteria from soil – Isolation of Phosphate Solubilizing Microorganisms. Isolation and characterization of microorganisms in composts.

Suggested Reading

Rangaswamy, G, 1992. *Agricultural Microbiology*, PHI Publication,
N.S. Subbarao, 1999. *Soil Microbiology* - Oxford and IBH publishing Co Pvt Ltd,
R.M. Aggarwal, 2013. *Soil Microbiology*– Wisdom Press/Dominant Publishers and Distributers,
Singh and Purohit, 2008. *Biofertilizer Technology*, Agrobios,
Shalini Suri, *Biofertilizers and Biopesticides*, 2011. APH Publishing Corporation,

3-Introductory Soil and Water Conservation Engineering

Course Code: BSAC 203

2(1+1)

Theory

Introduction to Soil and Water Conservation, causes of soil erosion. Definition and agents of soil erosion, water erosion: Forms of water erosion. Gully classification and control measures. Soil loss estimation by universal Loss Soil Equation. Soil loss measurement techniques. Principles of erosion control: Introduction to contouring, strip cropping, Contour bund. Graded bund and bench terracing. Grassed water ways and their design. Water harvesting and its techniques. Wind erosion: mechanics of wind erosion, types of soil movement. Principles of wind erosion control and its control measures.

Practical

General status of soil conservation in India. Calculation of erosion index. Estimation of soil loss. Measurement of soil loss. Preparation of contour maps. Design of grassed water ways. Design of contour bunds. Design of graded bunds. Design of bench terracing system. Problem on wind erosion.

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History of microbiology: Spontaneous generation theory, Germ theory of disease, Protection against infections, Metabolism in bacteria: ATP generation, chemoautotrophy, photo autotrophy, respiration, fermentation, Bacteriophages: structure and properties of Bacterial viruses - Lytic and Lysogenic cycles: viroids, prions, Bacterial genetics: Gene Expression: Genetic recombination: transformation, conjugation and transduction, genetic engineering, Plasmids, episomes, genetically modified organisms. Soil Microbiology: Microbial groups in soil, microbial transformations of carbon, nitrogen, phosphorus and sulphur, Biological nitrogen fixation, Microflora of Rhizosphere and Phyllosphere microflora, microbes in composting.

Practical

General instructions- Familiarization with instruments, materials, glassware etc., in a microbiology laboratory. Practice of aseptic methods- Evaluation of aseptic technique with Nutrient both tubes- Evaluation of aseptic technique with a Nutrient agar plate. Methods of sterilization and preparation of media, preparation of nutrient broth, nutrient agar plates, nutrient agar, slants and nutrient agar stablign- Sterilization of glassware by Dry heating- Sterilization of nutrient broth by Filtration. Planting methods for Isolation and Purification of bacteria- Isolation of bacteria by Enrichment using Streak plate method- Checking of purity of a bacteria by staining methods and Biochemical tests- Morphological examination of bacteria by simple and Differential staining- Different biochemical tests for identification of bacterial culture. Enumeration of bacteria- Enumeration of bacteria by Stain slide method- Enumeration of bacteria by Most Probable Number method- Enumeration of bacteria by Pour plate method and Spread plate method. Experiments in soil Microbiology- Study of rhizosphere and phyllosphere microflora- Isolation of Nitrogen fixing bacteria from soil - Isolation of Phosphate Solubilizing Microorganisms. Isolation and characterization of microorganisms in composts.

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Rangaswamy, G, 1992. *Agricultural Microbiology*, PHI Publication,
N.S. Subbarao, 1999. *Soil Microbiology* - Oxford and IBH publishing Co Pvt Ltd,
R.M. Aggarwal, 2013. *Soil Microbiology*- Wisdom Press/Dominant Publishers and Distributers,
Singh and Purohit, 2008. *Biofertilizer Technology*, Agrobios,
Shalini Suri, *Biofertilizers and Biopesticides*, 2011. APH Publishing Corporation,

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

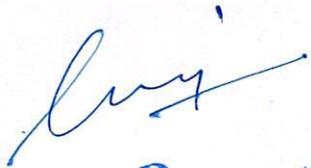
Course Code: BSAC 203

Theory

Introduction to Soil and Water Conservation, causes of soil erosion. Definition and agents of soil erosion, water erosion: Forms of water erosion. Gully classification and control measures. Soil loss estimation by universal Loss Soil Equation. Soil loss measurement techniques. Principles of erosion control: Introduction to contouring, strip cropping, Contour bund. Graded bund and bench terracing. Grassed water ways and their design. Water harvesting and its techniques. Wind erosion: mechanics of wind erosion, types of soil movement. Principles of wind erosion control and its control measures.

Practical

General status of soil conservation in India. Calculation of erosion index. Estimation of soil loss. Measurement of soil loss. Preparation of contour maps. Design of grassed water ways. Design of contour bunds. Design of graded bunds. Design of bench terracing system. Problem on wind erosion.


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Theory

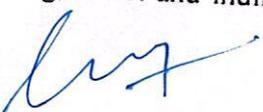
Introduction to crop physiology and its importance in Agriculture: Plant cell: an Overview: Diffusion and osmosis: Absorption of water, transpiration and Stomatal Physiology; Mineral nutrition of Plants: Functions and deficiency symptoms of nutrients, nutrient uptake mechanisms: Photosynthesis: Light and Dark reactions, C₃, C₄ and CAM plants: Respiration: Glycolysis, TCA cycle and electron transport chain: Fat Metabolism: Fatty acid synthesis and Breakdown: Plant growth regulators: Physiological roles and agricultural uses, Physiological aspects of growth and development of major crops: Growth analysis, Role of Physiological growth parameters in crop productivity.

Practical

Study of plant cells, structure and distribution of stomata, imbibitions, osmosis, plasmolysis, measurement of root pressure, rate of transpiration, Separation of photosynthetic pigments through paper chromatography, Rate of transpiration, photosynthesis, respiration, tissue test for mineral nutrients, estimation of relative water content, Measurement of photosynthetic CO₂ assimilation by Infra Red Gas Analyser (IRGA).

Fundamentals of Agricultural Economics Course Code : BSAC 205 2 (2+0)**Theory**

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. *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. 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. Supply: Stock v/s supply, law of supply, supply schedule, supply curve, determinants of supply, elasticity of supply. 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. *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. 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. Agricultural and 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. *Economic systems:* Concepts


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of economy and its functions, important features of capitalistic, socialistic and mixed economies, elements of economic planning.

6-Fundamentals of Plant Pathology Course Code-BSAC 206

3(2+1)

Theory

Introduction to the science of phytopathology, its objectives, scope and historical background. Classification of plant diseases, symptoms, signs, and related terminology. Parasitic causes of plant diseases (fungi, bacteria, viruses, phytoplasma, protozoa, algae and flowering parasitic plants), their characteristics and classification. Non-parasitic causes of plant diseases, Infection process, Survival and dispersal of plant pathogens. Plant disease epidemiology, forecasting and disease assessment. Principles and methods of plant disease management. Integrated plant disease management. Fungicides classification based on chemical nature. Commonly used fungicides, bactericides and nematicides.

Practical

Familiarity with general plant pathological laboratory and field equipments. Study of disease symptoms and signs and host parasite relationship. Identification and isolation of plant pathogens. Koch's postulates. Preparation of fungicidal solutions, slurries, pastes and their applications.

Suggested Readings:

- N.G. Ravichandra, 2013. Fundamentals of Plant Pathology. PHI Hall of India, New Delhi
- R.S. Mehrotra, Ashok Agarwal. *Fundamental of Plant Pathology*- Sambamurthy *A textbook of Plant Pathology*
- R.S. Singh *Introduction to principles of plant pathology*
- Alexopoulos, C.J. Mims, C.W. and Blackwell, M. 1996. *Introduction to Mycology* Wiley Eastern Ltd., New York.
- Mandahar, C.L. 1987. *Introduction to Plant Viruses*. Chand and Co. Pvt. Ltd., New Delhi.
- Mehrotra, R.S. and Aneja, K.R. 1990. . *An Introduction to Mycology*. New Age International (P) Ltd., New Delhi.
- Singh, R.S. 1982. *Plant Pathogens - The Fungi*. Oxford and IBH Publishing Co., New Delhi.
- Singh, R.S. 1989. *Plant Pathogens - The Prokaryotes*. Oxford and IBH Publishing Co., New Delhi.
- Dhingra and Sinclair 1993. *Basic Plant Pathology Methods*. CBS, Publishers & Distributors, New Delhi.
- Agrios, G.N. 2006. *Plant Pathology*. Elsevier Academic press, London.

7-Fundamentals of Entomology Course Code- BSAC 2074(3+1)

Part - I-

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. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretory (Endocrine) and reproductive system, in insects. Types of reproduction in insects. Major sensory organs like simple and compound eyes, chemoreceptor.

Part-II


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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.

Part III

Categories of pests. Concept of IPM. Practices, scope and limitations of IPM. Classification of insecticides, toxicity of insecticides and formulations of insecticides. Chemical control- importance, hazards and limitations. Recent methods of pest control, repellents, antifeedants, hormones, attractants, gamma radiation. Insecticides Act 1968-Important provisions. Application techniques of spray fluids. Symptoms of poisoning, first aid and antidotes.

Part - IV

Systematics: Taxonomy -importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order. 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, Tettigoniidae, Gryllidae, Gryllotalpidae; Dictyoptera: Mantidae, Blattidae; Odonata; Isoptera: Termitidae; Thysanoptera: Thripidae; Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidae, Aleurodidae, Pseudococcidae; Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papilionidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera: Tenthredinidae, Apidae, Trichogrammatidae, Ichneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae, Muscidae, Tephritidae.

Practical

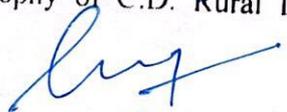
Methods of collection and preservation of insects including immature stages; External features of Grasshopper/Blister beetle; Types of insect antennae, mouthparts and legs; Wing venation, types of wings and wing coupling apparatus. Types of insect larvae and pupae; Dissection of digestive system in insects (Grasshopper); Dissection of male and female reproductive systems in insects (Grasshopper); Study of characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance. Insecticides and their formulations. Pesticide appliances and their maintenance. Sampling techniques for estimation of insect population and damage.

8-Fundamentals of Agricultural Extension Education Course Code- BSAC-208 3(2+1)

Theory

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. 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.

Rural Development: concept, meaning, definition; various rural development programmes launched by Govt. of India. Community Dev.-meaning, definition, concept & principles, Philosophy of C.D. Rural Leadership: concept and definition, types of leaders in rural


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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 TOI (New and Social Media), media mix strategies; 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

To get acquainted with university extension system. 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; Presentation skills exercise, micro teaching exercise; 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; visit to NGO and learning from their experience in rural development; understanding PRA techniques and their application in village development planning; exposure to mass media; visit to community radio and television studio for understanding the process of programme production; script writing, writing for print and electronic media, developing script for radio and television.

9-Communication skills and Personality Development Course Code- BSAC-2092(1+1)

Theory

Communication Skills: Structural and functional grammar; meaning and process of communication, verbal and nonverbal communication; listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting; individual and group presentations, impromptu presentation, public speaking; Group discussion, Organizing seminars and conferences.

Practical

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

Course Title: National Service Scheme II

Importance and role of youth leadership

Meaning, types and traits of leadership, qualities of good leaders; importance and roles of youth leadership

Life competencies

Definition and importance of life competencies, problem-solving and decision-making, inter personal communication

Youth development programmes

Development of youth programmes and policy at the national level, state level and voluntary sector; youth-focused and youth-led organisations

Health, hygiene and sanitation

Definition needs and scope of health education; role of food, nutrition, safe drinking water, water born diseases and sanitation (Swachh Bharat Abhiyan) for health; national health programmes and reproductive health.

Youth health, lifestyle, HIV AIDS and first aid


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Healthy lifestyles, HIV AIDS, drugs and substance abuse, home nursing and first aid

Youth and yoga

History, philosophy, concept, myths and misconceptions about yoga, yoga traditions and its impacts, yoga as a tool for healthy lifestyle, preventive and curative method

Semester II: National Cadet Corps

1. Arms Drill- Attention, stand at ease, stand easy, Getting on parade, Dismissing and falling out, Ground/take up arms, examine arms.
2. Shoulder from the order and vice-versa, present from the order and vice-versa.
3. Saluting at the shoulder at the halt and on the march, Short/long trail from the order and vice-versa.
4. Guard mounting, guard of honour, Platoon/Coy Drill.
5. Characteristics of rifle (.22/.303/SLR), ammunition, fire power, stripping, assembling, care, cleaning and sight setting.
6. Loading, cocking and unloading, The lying position and holding.
7. Trigger control and firing a shot, Range Procedure and safety precautions, Aiming and alteration of sight.
8. Theory of groups and snap shooting, Firing at moving targets, Miniature range firing.
9. Characteristics of Carbine and LMG.
10. Introduction to map, scales and conventional signs, Topographical forms and technical terms.
11. The grid system, Relief, contours and gradients, Cardinal points and finding north, Types of bearings and use of service protractor.
12. Prismatic compass and its use, Setting a map, finding north and own position, Map to ground and ground to map.
13. Knots and lashings, Camouflage and concealment, Explosives and IEDs.
14. Field defenses obstacles, mines and mine lying, Bridging, watermanship.
15. Field water supplies, tracks and their construction.
16. Nuclear, Chemical and Biological Warfare (NCBW)
17. Judging distance, Description of ground and indication of landmarks.
18. Recognition and description of target, Observation and concealment, Field signals, Section formations.
19. Fire control orders, Fire and movement, Movement with/without arms, Section battle drill.
20. Types of communication, media, latest trends and developments.

Semester II: Physical Education and Yoga Practices

1. Teaching of skills of Hockey – demonstration practice of the skills and correction.
2. Teaching of skills of Hockey – demonstration practice of the skills and correction. And involvement of skills in games situation
3. Teaching of advance skills of Hockey – demonstration practice of the skills and correction. Involvement of all the skills in games situation with teaching of rules of the game
4. Teaching of skills of Kho-Kho – demonstration practice of the skills and correction.
5. Teaching of skills of Kho-Kho – demonstration practice of the skills and correction. Involvement of the skills in games situation
6. Teaching of advance skills of Kho-Kho – demonstration practice of the skills and correction. Involvement of all the skills in games situation with teaching of rules of the game


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7. Teaching of different track events – demonstration practice of the skills and correction.
8. Teaching of different track events – demonstration practice of the skills and correction.
9. Teaching of different track events – demonstration practice of the skills and correction with competition among them
10. Teaching of different field events – demonstration practice of the skills and correction.
11. Teaching of different field events – demonstration practice of the skills and correction.
12. Teaching of different field events – demonstration practice of the skills and correction.
13. Teaching of different field events – demonstration practice of the skills and correction with competition among them.
14. Teaching of different asanas – demonstration practice and correction.
15. Teaching of different asanas – demonstration practice and correction.
16. Teaching of different asanas – demonstration practice and correction.
17. Teaching of different asanas – demonstration practice and correction.
18. Teaching of weight training – demonstration practice and correction.
19. Teaching of circuit training – demonstration practice and correction.
20. Teaching of calisthenics – demonstration practice and correction.

Note: 1) Compulsory Uniform: Half pants, Tee Shirts, Shoes and socks all white (Girls will have white Tee Shirt and Track pants) 2) The games mentioned in the practical may be inter changed depending on the season and facilities.

Semester-III

1-Crop Production Technology-I (Kharif Crops) Course Code- BSAC 301

2(1+1)

Theory

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Kharif* crops. Cereals – rice, maize, sorghum, pearl millet and finger millet, pulses-pigeonpea, mungbean and urdbean; oilseeds- groundnut, and soybean; fibre crops- cotton & Jute; forage crops-sorghum, cowpea, cluster bean and napier.

Practical

Rice nursery preparation, transplanting of Rice, sowing of soybean, pigeonpea and mungbean, maize, groundnut and cotton, effect of seed size on germination and seedling vigour of kharif season crops, effect of sowing depth on germination of kharif crops, identification of weeds in kharif season crops, top dressing and foliar feeding of nutrients, study of yield contributing characters and yield calculation of kharif season crops, study of crop varieties and important agronomic experiments at experimental farm, study of forage experiments, morphological description of kharif season crops, visit to research centres of related crops.

2-Fundamentals of Plant Breeding Course Code- BSAC-302

3(2+1)

Theory

Historical development, concept, nature and role of plant breeding, major achievements and future prospects; Genetics in relation to plant breeding, modes of reproduction and apomixes, self-incompatibility and male sterility- genetic consequences, cultivar options. Domestication, Acclimatization and Introduction; Centres of origin/diversity, components of Genetic variation; Heritability and genetic advance; Genetic basis and breeding methods in self-pollinated crops - mass and pure line selection, hybridization techniques and handling of segregating population; Multiline concept. Concepts of population genetics and Hardy-



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Weinberg Law, Genetic basis and methods of breeding cross pollinated crops, modes of selection; Population improvement Schemes- Ear to row method, Modified Ear to Row, recurrent selection schemes; Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties; Breeding methods in asexually propagated crops, clonal selection and hybridization; Maintenance of breeding records and data collection; Wide hybridization and pre-breeding; Polyploidy in relation to plant breeding, mutation breeding-methods and uses; Breeding for important biotic and abiotic stresses; Biotechnological tools-DNA markers and marker assisted selection, Participatory plant breeding; Intellectual Property Rights, Patenting, Plant Breeders and & Farmer's Rights.

Practical

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

3-Agricultural Finance and Co-Operation Course Code- BSAC-303 3(2+1)

Theory

Agricultural Finance- meaning, scope and significance, credit needs and its role in Indian agriculture, Agricultural credit: meaning, definition, need, classification, Credit analysis: 4 R's, and 3C's of credits, Sources of agricultural finance: institutional and non-institutional sources, commercial banks, social control and nationalization of commercial banks, Micro financing including KCC, Lead bank scheme, RRBs, Scale of finance and unit cost, An introduction to higher financing institutions – RBI, NABARD, ADB, IMF, world bank, Insurance and Credit Guarantee Corporation of India, Cost of credit, Recent development in agricultural credit, Preparation and analysis of financial statements – Balance Sheet and Income Statement, Basic guidelines for preparation of project reports- Bank norms – SWOT analysis.

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

Practicals

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

4-Agri-Informatics

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Theory

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

e-Agriculture, concepts and applications, Use of ICT in Agriculture, Computer Models for understanding plant processes, IT application for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management, Smartphone Apps in Agriculture for farm advises, market price, postharvest management etc; Geospatial technology for generating valuable agri-information, Decision support systems, concepts, components and applications in Agriculture, Agriculture Expert System, Soil Information Systems etc for supporting Farm decisions, Preparation of contingent crop-planning using IT tools.

Practical

Study of Computer Components, accessories, practice of important DOS Commands, Introduction of different operating systems such as windows, Unix/ Linux, Creating, Files & Folders, File Management, Use of MS-WORD and MS Power-point for creating, editing and presenting a scientific Document, MS-EXCEL – Creating a spreadsheet, use of statistical tools, writing expressions, creating graphs, analysis of scientific data, MS-ACCESS: Creating Database, preparing queries and reports, demonstration of Agri-information system, Introduction to World Wide Web (WWW), Introduction of programming languages, Hands on Crop Simulation Models (CSM) such as DSSAT/Crop-Info/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.

5-Farm Machinery and Power Course Code- BSAC-305

2(1+1)

Theory

Status of Farm Power in India, Sources of Farm Power , I.C. engines, working principles of I C engines, comparison of two stroke and four stroke cycle engines , Study of different components of I.C. engine, I.C. engine terminology and solved problems, Familiarization with different systems of I.C. engines: Air cleaning, cooling, lubrication ,fuel supply and hydraulic control system of a tractor, Familiarization with Power transmission system : clutch, gear box, differential and final drive of a tractor , Tractor types, Cost analysis of tractor power and attached implement, Familiarization with Primary and Secondary Tillage implement, Implement for hill agriculture, implement for intercultural operations, Familiarization with sowing and planting equipment, calibration of a seed drill and solved examples, Familiarization with Plant Protection equipment, Familiarization with harvesting and threshing equipment.

Practicals

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


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Familiarization with different inter-cultivation equipment. Familiarization with harvesting and threshing machinery.

6-Production Technology for Vegetable and Spices Course Code- BSAC-306

2(1+1)

Theory

Importance of vegetables & spices in human nutrition and national economy, kitchen gardening, brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders, of important vegetable and spices (Tomato, Brinjal, Chilli, Capsicum, Cucumber, Melons, Gourds, Pumpkin, French bean, Peas; Cole crops such as Cabbage, Cauliflower, Knol-khol; Bulb crops such as Onion, Garlic; Root crops such as Carrot, Raddish, Beetroot; Tuber crops such as Potato; Leafy vegetables such as Amaranth, Palak, Perennial vegetables).

Practical

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

7-Environmental Studies and Disaster Management Course Code- BSAC3073(2+1)

Theory

Multidisciplinary nature of environmental studies Definition, scope and importance.
Natural Resources: Renewable and non-renewable resources, Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role of an individual in conservation of natural resources. • Equitable use of resources for sustainable lifestyles.
Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem. Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)
Biodiversity and its conservation: - Introduction, definition, genetic, species & ecosystem diversity and biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels, India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

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Environmental Pollution: definition, cause, effects and control measures of: a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards. Solid Waste Management: causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.

Social Issues and the Environment: From Unsustainable to Sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, dies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.

Human Population and the Environment: population growth, variation among nations, population explosion, Family Welfare Programme. Environment and human health: Human Rights, Value Education, HIV/AIDS, Women and Child Welfare. Role of Information Technology in Environment and human health.

Disaster Management

Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion.

Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, air accidents, sea accidents.

Disaster Management- Effect to migrate natural disaster at national and global levels. International strategy for disaster reduction. Concept of disaster management, national disaster management framework: financial arrangements; role of NGOs, community -based organizations and media. Central, state, district and local administration; Armed forces in disaster response: Disaster response: Police and other organizations.

Practical

Pollution case studies. Case Studies- Field work: Visit to a local area to document environmental assets river/ forest/ grassland/ hill/ mountain, visit to a local polluted site- Urban/Rural/Industrial/Agricultural, study of common plants, insects, birds and study of simple ecosystems-pond, river, hill slopes, etc.

8-Statistical Methods

Course Code- BSAC-308

2(1+1)

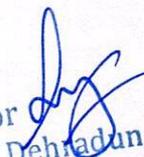
Theory

Introduction to Statistics and its Applications in Agriculture, Graphical Representation of Data. Measures of Central Tendency & Dispersion, Definition of Probability, Addition and Multiplication Theorem (without proof). Simple Problems Based on Probability. Binomial & Poisson Distributions. Definition of Correlation, Scatter Diagram. Karl Pearson's Coefficient of Correlation. Linear Regression Equations. Introduction to Test of Significance, One sample & two sample test t for Means, Chi-Square Test of Independence of Attributes in 2×2 Contingency Table. Introduction to Analysis of Variance, Analysis of One Way Classification. Introduction to Sampling Methods, Sampling versus Complete Enumeration, Simple Random Sampling with and without replacement, Use of Random Number Tables for selection of Simple Random Sample.

Practical

Graphical Representation, of Data. Measures of Central Tendency (Ungrouped data) with Calculation of Quartiles, Deciles & Percentiles. Measures of Central Tendency (Grouped


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data) with Calculation of Quartiles, Deciles & Percentiles. Measures of Dispersion (Ungrouped Data). Measures of Dispersion (Grouped Data). Moments, Measures of Skewness & Kurtosis (Ungrouped Data). Moments, Measures of Skewness & Kurtosis (Grouped Data). Correlation & Regression Analysis. Application of One Sample t-test. Application of Two Sample Fisher's t-test. Chi-Square test of Goodness of Fit. Chi-Square test of Independence of Attributes for 2 × 2 contingency table. Analysis of Variance One Way Classification. Analysis of Variance Two Way Classification. Selection of random sample using Simple Random Sampling.

9-Livestock & Poultry Management

Course Code- BSAC-309

4(3+1)

Theory

Role of livestock in the national economy. Reproduction in farm animals and poultry. Housing principles, space requirements for different species of livestock and poultry. Management of calves, growing heifers and milch animals. Management of sheep, goat and swine. Incubation, hatching and brooding. Management of growers and layers. Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry. Improvement of farm animals and poultry. Digestion in livestock and poultry. Classification of feedstuffs. Proximate principles of feed. Nutrients and their functions. Feed ingredients for ration for livestock and poultry. Feed supplements and feed additives. Feeding of livestock and poultry. Introduction of livestock and poultry diseases. Prevention (including vaccination schedule) and control of important diseases of livestock and poultry.

Practical

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

Semester –IV

1-Crop Production Technology-II (Rabi crops)

Course Code- BSAC-401

2(1+1)

Theory

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops; cereals –wheat and barley, pulses-chickpea, lentil, peas, oilseeds-rape seed, mustard and sunflower; sugar crops-sugarcane; medicinal and aromatic crops-mentha, lemon grass and citronella, Forage crops-berseem, 28ucerne and oat.

Practical

Sowing methods of wheat and sugarcane, identification of weeds in *rabi* season crops, study of morphological characteristics of *rabi* crops, study of yield contributing characters of *rabi* season crops, yield and juice quality analysis of sugarcane, study of important agronomic


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experiments of *rabi* crops at experimental farms. Study of *rabi* forage experiments, oil extraction of medicinal crops, visit to research stations of related crops.

2-Production Technology for Ornamental Crops, MAPs and Landscaping Course Code- BSAC-402

2(1+1)Theory

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

Practical

Identification of Ornamental plants. Identification of Medicinal and Aromatic Plants. Nursery bed preparation and seed sowing. Training and pruning of Ornamental plants. Planning and layout of garden. Bed preparation and planting of MAP. Protected structures – care and maintenance. Intercultural operations in flowers and MAP. Harvesting and post harvest handling of cut and loose flowers. Processing of MAP. Visit to commercial flower/MAP unit.

3-Renewable Energy and Green Technology

Course Code- BSAC-403 2(1+1)

Theory

Classification of energy sources, contribution of these of sources in agricultural sector. Familiarization with biomass utilization for biofuel production and their application. Familiarization with types of biogas plants and gasifiers, biogas, bioalcohol, biodiesel and biooil production and their utilization as bioenergy resource, introduction of solar energy, collection and their application. Familiarization with solar energy gadgets: solar cooker, solar water heater. application of solar energy: solar drying, solar pond, solar distillation, solar photovoltaic system and their application, introduction of wind energy and their application.

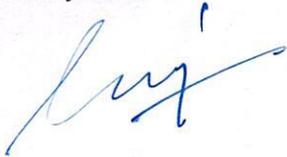
Practical

Familiarization with renewable energy gadgets. To study biogas plants, To study gasifier. To study the production process of biodiesel, To study briquetting machine, To study the production process of bio-fuels. Familiarization with different solar energy gadgets. To study solar photovoltaic system: solar light, solar pumping, solar fencing. To study solar cooker, To study solar drying system. To study solar distillation and solar pond.

4-Problematic Soils and their Management Course Code- BSAC-404 2(2+0)

Theory

Soil quality and health, Distribution of Waste land and problem soils in India. Their categorization based on properties. Reclamation and management of Saline and sodic soils, Acid soils. Acid Sulphate soils, Eroded and Compacted soils, Flooded soils, Polluted soils. Irrigation water – quality and standards, utilization of saline water in agriculture. Remote sensing and GIS in diagnosis and management of problem soils. Multipurpose tree species, bio remediation through MPTs of soils, land capability and classification, land suitability classification. Problematic soils under different Agro-ecosystems.


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5-Production Technology for Fruit and Plantation Crops
BSAC2(1+1)

Course

Code-405

Theory

Importance and scope of fruit and plantation crop industry in India; Importance of rootstocks; Production technologies for the cultivation of major fruits-mango, banana, citrus, grape, guava, litchi, papaya, sapota, apple, pear, peach, walnut, almond and; minor fruits- date, ber, pineapple, pomegranate, jackfruit, strawberry, plantation crops-coconut, arecanut, cashew, tea, coffee & rubber.

Practical

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

6-Principles of Seed Technology Course Code- BSAC-406

3(1+2)

Theory

Seed and seed technology: introduction, definition and importance. Deterioration causes of crop varieties and their control; Maintenance of genetic purity during seed production, seed quality; Definition, Characters of good quality seed, different classes of seed. Foundation and certified seed production of important **cereals, pulses, oilseeds, fodder and vegetables**. Seed certification, phases of certification, procedure for seed certification, field inspection. Seed Act and Seed Act enforcement. Duty and powers of seed inspector, offences and penalties. Seeds Control Order 1983, Varietal Identification through Grow Out Test and Electrophoresis. Molecular and Biochemical test. Detection of genetically modified crops. Transgene contamination in non-GM crops, GM crops and organic seed production. Seed drying, processing and their steps, seed testing for quality assessment, seed treatment, its importance, method of application and seed packing. Seed storage; general principles, stages and factors affecting seed longevity during storage. Measures for pest and disease control during storage. Seed marketing: structure and organization, sales generation activities, promotional media. Factors affecting seed marketing, Role of WTO and OECD in seed marketing. Private and public sectors and their production and marketing strategies.

Practical

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

7-Farming System and Sustainable Agriculture Course Code- BSAC-407

1(1+0)

Theory

Farming System-scope, importance, and concept, Types and systems of farming system and factors affecting types of farming, Farming system components and their maintenance, 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; Sustainable agriculture-problems and its impact on agriculture, Indicators of sustainability, adaptation and mitigation, conservation agriculture


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strategies in agriculture. HEIA, LEIA and LEISA and its techniques for sustainability. 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. 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.

8-Agricultural Marketing, Trade and Prices Course Code- BSAC-408

3(2+1)

Theory

Agricultural Marketing: Concepts and definitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation, classification and characteristics of agricultural markets; demand, supply and producer's surplus of agri-commodities; nature and determinants of demand and supply of farm products, producer's surplus – meaning and its types, marketable and marketed surplus, factors affecting marketable surplus of agri-commodities; product life cycle (PLC) and competitive strategies: Meaning and stages in PLC; characteristics of PLC; strategies in different stages of PLC; pricing and promotion strategies: pricing considerations and approaches – cost based and competition based pricing; market promotion – advertising, personal selling, sales promotion and publicity – their meaning and merits & demerits; marketing process and functions: Marketing process-concentration, dispersion and equalization; exchange functions – buying and selling; physical functions – storage, transport and processing; facilitating functions – packaging, branding, grading, quality control and labeling (Agmark); Market functionaries and marketing channels: Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel; number of channel levels; marketing channels for different farm products; Integration, efficiency, costs and price spread: Meaning, definition and types of market integration; marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs; Role of Govt. in agricultural marketing: Public sector institutions- CWC, SWC, FCI, CACP & DMI – their objectives and functions; cooperative marketing in India; Risk in marketing: Types of risk in marketing; speculation & hedging; an overview of futures trading; Agricultural prices and policy: Meaning and functions of price; administered prices; need for agricultural price policy; Trade: Concept of International Trade and its need, theories of absolute and comparative advantage. Present status and prospects of international trade in agri-commodities; GATT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR.

Practical

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

9-Introductory Agrometeorology & Climate Change Course Code- BSAC-409

2(1+1)

Theory


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

Practical

Visit of Agrometeorological Observatory, site selection of observatory, exposure of instruments and weather data recording, Measurement of total, shortwave and longwave radiation, and its estimation using Planck's intensity law, Measurement of albedo and sunshine duration, computation of Radiation Intensity using BSS, Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis, Measurement of soil temperature and computation of soil heat flux, Determination of vapor pressure and relative humidity, Determination of dew point temperature, Measurement of atmospheric pressure and analysis of atmospheric conditions, Measurement of wind speed and wind direction, preparation of windrose, Measurement, tabulation and analysis of rain, Measurement of open pan evaporation and evapotranspiration, Computation of PET and AET.

Semester-V

1-Principles of Integrated Pest and Disease Management Course Code- BSAC-501 3(2+1)

Theory

Categories of insect pests and diseases, IPM: Introduction, history, importance, concepts, principles and tools of IPM, 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, Methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control, 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, 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

Methods of diagnosis and detection of various insect pests, and plant diseases, Methods of insect pests and plant disease measurement, Assessment of crop yield losses, calculations based on economics of IPM, Identification of biocontrol agents, different predators and natural enemies, Mass multiplication of *Trichoderma*, *Pseudomonas*, *Trichogramma*, NPV


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etc. Identification and nature of damage of important insect pests and diseases and their management. Crop (agro-ecosystem) dynamics of a selected insect pest and diseases. Plan & assess preventive strategies (IPM module) and decision making. crop monitoring attacked by insect, pest and diseases . Awareness campaign at farmers fields.

2-Manures, Fertilizers and Soil Fertility Management Course Code- BSAC-502 3(2+1)

Theory

Introduction and importance of organic manures, properties and methods of preparation of bulky and concentrated manures. Green/leaf manuring. Fertilizer recommendation approaches. Integrated nutrient management.

Chemical fertilizers: classification, composition and properties of major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, Complex fertilizers, nano fertilizers Soil amendments, Fertilizer Storage, Fertilizer Control Order.

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. 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. Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions.

Practical

Introduction of analytical instruments and their principles, calibration and applications. Colorimetry and flame photometry. Estimation of soil organic carbon, Estimation of alkaline hydrolysable N in soils. Estimation of soil extractable P in soils. Estimation of exchangeable K; Ca and Mg in soils . Estimation of soil extractable S in soils.. Estimation of DTPA extractable Zn in soils. Estimation of N in plants. Estimation of P in plants. Estimation of K in plants. Estimation of S in plants.

3-Pests of Crops and Stored Grains and their Management Course Code- BSAC-503 3(2+1)

Theory

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, and 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. Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain. Insect pests, mites, rodents, birds and microorganisms associated with stored grain and their management. Storage structure and methods of grain storage and fundamental principles of grain store management.

Practical

Identification of different types of damage. Identification and study of life cycle and seasonal 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. Identification of insect pests and Mites associated with stored grain.


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Determination of insect infestation by different methods. Assessment of losses due to insects. Calculations on the doses of insecticides application technique. Fumigation of grain store / godown. Identification of rodents and rodent control operations in godowns. Identification of birds and bird control operations in godowns. Determination of moisture content of grain. Methods of grain sampling under storage condition. Visit to Indian Storage Management and Research Institute, Hapur and Quality Laboratory, Department of Food, Delhi. Visit to nearest FCI godowns.

4-Diseases of Field & Horticultural Crops & their Management-I Course Code- BSAC-504

3 (2+1)

Theory

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

Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory. Field visit for the diagnosis of field problems. Collection and preservation of plant diseased specimens for Herbarium; Note: Students should submit 50 pressed and well-mounted specimens.

5-Crop Improvement – I (Kharif) Course Code- BSAC-505

2(1+1)

Theory

Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fibres; fodders and cash crops; vegetable and horticultural crops; Plant genetic resources, its utilization and conservation, study of genetics of qualitative and quantitative characters; Important concepts of breeding self pollinated, cross pollinated and vegetatively propagated crops; 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); Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeonpea, etc. Ideotype concept and climate resilient crop varieties for future.

Practical

Floral biology, emasculation and hybridization techniques in different crop species; viz., Rice, Jute, Maize, Sorghum, Pearl millet, Ragi, Pigeonpea, Urdbean, Mungbean, Soybean, Groundnut, Sesame, Caster, Cotton, Cowpea, Tobacco, Brinjal, Okra and Cucurbitaceous crops. Maintenance breeding of different *kharif* crops. Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent


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methods: Study of field techniques for seed production and hybrid seeds production in *Kharif* crops; Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments; Study of quality characters, donor parents for different characters; Visit to seed production plots; Visit to AICRP plots of different field crops.

6- Entrepreneurship Development and Business Communication Course Code- BSAC-506 2 (1+1)

Theory

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

Practical

Assessing entrepreneurial traits, problem solving skills, managerial skills and achievement motivation, exercise in creativity, time audit through planning, monitoring and supervision, identification and selection of business idea, preparation of business plan and proposal writing, visit to entrepreneurship development institute and entrepreneurs.

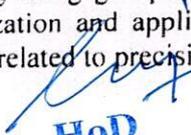
7-Geoinformatics, Nano-technology and Precision Farming Course Code- BSAC-507 2(1+1)

Theory

Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture; Geo-informatics- definition, concepts, tool and techniques; their use in Precision Agriculture. 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; Global positioning system (GPS), components and its functions; Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs; STCR approach for precision agriculture; Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors, Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.

Practical

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


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methods: Study of field techniques for seed production and hybrid seeds production in *Kharif* crops: Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments: Study of quality characters, donor parents for different characters: Visit to seed production plots: Visit to AICRP plots of different field crops.

6- Entrepreneurship Development and Business Communication Course Code- BSAC-506 2 (1+1)

Theory

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

Practical

Assessing entrepreneurial traits, problem solving skills, managerial skills and achievement motivation, exercise in creativity, time audit through planning, monitoring and supervision, identification and selection of business idea, preparation of business plan and proposal writing, visit to entrepreneurship development institute and entrepreneurs.

7-Geoinformatics, Nano-technology and Precision Farming Course Code- BSAC-507 2(1+1)

Theory

Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture: Geo-informatics- definition, concepts, tool and techniques; their use in Precision Agriculture. 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; Global positioning system (GPS), components and its functions; Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs; STCR approach for precision agriculture; Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors, Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.

Practical

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


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8-Practical Crop Production-I (Kharif Crops) Course Code- BSAC 508 2(0+2)

Practical

Crop planning, raising field crops in multiple cropping systems: 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. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.

9-Intellectual Property Rights Course Code- BSAC -509 1(1+0)

Theory

Introduction and meaning of intellectual property, brief introduction to GATT, WTO, TRIPs and WIPO. Treaties for IPR protection: Madrid protocol, Berne Convention, Budapest treaty, etc.

Types of Intellectual Property and legislations covering IPR in India:-Patents, Copyrights, Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets. Patents Act 1970 and Patent system in India, patentability, process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement, Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database.

Origin and history including a brief introduction to UPOV for protection of plant varieties, Protection of plant varieties under UPOV and PPV&FR Act of India, Plant breeders rights, Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights, Traditional knowledge-meaning and rights of TK holders.

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

Semester-VI

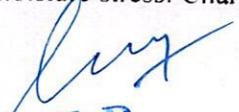
1-Rainfed Agriculture and Watershed Management – Course Code- BSAC-601 2(1+1)

Theory

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

Practical

Studies on climate classification, studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons. Studies on cropping pattern of different rainfed areas in the country and demarcation of rainfed area on map of India. Interpretation of meteorological data and scheduling of supplemental irrigation on the basis of evapo-transpiration demand of crops. Critical analysis of rainfall and possible drought period in the country, effective rainfall and its calculation. Studies on cultural practices for mitigating moisture stress. Characterization and delineation of model watershed. Field demonstration on


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soil & moisture conservation measures. Field demonstration on construction of water harvesting structures. Visit to rainfed research station/watershed.

2-Protected Cultivation and Secondary Agriculture Course Code- BSAC -602 2(1+1)

Theory

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. 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.

Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHI equipment design and operation. 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). Material handling equipment; conveyer and elevators, their principle, working and selection.

Practical

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

3-Diseases of Field & Horticultural Crops & their Management-II Course Code- BSAC -6033(2+1)

Theory

Symptoms, etiology, disease cycle and management of following diseases:

Field Crops

Wheat: rusts, loose smut, karnal bunt, powdery mildew, alternaria blight, and ear cockle;

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; 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.

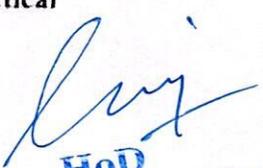
Horticultural Crops:

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;

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


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Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory. Field visit for the diagnosis of field problems. Collection and preservation of plant diseased specimens for herbarium.

Note: Students should submit 50 pressed and well-mounted specimens.

4-Post-harvest Management and Value Addition of Fruits and Vegetables

Course Code- BSAC-604

2(1+1)

Theory

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

Practical

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

5-Management of Beneficial Insects Course Code- BSAC -605

2(1+1)

Theory

Importance of beneficial Insects, Beekeeping and pollinators, bee biology, commercial methods of rearing, equipment used, seasonal management, bee enemies and disease. Bee pasturage, bee foraging and communication. Insect pests and diseases of honey bee. Role of pollinators in cross pollinated plants.

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.

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.

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

Honey bee species, castes of bees. Beekeeping appliances and seasonal management, bee enemies and disease. Bee pasturage, bee foraging and communication. Types of silkworm, voltinism and biology of silkworm. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Species of lac insect, host plant identification. Identification of other important pollinators, weed killers and scavengers. Visit to research and training institutions devoted to beekeeping, sericulture, lac culture and natural enemies. Identification and techniques for mass multiplication of natural enemies.

6-Crop Improvement – II (Rabi) Course Code- BSAC -606

2(1+1)

Theory

Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fodder crops and cash crops; vegetable and horticultural crops; Plant genetic resources, its utilization and conservation; study of genetics of qualitative and quantitative characters; 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); Hybrid seed production technology of *rabi* crops. Ideotype concept and climate resilient crop varieties for future.

Practical

Floral biology, 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; Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods; Study of field techniques for seed production and hybrid seeds production in *Rabi* crops; Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments; Study of quality characters, study of donor parents for different characters; Visit to seed production plots; Visit to AICRP plots of different field crops

7-Practical Crop Production-II (Rabi Crops)

Course Code- BSAC-607

2(0+2)

Practical

Crop planning, raising field crops in multiple cropping systems: 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. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.

8-Principles of Organic Farming

Course Code- BSAC-608

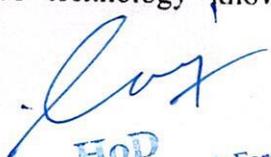
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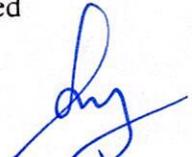
Theory

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

Practical

Visit of organic farms to study the various components and their utilization; Preparation of enrich compost, vermicompost, bio-fertilizers/bio-inoculants and their quality analysis; Indigenous technology knowledge (ITK) for nutrient, insect, pest disease and weed


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management: Cost of organic production system: Post harvest management: Quality aspect. grading, packaging and handling.

9-Farm Management, Production and Resource Economics

**Course Code- BSAC-609
2(1+1)**

Theory

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. 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 labor income and farm business income. 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. 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. 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

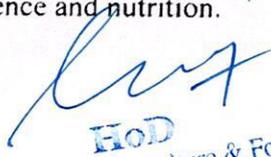
Preparation of farm layout. Determination of cost of fencing of a farm. Computation of depreciation cost of farm assets. Application of equi-marginal returns/opportunity cost principle in allocation of farm resources. Determination of most profitable level of inputs use in a farm production process.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

10-Principles of Food Science and Nutrition Course Code- BSAC-610

2(2+0)

Theory

Concepts of Food Science (definitions, measurements, density, phase change, pH, osmosis, surface tension, colloidal systems etc.); Food composition and chemistry (water, carbohydrates, proteins, fats, vitamins, minerals, flavours, colours, miscellaneous bioactives, important reactions); Food microbiology (bacteria, yeast, moulds, spoilage of fresh & processed foods, Production of fermented foods); 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; Energy metabolism (carbohydrate, fat, proteins); Balanced/ modified diets, Menu planning, New trends in food science and nutrition.


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ELECTIVE COURSES

1. Agri-business Management 3(2+1)

Theory

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

Practical

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

2. Agrochemicals 3(2+1)

Theory

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.

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.

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.

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Fertilizers and their importance. 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. 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

Sampling of fertilizers and pesticides. Pesticides application technology to study about various pesticides appliances. Quick tests for identification of common fertilizers. Identification of anion and cation in fertilizer. Calculation of doses of insecticides to be used. To study and identify various formulations of insecticide available in market. Estimation of nitrogen in Urea. Estimation of water soluble P_2O_5 and citrate soluble P_2O_5 in single super phosphate. Estimation of potassium in Murreite of Potash/ Sulphate of Potash by flame photometer. Determination of copper content in copper oxychloride. Determination of sulphur content in sulphur fungicide. Determination of thiram. Determination of ziram content.

3. Commercial Plant Breeding 3(1+2)

Theory

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

Practical

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

4. Landscaping 3(2+1)

Theory

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


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purposes. Trees: selection, propagation, planting schemes, canopy management, shrubs and herbaceous perennials: selection, propagation, planting schemes, architecture. Climber and creepers: importance, selection, propagation, planting. Annuals: selection, propagation, planting scheme. Other garden plants: palms, ferns, grasses and cacti succulents. Pot plants: selection, arrangement, management. 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. Bonsai: principles and management, lawn: establishment and maintenance, CAD application.

Practical

Identification of trees, shrubs, annuals, pot plants; Propagation of trees, shrubs and annuals, care and maintenance of plants, potting and repotting, identification of tools and implements used in landscape design, training and pruning of plants for special effects, lawn establishment and maintenance, layout of formal gardens, informal gardens, special type of gardens (sunken garden, terrace garden, rock garden) and designing of conservatory and lathe house. Use of computer software, visit to important gardens/ parks/ institutes.

5. Food Safety and Standards 3(2+1)

Theory

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

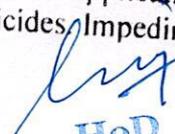
Practical

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

6. Course title: Biopesticides & Biofertilizers 3(2+1)

Theory

History and concept of biopesticides. Importance, scope and potential of biopesticide. Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and biorationales. Botanicals and their uses. Mass production technology of bio-pesticides. Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes. Methods of application of biopesticides. Methods of quality control and Techniques of biopesticides. Impediments and limitation in production and use of biopesticide.


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Biofertilizers - Introduction, status and scope. Structure and characteristic features of bacterial biofertilizers- *Azospirillum*, *Azotobacter*, *Bacillus*, *Pseudomonas*, *Rhizobium* and *Frankia*; Cyanobacterial biofertilizers- *Anabaena*, *Nostoc*, *Hapalosiphon* and fungal biofertilizers- AM mycorrhiza and ectomycorrhiza. Nitrogen fixation -Free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilization and phosphate mobilization, K solubilization. Production technology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid 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

Isolation and purification of important biopesticides: *Trichoderma*, *Pseudomonas*, *Bacillus*, *Metarhizium* etc. and its production. Identification of important botanicals. Visit to biopesticide laboratory in nearby area. Field visit to explore naturally infected cadavers. Identification of entomopathogenic entities in field condition. Quality control of biopesticides.

Isolation and purification of *Azospirillum*, *Azotobacter*, *Rhizobium*, P-solubilizers and cyanobacteria. Mass multiplication and inoculums production of biofertilizers. Isolation of AM fungi -Wet sieving method and sucrose gradient method. Mass production of AM inoculants.

7. Protected Cultivation 3(2+1)

Theory

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. Greenhouse design, environment control, artificial lights, Automation. Soil preparation and management, Substrate management. Types of benches and containers. Irrigation and fertigation management. Propagation and production of quality planting material of horticultural crops. Greenhouse cultivation of important horticultural crops - rose, carnation, chrysanthemum, gerbera, orchid, anthurium, liliun, tulip, tomato, bell pepper, cucumber, strawberry, pot plants, etc. Cultivation of economically important medicinal and aromatic plants. Off-season production of flowers and vegetables. Insect pest and disease management.

Practical

Raising of seedlings and saplings under protected conditions, use of protrays in quality planting material production, Bed preparation and planting of crop for production, Inter cultural operations, Soil EC and pH measurement, Regulation of irrigation and fertilizers through drip, fogging and misting.

8. Micro propagation Technologies 3(1+2)

Theory

Introduction, History, Advantages and limitations; Types of cultures (seed, embryo, organ, callus, cell), Stages of micropropagation, Axillary bud proliferation (Shoot tip and meristem culture, bud culture), Organogenesis (callus and direct organ formation), Somatic embryogenesis, cell suspension cultures, Production of secondary metabolites, Somaclonal variation, Cryopreservation

Practical

Identification and use of equipments in tissue culture Laboratory, Nutrition media composition, sterilization techniques for media, containers and small instruments, sterilization techniques for explants, Preparation of stocks and working solution, Preparation

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of working medium. Culturing of explants :Seeds, shoot tip and single node, Callus induction. Induction of somatic embryos regeneration of whole plants from different explants. Hardening procedures.

9. Hi-tech. Horticulture 3(2+1)

Theory

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, Micro irrigation systems and its components: EC, pH based fertilizer scheduling, canopy management, high density orcharding. Components of precision farming: Remote sensing, Geographical Information System (GIS), Differential Geo-positioning System (DGPS), Variable Rate applicator (VRA), application of precision farming in horticultural crops (fruits, vegetables and ornamental crops): mechanized harvesting of produce.

Practical

Types of polyhouses and shade net houses, Intercultural operations, tools and equipments identification and application, Micro propagation, Nursery-protrays, micro-irrigation, EC, pH based fertilizer scheduling, canopy management, visit to hi-tech orchard/nursery.

10. Weed Management 3(2+1)

Theory

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

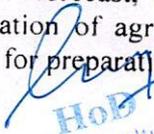
Practical

Techniques of weed preservation. Weed identification and their losses study. Biology of important weeds. Study of herbicide formulations and mixture of herbicide. Herbicide and agro-chemicals study. Shift of weed flora study in long term experiments. Study of methods of herbicide application, spraying equipments. Calculations of herbicide doses and weed control efficiency and weed index.

11. System Simulation and Agroadvisory 3(2+1)

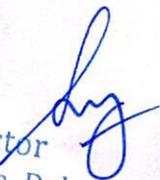
Theory

System Approach for representing soil-plant-atmospheric continuum, system boundaries, Crop models, concepts & techniques, types of crop models, data requirements, relational diagrams. Evaluation of crop responses to weather elements; Elementary crop growth models: calibration, validation, verification and sensitivity analysis. 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. Weather forecasting, types, methods, tools & techniques, forecast verification; Value added weather forecast, WTK for weather forecast and its validity; 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.


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SEMESTER WISE DETAILED LAYOUT OF COURSES

Semester – I						
Course No.	Course Title	Credit Hrs	Theory		Practical	Total
			Ex.	Int.		
BSAG 101	Elementary Statistics	1+1	35	15	25	75
BSAG102	Agriculture Meteorology	1+1	35	15	25	75
BSAG103	Computer Application	1+1	35	15	25	75
BSAG 104	Str. & Spoken English	1+1	35	15	25	75
BSAG 105	Elementary Agri/Elementary/ Biology/Elementary Mathematics (Only one depending on subjects in 10+2)	2+1	35	15	25	75
BSAG 106	Principles of Agronomy	2+1	35	15	25	75
BSAG 107	Rural Sociology & Educational Psychology	2+1	35	15	25	75
Total		10+7 = 17	245	105	175	525

Semester – II						
Course No.	Course Title	Credit Hrs	Theory		Practical	Total
			Ex.	Int.		
BSAG 201	Fundamentals of Soil Science	2+1	35	15	25	75
BSAG 202	Fundamentals of Horticulture	2+1	35	15	25	75
BSAG 203	Elementary Plant Biochemistry	2+1	35	15	25	75
BSAG 204	Weed Management	1+1	35	15	25	75
BSAG 205	Element of Genetics	2+1	35	15	25	75
BSAG 206	Introductory Entomology	2+1	35	15	25	75
BSAG 207	Introductory Plant Pathology	2+1	35	15	25	75
BSAG 208	Microbiology	1+1	35	15	25	75
Total		14+8 = 22	280	120	200	600


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B.SC. AGRICULTURE SEMESTER – I

PAPER – I (ELEMENTARY STATISTICS)

BSAG 101	ELEMENTARY STATISTICS	2L: 1T: 1P	Credit hr 2
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Course Outcomes:

- Determine potential outliers of data sets, understand how they affect the various numerical measures & analyse the errors of different crops.
- Analyse and/or compare different sets of data using graphs, charts, tables, and numerical measures, and write about them in clear and precise sentences using statistical vocabulary and apply in different fields of agriculture.
- Find and interpret the sample correlation coefficient (r) to determine the strength and direction of the linear relationship between predictor and response variables.
- Examine information about different operations and different methods which can be adopted for improving crop output
- Important for collecting, presenting analysis and interpreting data in research work.

Course Content:

Introduction to statistics, arithmetic mean, median, mode and partition values range, interquartile range, quartile deviation, mean deviation, variances, standard deviation, coefficient of variation, moments, skewness, Kurtosis and its measure; Definition of probability. Simple problems based on probability theory; Definition of correlation; Scatter diagram; Karl Pearson's coefficient of correlation; Linear regression equations; introduction to test of significance, one sample and two sample test for mean.

Practicals

Based on Graphical Representation of Data, measure of dispersion raw & central tendency, partition values, measure of dispersion raw & central moments, measure of skewness & kurtosis, correlation and regression analysis, application of one sample t-test and Fisher's 2 sample t-test.

References:

1. Fundamentals of Statistical Methods S.C. Gupta & V.K. Kapoor
2. Fundamentals of Applied Statistics S.C. Gupta & V.K. Kapoor
3. Elementary Statistical Methods S.P. Gupta


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PAPER – II (AGRICULTURE METEOROLOGY)

BSAG 102	AGRICULTURE METEOROLOGY	2L: 1T: 1P	Credit hr 2
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Course Outcomes:

1. Knowledge about weather elements that have direct relevance to agriculture and apply it in crop production
2. To develop weather based agro-advisories and to sustain crop production by utilizing weather forecast instruments.
3. To monitor the drought conditions in crop as well as different areas and formulate their management.
4. To impart knowledge and its application in acquaint with recent developments in agro-meteorology with historical development of climate change.
5. To learn and classify about the formation of dew, fog, mist, frost, snow rain, hail, precipitation, cloud formation and movement.

Course Content:

Earth atmosphere its composition, extent and structure; Atmospheric weather variables: Atmospheric pressure, its variation with height; Daily and seasonal variation of wind speed and direction. Cyclones and anticyclones, air masses and fronts; Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave and thermal radiation, net radiation, albedo, atmospheric temperature – temperature inversion, daily and seasonal variation of temperature balance of earth; atmospheric humidity; concept of saturation, vapour process of condensation, formation of dew, fog, mist, frost, snow rain and hail: precipitation cloud formation and movement.

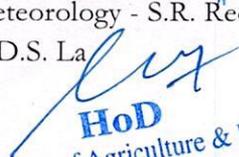
Agriculture and weather relations: Modification of crop microclimate, use of weather data for irrigation scheduling, pesticides sprays, fertilizer application, climatic normals for crop production.

Practicals

Agro-meteorological observatory-its site selection, installation and exposure of instruments, weather data recording. Measurement of total solar radiation, short wave and long wave radiation, albedo and sunshine duration, maximum and minimum air temperatures, soil temperature, dew point temperature. Determination of vapor pressure, relative humidity, atmospheric pressure, wind speed and wind direction. Measurement of rain, open pan evaporation and evapo-transpiration. Processing, tabulation and presentation of weather data.

Reference:

1. Environment & Plant Ecology - J.B. Etherington
2. Plant & Environment - R.F. Deubenmire
3. Agricultural Meteorology - H.S. Mavi
4. Agricultural Meteorology - G.S.L.H.V. Prasad Rao
5. Agricultural Meteorology - S.R. Reddy and D.S. Reddy
6. Climatology - D.S. Lal


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PAPER – III (COMPUTER APPLICATION)

BSAG103	Computer Application	2L:1T:1P	Credit hr 2
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Course Outcomes:

- To learn DOS, windows and high level languages and apply in the crop management
- Describe and analyze the function of lotus, Fox pro and statistical packages
- Record keeping and estimation of cost related to crop production
- Easy evaluation of data
- Application in reserarch findings

Course Content

Introduction to personal computer, peripherals, operating systems (Dos & Windows) and high-level language- Interaction with software pack-ages (Lotus, Foxpro, Statistical, packages) and its execution for the following applications: Solution of simultaneous equations, plotting of graph and diagrams. Simple agricultural statistics computations. Database file; creation and Query.

Practicals

Demonstration of working of computer system, MS-DOS, MS Windows commands and utilities, writing sample software for agricultural problems, Basic programmes.

References:

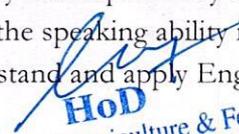
1. Computer Fundamentals by B. Ram
2. Computers Today by Basandra
3. Introduction to Computers by Rajaraman
4. PC Software for Windows 98 Made Simple by R.K. Taxali
5. Computer Fundamentals by Balaguruswamy

PAPER – IV (STRUCTURAL AND SPOKEN ENGLISH)

BSAG104	Str. & Spoken English	2L:1T:1P	Credit hrs 2
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Course outcomes:

- Studying & application of basics
- Developing marketing strategies to be utilized in agriculture
- Personality development by using modern tools.
- Develop the speaking ability in terms of fluency & comprehensibility
- To understand and apply English tools in research writing


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Course Content:

Structural patterns of communicative grammar; modern usages; functional language disorder and common structural errors in part of speech-noun, pronoun, verb, adjective, adverb, preposition, conjunction; articles; word-formation and vocabulary building-affixes, prefixes, suffixes, synonyms, antonyms, substitutions and foreign words; prepositions; phrases idioms; gerunds; participles; infinitives; time and tense; modal verbs, conditional parities; synthesis; transformation controlled writing; paragraph writing; study of modern technical prose; listening and reading skills; comprehension; phonetic and scientific systems of spoken English – speech mechanism; symbols and sounds; stress and intonation.

Practicals

Speech mechanism speech event, production of speech; speech organs; abonetic sounds and symbolspure vowels; diphthongs; consonants (voiceless/voiced, accented/ unaccented, aspirated/unaspirate); stress and intonation word accent (syllable, consonant clusters), stress shift, compound words, word accent in Indian English Vs R sonant clusters); stress shift, compound words; word accent in Indian English VS RP; rules for accentual patterns, accent in connected speech rhythm; weak forms; intonation- falling tone; rising tone; rising falling tone; listening comprehension; skill sear training.

References:

1. 'Strengthen your Writing', By - V.R. Narayan Swami, Orient Longman Publication.
2. 'Business Communication and Report writing', By - G.S.R.K. Babu Rao, Himalaya Publishing House, Mumbai.
3. 'Write to Communicate', By - Geeta Nagraj, Foundation Books, New Delhi.
4. 'Improve your writing', By - V.N. Arora & Laxmi Chandra, Oxford University Press.
5. 'Creative English for Communication', By - N. Krishna Swami & N.T. Sriraman, MacMillan India Limited.
6. 'Developing Communication Skill', By - Krishna Mohan & Meena Banerji, MacMillan India Limited.

PAPER – V (ANY ONE UNIT OF THE FOLLOWING)

UNIT I – ELEMENTARY AGRICULTURE

BSAG105	Elementary Agri/Elementary/ Biology/Elementary Mathematics	3L:2T:1P	Credit hrs 3
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Course outcome:

- To design agriculture techniques and land management systems
- To examine practice of farming, including cultivation of the soil for the growing of crops.
- Analysis of markets, banks to find the solution of agriculture produce and to classify the rearing of animals for farmers welfare
- Handling & utilization of farm machines, equipment's & farm animals
- Application of power transmission, drainage system and irrigation scheduling

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Course content:

Indian agriculture-scope and resources; crop plants-their significance as source of food, feed, fuel and raw material for various industries. Crop seasons and classification of crops according to seasons. Soils their formation, classification, physical and chemical properties and manures and fertilizers-essential plant nutrients, uptake of N,P & K by important crops, methods of manure & fertilizer application, composition of bulky organic manures, concentrated organic manures, green manures and various types of inorganic fertilizers, Irrigation and drainage-importance of water, quality of irrigation water; sources methods and measurement of irrigation water, disadvantages of excessive soil moisture necessity and methods of drainage. Cultivation of important crops in the state such as wheat, rice cotta, sorghum, maize, groundnut, rape seed & mustard, chickpea, pigeonpea, tobacco, berseem, potato and sugarcane. Acquaintance with horticultural crops such as cabbage, cauliflower, onion, garlic, cucurbits, rot crops, peas, tomato, brinjal, banana, apple, mango, litchi, citrus, guava. Introductory economics-Factors of production, exchange, different types of markets; pricing, bank and credits, law of diminishing returns, elementary rural sociology, place of agriculture in five year plans, statistics relating to agricultural production. Study of main breeds of animals such as cows, buffaloes, goats, sheep and poultry. Elementary physiology and anatomy of cow and buffaloes. Characteristics of milch cattles. Care of animal, poultry management, principles of nutrition, common medicines. Types of iron and steel used in agricultural implements; different types of plough, mechanical devices, their management and cost. Water lifting devices, tillage, different methods of ploughing. Power transmission through belts, pullies, gears, chaff, cutter, cane crusher. Necessity for drainage, damage to soil due to excess moisture, land development, prevention and formation of acidic and alcolic soils.

Practicals

Identification of important crops, crop seeds, fertilizers and agricultural chemicals, crop weeds, farm implements and acquaintance with irrigation resource and instruments. Acquaintance with vegetable and horticulture crops and their management, study of main cattle breeds and their management and also visit to Livestock Centers and Laboratories. Practical Knowledge of seed bed preparation and other recent agronomic practices of main crops, visit to agricultural museum and meteorological observatory Estimation of yields and cultivation cost of main field and horticultural crop, study of different type of markets and banks including their visits.

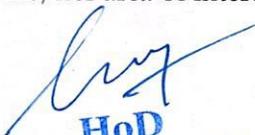
References:

1. Hand book of Agriculture: ICAR.
2. Principles & Practices of Agronomy – S.S. Singh.
3. Introduction to Agronomy and Soil & Water management – V.G. Vaidya & H.R. Sahasrabudhe.
4. Nature and Properties of Soils – N.C. Brady.
5. Prarambhik Sasya Vigyan: Nandeha, K. L.

UNIT II – ELEMENTARY BIOLOGY

Course outcomes:

- The student will be able to read, understand, and critically interpret the primary biological literature in his/her area of interest.


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- The student will be able to design, conduct, analyze, and communicate (in writing and orally) biological research.
- The student will recognize and be able to apply basic ethical principles to basic and applied biological/biomedical practice and will understand the role of biological/biomedical science, scientists, and practitioners in society.
- The student will be able to explain the process of organic evolution and its underlying principles and mechanisms.

Course content:

Introduction to the living world, diversity of life, characteristics of life, system of classification, binomial nomenclature, main groups of animals from protozoa to mammals. Diversity of plants, classification, brief study of algae, fungi, bryophytes, pteridophytes. Gymnosperms and angiosperms, morphology of root, stem leaf, inflorescence, flower, germination, systematics and ecology. Structure of Cell, cell division, heredity and genetics, origin of life and evolution. Histology and physiology of rabbit. Economic importance.

Practicals

Important characters of algae, fungi, bryophytes and gymnosperms. Morphology of flowering plants and its parts i.e. root, stem and leaf modification. Internal morphology (anatomy) of root, stem and leaf of both dicots and monocots. Families: Cruciferae, Leguminosae, Compositae and Gramineae. Field trip. Study of specimens and slides from protozoa to mammals. Cell-Cell division and tissues. Histology and skeletal system of rabbit.

References:

1. Trueman's Elementary Biology: K. N Bhatia and M.P Tyagi
2. Textbook of Elementary Biology, Vol. 1 (Classic Reprint) (English, Paperback): Henry Johnstone Campbell.

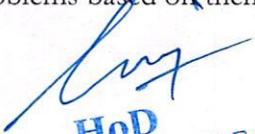
PAPER – V (ANY ONE UNIT OF THE FOLLOWING) UNIT III – ELEMENTARY MATHEMATICS

Course Outcome

- Demonstrate competency in the areas that comprise the core of the mathematics major
- Demonstrate the ability to understand and write mathematical proofs
- Be able to use appropriate technologies to solve mathematical problems
- Be able to construct appropriate mathematical models to solve a variety of practical problems
- Obtain a full-time position in a related field or placement

Course content:

Co-ordinates: distance between two points, coordinates of a point of division of straight line joining two points, area of triangle and quadrilateral, equation of straight line, change of axes, circle, parabols and ellipse. Simple problems based on them.


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Functions: Limit continuity, differentiation, equations of tangent and normal, maxima and minima. Methods of integration including integration by parts. Define integrals, application of definite Integrals in finding areas under curves.

Determinants: Matrices, matrix addition and matrix multiplication, transpose of matrix, solution of linear equation using crammers rule.

References:

1. Elementary Mathematics (English, Paperback): Dorofeev G.
2. Fundamentals of elementary Mathematics : Merlyn J. Behr and Dale G. Jungst

B.SC. AGRICULTURE SEMESTER – I PAPER – VI (PRINCIPLES OF AGRONOMY)

BSAG106	Principles of Agronomy	3L:2T:1P	Credit hrs 3
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COURSE OUTCOMES

- Summarizing the basic concepts of agronomic principles & apply it in crop to crop management approaches.
- Classify the important principles underlying the management and interactions between plants and their physical environment.
- Evaluate and analyze the plan for the application of production technology in many crops.
- Design the Agro-techniques for augmenting productivity of pulses and oilseeds
- Determine the methodology of planning, layout, data recording, analysis, interpretation and report writing of agronomic experiments

Course content:

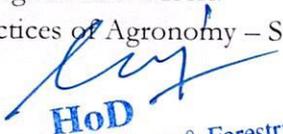
Agronomy as a science and its scope, plant growth and development, environmental effects on growth, ideal plant type, tillage, seed quality, sowing, crop density and spatial arrangement, crop nutrition, organic manures and fertilizers, irrigation and drainage, weed management, distribution of crops, cropping systems, selection of crops and varieties for multiple cropping, crop yield contributing characters; Organic farming-concept, practice and scope in India. Crop production in dry lands, salt affected, acidic, flood affected, waterlogged and eroded areas.

Practicals

Sowing techniques different crops, effect of seeding depth on germination and seeding vigor, weeds and weed control experiments, top dressing of nitrogen, layouts design and statistical techniques used in field experimentation, yield contributing characters and yield estimation, germination and viability test, forage crops and important experiments at LRC, numerical exercises on requirement of fertilizer, plant population and herbicides, tillage implements, morphological description of major crops, irrigation water measurement by parshal flume and calculation of time required to irrigate unit area, preparation techniques of charts and diagram and preparation of cropping scheme for a given farm.

References:

1. Hand book of Agriculture: ICAR.
2. Principles & Practices of Agronomy – S.S. Singh.


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3. Introduction to Agronomy and Soil & Water management – V.G. Vaidya & H.R. Sahasrabudhe.
4. Nature and Properties of Soils – N.C. Brady.
5. Prarambhik Sasya Vigyan: Nandeha, K. L.

B.SC. AGRICULTURE SEMESTER – I
PAPER – VII (RURAL SOCIOLOGY AND EDUCATIONAL PSYCHOLOGY)

BSAG107	Rural Sociology & Educational Psychology	3L:2T:1P	Credit hrs 3
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Course outcomes:

- To understand, explain and analyze the rural-social life.
- Understand and design rural development programs among farmers.
- Classify the Panchayati institutions, their features and functioning.
- Classify the education psychology of rural society and its significance in agriculture.
- Acquire basic knowledge which will enable them to understand the importance of educational psychology in rural and agricultural extension.

Course content:

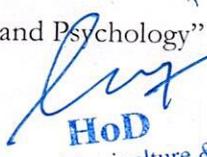
Concepts, methods, tools, characteristics of rural society and people; rural – urban continuum and differences, Rural social structure: interaction, processes, institutions groups, Rural social stratification: status, roles, class, castes etc. panchayati Raj and and Block Development Organizations as rural peoples participative agencies for planned development, Specific, programs for rural area upliftment/ employment: JRY, IAT, EAS, MWS, IRDP, GK, DWRA, TRYSEM, DPAP, DDP, NSAP, Land reforms, etc. Council for Advancement of peoples Action and Rural Technology (CAPART). National Fund for Rural Development (NFRD), NGOs/Voluntary Sector. Conceptual/Clarifications on educational psychology, Psychology of individual differences; MA & IQ; the gifted, Slow Learner and Socially disadvantaged child. Learning and motivation, mental hygiene and adjustment, guidance and counseling.

Practicals

Socio economic survey and its tools, study of rural social institutions, Panchayati Raj institutes (any one at any tier of Panchayat Raj system), and measurement of IQ.

Reference :

1. Chitambar, J.B. "Introductory Rural Sociology", Wiley Eastern Limited, 4835/24, Ansari Road, Dariyaganj, New Delhi-110002.
2. "Gramin Samaj Shastra" (Hindi) Dharmvir Mahajan and Kamlesh, Mahajan, Shiksha, Sahitva, Prakashan, 312/313, Chahshir, Meruth-2.
3. Educational Psychology, Mathur S.S., Vinod Pustak Madir, Agra.
4. "Exstension and Rural Welfare" Daham, O.P. and Bhatnagar Ram Prasad & sons, Agra.
5. "Indian Social System" Singh K. Prakashan Kendra, Railway Crossing, Sitapur Road, Lucknow 226620.
6. Rural Sociology and Psychology" Tyagi, B.D. Rama Publishing House, Badoth (Maroth).


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7. Desai, A.R., "Rural Sociology in India" 5th edition, Popular Prakashan, 35-C, Pt. Madan Mohan Malviya Road, Tardeo, Bombay 400034.
8. Mathur, S.S., Educational Psychology, Vinod Pustak Mandir, Agra. 9. Dahama, O.P., "Extension and Rural Welfare" Ram Prasad and Sons, Agra. Shanker Rao C.N., "Sociology", S. Chand and Co. Ltd., Ram Nagar, New Delhi-110055.


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B.S.C. AGRICULTURE SEMESTER – II
PAPER – I (FUNDAMENTALS OF SOIL SCIENCE)

BSAG201	Fundamentals of Soil Science	3L:2T:1P	Credit hrs 3
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Course outcomes:

- Explain principles of soil formation and classification.
- Illustrate soil physical, chemical, and biological properties.
- Relate the relationship between crops and soils.
- Apply the principles of soil and water conservation.
- Interpret soil analysis and need of fertilizer application

Course content:

Soil as a natural body and medium for plant growth; soil compounds and soil plants relationship; soil forming rocks and minerals; weathering and processes of soil formation; physical properties of soils – texture, structure, density and porosity, soil colour, consistence and plasticity, soil reaction pH and its measurement, soil acidity and alkalinity, buffering, effect of pH on nutrient availability, soil colloids – inorganic and organic; silicate clays: constitution and properties; humic substances nature and properties; ion exchange, cation exchange capacity, base saturation; soil organic matter: composition, properties and influence on soil properties, transformation of organic and inorganic constituents of soil; biological nitrogen fixation; recycling of organic wastes in soils – Urban and industrial wastes. Soil water retention, dynamics and availability; soil air composition and dynamics; source, amount and flow of heat in soils; soil temperature and plant growth; soil survey and classification, soils of India; soil pollution – behavior of pesticides and inorganic contaminants, prevention and mitigation of soil pollution.

Practicals

Study of soil as a natural body. Use of soil sampling tools, collection, processing and storage of soil samples. Study of soil forming rocks, mineral's density and porosity. Study of soil texture by feel methods. Study of soil structure, colour and soil map. Capillary rise phenomenon of water in soil column and water movement in soil. Soil reaction measurement by indicators and glass electrode pH meter. Determination of electrical charges on soil colloids and its nutrient retention capacity. Estimation of organic matter content and buffering capacity of soil. Microscopic examination of soil microbes.

Reference:

1. Nature and Properties of Soils by Brady
2. Mrida Vigyan ke Moolbhut Siddhant by Dr Vinay Singh Published by Bharati Bhandar Meerut.
3. Soil Physics by Ghildyal & Tripathi, Published by Wiley and Eastern LTD, New Delhi.
4. Mrida Vigyan By NL Sharma and TB Singh Rama Publishin House Baduot Merrut
5. Soil Physics by LD Baver et al, Published by Wiley and Eastern LTD, New Delhi.


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PAPER – II (FUNDAMENTALS OF HORTICULTURE)

BSAG202	Fundamentals of Horticulture	3L:2T:1P	Credit hrs 3
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Course Outcome

- Application of basic and advanced plant science/horticulture skills development and improvement.
- Construction of a fundamental understanding of basic horticultural principles and practices.
- Interpretation of the understanding of plant identification, selection, use, and maintenance of plant material best suited for conventional and sustainable landscapes.
- Discovering the importance of the Integrated Pest Management principles and practices best suited for horticultural crops and nursery environments.
- Construction of an understanding of production technique, processing and merchandizing of fruits, vegetables, flowers, spices, plantation, medicinal and aromatic plants.

Course content:

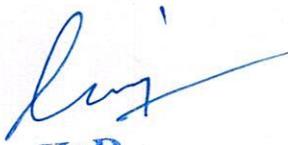
Horticulture: its definition and branches; importance and scope; horticultural and botanical classification; climate, soil and distribution of fruit crops; propagation and nursery raising; principles of orchard establishment and management; flower bud differentiation and pollination; causes of unfruitfulness, pollinizers and pollinators; environmental and soil factors affecting vegetable production, kitchen gardening; garden types and parts; care and maintenance of ornamental plants; lawn making; knowledge of land scaping of rural and urban areas; exposure to important medicinal aromatic plants, spices and condiments, use of plant bio-regulators in horticulture, Post Harvest Technology-Principles and Practices.

Practicals

Identification of garden tools, horticultural crops. Preparation of seed bed/nursery bed for fruit, crops. Practice in asexual methods of propagation-cutting, layering, budding & grafting, layout and planting of orchard plants, training and pruning of fruit trees, transplanting and care of vegetable seedlings, making of herbaceous and shrubbery borders and potting mixtures; potting and repotting.

References:

1. Fundamentals of Horticulture: Jitendra Singh
2. Fundamentals of Horticulture: U. S. Bose


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PAPER – III (ELEMENTARY PLANT BIOCHEMISTRY)

BSAG203	Elementary Plant Biochemistry	3L:2T:1P	Credit hrs 3
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Course Outcome:

- To know about plant cell structure, organization, and justify specific, biochemical functions to all compartments of the plant cell.
- To learn the structure, function and biosynthetic pathways of essential biochemical molecules including their key chemical and physical properties
- To determine how light energy is captured and used to provide chemical forms of energy to power the functions of cells and whole plants.
- To understand the importance of CO₂ fixation and carbohydrate metabolism.
- To explain central metabolism, its plant-specific components, and their functional significance at multiple levels.

Course Content:

Recapitulation of basic chemistry and biology, water, pH and buffer, Cellular constituents: Structure and function – amino acids and protein, carbohydrates, lipids and biomembrances and nucleic acids; Enzymes-function, properties and mechanism, metabolism of cellular constituents: Central Metabolic Pathways: Degradative path ways – glycolysis, hexose monophosphate pathway, degradation of starch, sucrose, other sugars, fatty acids and acylglycerols, proteins and amino acids; Biosynthetic pathways – photosynthesis, formation of sucrose and starch, Kreb's cycle and electron transport chain; Nitrogen and sulphur cycles; Nitrogen fixation, assimilation of ammonia; Synthesis of DNA, RNA and proteins; Secondary metabolites – structure, function and metabolism.

Practicals

Preparation of standard, buffer and colloidal solution; determination of pH, qualitative tests on carbohydrates, lipids, amino acids and proteins; quantitative estimation of reducing sugars, amino acids, proteins and cholesterol; acid and enzymatic hydrolysis of starch and identification of products by paper chromatography; enzymatic hydrolysis of sterol and identification of products by paper chromatography; enzymatic action of potato oxidase or urease; layer chromatography of lipids; assay of dehydrogenase and demonstration of differential centrifugation, gel electrophoresis, ion exchange chromatography and gel filtration.

Reference:

1. Outline of Biochemistry : E.E. Conn and P.K. Stumpf.
2. Essential Biochemistry : M.C. Pant.
3. Introduction to Biochemistry : Mertz.
4. Padap Rasayan Shastra : M.M. Rai
5. Chemistry of natural products : Agrawal.


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PAPER – IV (WEED MANAGEMENT)

BSAG204	Weed Management	2L:1T:1P	Credit hrs 2
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Course outcomes:

- Examine and explain the importance of weed management
- Analyze the difference between broad leaf species, sedges and grasses, and their application in weed management
- Identify how herbicides work with different types of weeds, and clarify different types of herbicides
- Design appropriate techniques for the safe application of herbicides in a specific situation and environmentally safe weed control
- identify the various weed management techniques through manual, mechanical, cultural and chemical methods

Course content:

Introduction: Definition, costs to society from weeds, classification of weeds. Ecology of weeds: Reproduction (seed production, seeds dissemination, seeds germination, vegetative reproduction), geographics, distribution, factors influencing weed distribution, weed succession of uncultivated sites, competition between crops and weeds. Concepts of prevention, eradication and control. Weed control methods: Physical, cultural, biological, chemical, integrated weed management. Introduction to herbicides: basic concepts, polar vs. Non-polar, Esters, Salts, acids, etc. surfactant chemistry. Factors influencing foliage active herbicides: reaching the target plant, spray retention, absorption into leaf, translocation, factors influencing soil applied herbicides: microbiological effect, soil absorption, photodecomposition and volatilization, spray of herbicides.

Practicals

Study of common Indian weeds – their characteristics, mode of propagation, occurrence and importance, techniques of weed collection and preservation, herbicide classification and identification, spray equipment and their calibration, herbicides doses calculations, effect of herbicides on growth and development of crops and weeds ours and visit to poolern areas.

Reference:

1. Manual of weed control: N.C. Joshi.
2. Weed control as a science: G.C. Klingman.
3. Principles of weed science: V.S. Rao
4. Weed control: A.S. Crafts and W.W. Robbins.
5. Modern weed science: O.P. Gupta


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PAPER – V (ELEMENTS OF GENETICS)

BSAG205	Element of Genetics	3L:2T:1P	Credit hrs 3
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Course outcomes:

- To understand, discuss & apply the basic principles of Mendelian inheritance in agriculture
- To understand and apply the concept of cell division & chromosome segregation.
- To learn and categorize the concepts of Linkage for sex determination and sex-linked inheritance
- To gain knowledge about the organelle inheritance and apply it in the field of agriculture
- To understand the multifactorial inheritance and evaluate in the crops

Course content:

History: Pre mendelian and post-Mendelian concepts of heredity, mendelian principles of heredity, Probability and chi-square. *Cell* plant cell and animal cell, chromosome structure. Cell division mitosis, meiosis, variation in chromosomes polytene chromosome, Lampbrush chromosomes. Dominance relationship gene interaction.

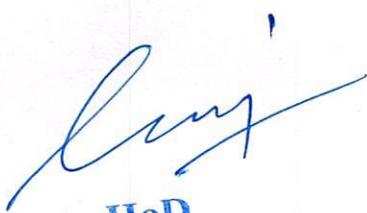
Multiple alleles, pleiotropism and pseudoalleles. Sex determination and sex linkage, sex limited and sex influenced traits. Linkage, Crossing over mechanism, Chromosomes mapping, structural changes in chromosomes: Deletion and Duplication, Translocation and diversion, "Numerical changes in chromosomes, chemical basis of heredity". Gene concept made of replication of genetic material, transcription and translational mechanism of genetic material. Gene regulation and operon concept. Mutations: chemical and physical mutagens, mode of action of mutagens. Extracuclear inheritance. Polygene and quantitative inheritance. Introduction to plant tissue culture.

Practicals

Simple and compound microscope, cell culture, monohybrid and dihybrid cross, test cross, back cross, epistatic interactions. Practice of mitotic and meiotic cell division; study of special chromosome. Probability, chi-square, linkage and crossing over, two point test cross linkage analysis, three point test cross linkage analysis, sex linked inheritance, pedigree analysis, DNA and RNA structure. Structural changes in chromosomes and numerical changes in chromosomes.

References:

1. Genetics by P.K.Gupta, Rastogi Publication Meerut.
2. Fundamentals of Genetics by B.D. Singh, Kalyani Publishers, Ludhiana.
3. Cytogenetics and plant breeding by Chandrasekharan, S.N. and Parthasarthy, P. Vardachary & Co, 8, Linghi chatty street, Madras.
4. Genetics by stick Berger, H.W., McMillan Co. New York.


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PAPER – VI (INTRODUCTORY ENTOMOLOGY)

BSAG206	Introductory Entomology	3L:2T:1P	Credit hrs 3
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Course Outcome:

- To categorize insects based on basic ecological, behavioural, morphological, physiological, or developmental attributes.
- To examine the insects deeply within a biological level of analysis and compare strategies used by different group.
- To evaluate the potential impact of different insect species on agriculture, human health, and society in general; to be knowledgeable about potential control strategies.
- Application of scientific method in problem solving and the principles of experimental design and analysis
- To appraise the agro-forestry environment in the view of the management of the insect populations and plant protection

Course content:

The scope of Entomology, brief history of entomology in India, insects as Arthropods and its relationship with phylum Annelida and other classes of Arthropoda, origin in insects major points related to dominance of insects in Animal Kingdom. External morphology and anatomy of grass hopper; body segmentation, integument, thorax and abdomen, antennae, legs and wings and their modifications, generalized mouth parts and their modifications, Alimentary, Circulatory, Excretory, Respiratory, Reproductive and nervous systems, major sensory organs like simple and compound eyes chemoreceptors, endocrine glands; basic embryology and post embryonic development, basic groups of present day insects with special emphasis to orders and families of agricultural importance like Orthoptera; Tetigonidae, Gryllidae, Gryllotalpidae, Acrididae, Dictyoptera; Mantidae, Blattidae; Isoptera; Hemiptera; Pentatomidae; Coreidae; Cimicidae, Cicadellidae, Delphacidae, Lophophidae, Aleurodidae; Aphididae; Coccidae; Thysanoptera, Coleoptera. Carabidae, Meloidae, Coccinellidae, Bruchidae, Chrysomelidae, Curculionidae, Cerambycidae; Diptera; Culicidae Cephritidae, Agromyzidae, Muscidae; Lepidoptera, Pleuridae; Papilionidae, Hespirlidae, Sphingidae, Noctuidae, Artilidae, Pyralidae, Saturnidae, Bombycidae; Hymonoptera. Tenthredinidae, Braconidae, Chalcididae, Trichogrammatidae.

Practicals

Collection killing, planing and mounting of insects, study of different classes of phylum Arthropoda, external morphology of grasshopper, typical mouth parts and their modification of antennae, legs, wings and their coupling apparatus, structure of alimentary canal and nervous system, mcheal, reproductive and other systems in insects, post embryonic development in insects and basic of insects classification. Basic groups of present day insects with special reference to orders and families of agricultural importance.

Reference:

1. Krishi keet Shastra- J.P. Sharma.
2. Imm"s General Text Book of Entomology by Richards, D.W. and Davis, E.C.
3. Agricultural Entomology for Indian Students by Khanna, S.S.
4. Agricultural Entomology by Mathur and Upadhayay.

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5. General and Applied Entomology by B.V. David and T.N. Ananthkrishnan.
6. Introduction to General and Applied Entomology By B.V. Awasthi.
7. Principles of Insect Morphology by R. E. Snodgrass.
8. Insect structure and Function by R.F. Chapman.
9. Essentials of Agricultural Entomology by G.S. Dhariwal.
10. Destructive and useful insects-their habit and control by C.L. Metcaff & W.P. Flint.
11. A Text Book of Agricultural Entomology by H.S. Pruthi.

PAPER – VII (INTRODUCTORY PLANT PATHOLOGY)

BSAG207	Introductory Plant Pathology	3L:2T:1P	Credit hrs 3
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Course Outcomes:

- To discuss and apply the basic principles and concepts of plant pathology in agricultural crops
- To evaluate and analyze the major diseases with their hosts in agricultural crops
- To develop and apply the preventive measures and management of different crop diseases
- To create the detection method and diagnosis of plant diseases
- Categorization and general identifying characters of phenerogames plant parasites, reproduction and life cycle

Course content:

Importance of plant diseases, scope and objectives of plant pathology concept of plant disease, of a use of plant disease, inanimate causes and plant viruses. Classification of plant diseases. Definition and terms, parasites, pathogens biotrophs, heribiotrphs, necrotroph, pathogenicity, pathogene is virulence, infection primary infection, inoculum, invasion and colonization, inoculation potential, symptoms, incubation period, disease cycle, disease syndrome, single cycle disease, multiple cycle, single cycle period, multiple cycle disease, alternate host collateral host, predisposition, physiogicerase biotype, symbiosis, mutualism, antagonism. History of plant pathology with special reference to Indian work. Pathogenesis and parasitism, Koch's postulate. Effect of pathogenesis on the plants, morphological changes, physiological changes, symptom of plant diseases. Development of identities. Principles and methods of plant disease management. Basic concepts avoidance, exclusion, erailication, proptect on, disease resistance and therapy. Methods of plant disease management. Genera morphology, characters of fungi and somatic structure, reproduction of various structure. Basic and different methods of classification of fung, taxonomy and nomenclature. Study of selected genera, Plasmodiophora, spongospora (myconycota), Synchitrum, Thyseoderma, pythiym phytophthora, albugo selerophthora, periosdocrospora and percnosi on (Mastigomyccinal); Taplirina, Erisyphe, Claviceps, Sclerotinia (Ascomycocina), Puccinia Melarapsora, Uromyces, Ustillgo, Tilletia, Neovosain, Splacelothera, Telyposporium (Besidimycotina); Collectotrichum Alternate Cercospora, Fusarium, Helmilthosporium, Pyricularia, Seletorian. Rhizoctonia, Phyllostica, Phoma (Deuteromycotina). General morphological and cultural characters of prokaryotes (bacteria), basic methods of classification taxonomy and nomenclature. Nutrition and effects of physiochemical factor on growth, reproduction and life cycle genetics and variability. Importance and general original characters of morcoplasms, spiroplasma and fastidions bacteria. Reproduction nomenclature and classification physical architecture and chemical

composition of viruses and viroids, nomenclature and criteria for identification, multiplication, transmission and infective nature. General morphological characters, life cycle and reproduction of nematodes, behaviour in soil and nematodes as vectors for other plant pathogens. Classification and general identifying characters of phanerogamic plant parasite reproduction and life-cycle.

Practicals

Acquaintance with various laboratory equipment and microscopy. General study of different structures of presentative fungal genera, staining and identification of plant pathogenic bacteria, diagrammatic representation, identification and transmission of plant viruses. Extraction and identification of plant parasitic nematodes, study of phanerogamic plant parasite. Preparation of media, isolation and Koch's postulates and use of chemicals and plant disease control.

References:

1. Introduction to principles of Plant Pathology - R.S. Singh.
2. Pod Rog Vigyan - B.P. Singh.
3. Plant Pathology - G.N. Agrios
4. Plant Pathology - R.S. Mehrotra
5. Plant Pathology - P.D. Sharma

PAPER – VIII (MICROBIOLOGY)

BSAG208	Microbiology	2L:1T:1P	Credit hrs 2
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Course outcome:

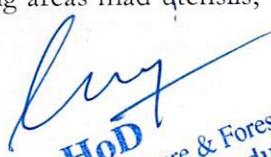
- To gain basic knowledge about microbes and application of these in the field of agriculture
- To learn, discuss and apply the taxonomic classification of microorganisms
- To discuss and categorize the historical events in microbiology related to agriculture
- To apply various microbiology terms for microbial cultural or practices in agriculture field.
- To develop the concepts of growth and reproduction of Microbes

Course content:

Microbial world history- History of microbiology prokaryotic and eukaryotic microbes, their cell structure, genetics distribution in nature and importance in agriculture, microorganisms in soil fertility and crop production; carbon, nitrogen, phosphorus and sulphur cycles, plant microbes association symbiotic associative and a symbiotic nitrogen fixation, Azolla and mycorrhiza iodegradation of agricultural chemicals pesticides, herbicides and agricultural organic wastes; Microbiology of milk and milk products, rural microbiology and silage production; Microbes in human welfare biocertilizers, bipesticides, waste treatment and recycling; composting, ethanol production, antibiotic production, Human and plant pathogenic microbes.

Practicals

Introduction to microbiology laboratory and its equipments, study of microscope, observation of microbial studies, nutritional media and their preparation, staining techniques, microbial analysis of household working areas and utensils, methods of disinfections and sterilization, microbial analysis of


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air, water, soil and compost, microbial examination of storeal produces, microbial analysis of fresh food vegetables, milk and dairy products, microbial examination offeriented food products, antibiotic assay.

References :

1. Alexander, M. (1976). Introduction to Soil Microbiology (Willy Eastern Ltd., New Delhi).
2. Allen, A. benton and W.E.Werner (1976). Field Biology and Ecology (TataMcGraw Hill Pub. Co., New Delhi)
3. Atlas, R.M. (1995). Microorganisms in Our World (Wm. C. Brown Pub., Oxford).]
4. Atlas, R.M. (1997). Hand Book of Microbiological Media (CRC Press, New York).
5. Burn, R.G. and J.H Slater (1982). Experimental Microbial Ecology (Blackwell Scientific Pub., Edinburg).
6. Buscot, F. and A. Varma (eds.) (2005). Microorganisms in Soils: Roles in Genesis and Function (Springer –Verlag Berlin).
7. Kannaiyan, S., K. Kumar and K. Govindarajan (eds.) (2004). Biofertilizers Technology (Scientific Pub., Jodhpur).
8. Motsora, M.R., P.Bhattacharya and Beena Srivastava (1995). Biofertilizer Technology, Marketing and Usage- A Source Book-cum-Glossary (FDCO, New Delhi).
9. Mukerji, K.G., C.Manoharachary and B.P. Chamola (Eds.) (2002). Techniques in Mycorrhizal Studies (Kluwer Academic Pub., Netherlands).
10. Nutman, P.S. (1976). Symbiotic Nitrogen Fixation in Plants (Cambridge Univ. Press, London).
11. Rangaswami, G. and D.T. Bagyaraj (2002). Agricultural Microbiology (Prentice Hall of India Pvt. Ltd., New Delhi).
12. Subbarao, N.S.(1993). Biofertilizers in Agriculture and Forestry (Oxford and IBH Pub. Co., New Delhi).


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Semester – III						
Course No.	Course Title	Credit Hrs	Theory		Practical	Total
			Ex.	Int.		
BSAG 301	Vegetable Production	2+1	35	15	25	75
BSAG 302	Irrigation Water Management	2+1	35	15	25	75
BSAG 303	Principles of Plant Breeding & Breeding of Field Crops	3+1	35	15	25	75
BSAG 304	Soil Fertility and Nutrient Management	2+1	35	15	25	75
BSAG 305	Agri. Marketing and International Trade	2+1	35	15	25	75
BSAG 306	Field Crops I (Kharif)	2+1	35	15	25	75
BSAG 307	Crop Diseases and their Management	2+1	35	15	25	75
Total		15+7 = 22	245	105	175	525

Semester – IV						
Course No.	Course Title	Credit Hrs	Theory		Practical	Total
			Ex.	Int.		
BSAG 401	Economic Entomology	2+1	35	15	25	75
BSAG 402	Introduction to Plant Biotechnology	1+1	35	15	25	75
BSAG 403	Field Crops II (Rabi)	2+1	35	15	25	75
BSAG 404	Agriculture Co-operation, Finance and Busi. Mgt.	2+1	35	15	25	75
BSAG 405	Insect Pest and their Management	2+1	35	15	25	75
BSAG 406	Fruit and Plantation Crops	2+1	35	15	25	75
BSAG 407	Livestock Production	2+1	35	15	25	75
BSAG 408	Rainfed Agriculture	1+1	35	15	25	75
Total		14+8 = 22	280	120	200	600


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B.SC. AGRICULTURE SEMESTER – III

PAPER – I (VEGETABLE PRODUCTION)

BSAG301	Vegetable Production	3L:2T:1P	Credit hrs 3
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Course Outcomes

- To understand and apply the cultivation practices of vegetable crops
- To know the importance of vegetables and estimate their value in national economy.
- Categorization of vegetable crops and discussion of their importance with the farmers.
- Illustration and formulation of marketing strategies of vegetable crops among farmers
- Identification and explanation of trends that influence vegetable production in India and abroad.

Course content:

Importance of vegetables in human nutrition and national economy, factors effecting vegetable productivity viz. light, temperature, moisture, oxygen, CO₂ mineral nutrients, soil reaction, disease and insect pests; types of vegetable farming; types of classification of vegetable viz, botanical, classification, based on col: mandliness, parts used duration of crop; weed management, use of bioregulation seed production, harvesting and marketing. Cultivation practices vis. time of sowing nursery management, transplanting, sowing/planning distance, recommended cultivars seed rate, manure and fertilizers doses, harvesting, storage, physiological disorders, diseases and insect pests and their control measure of various vegetable crops namely potato, tomato, onion, garlic, okra, sweet corn pea, beans, cucurbitaceous crops-pumpkin, bottle gourd, sponge gourd, ridge gourd, pointed gourd, bitter gourd, cucumbers etc.

Practicals

Identification of vegetable crops seeds, study of orphotological characters; practice of nursery raising. Transplanting of seedlings and direct seed sowing in the field; fertilizer application by different methods; raising of vegetable seed crops, seed extraction; harvesting and preparation for market, economics of vegetable production.

Reference:

1. "Vegetable Production in India" – S.P.Singh, Agrotech Publishing Academy, Udaipur.
2. "Text Book of Vegetables, Tuber Crops and Spices" – S.Thamburaj, N. Singh, ICAR, New Delhi.
3. "Vegetable Production in India" – Dr.V.S.Chauhan, Ram Prasad and Sons, Agra.


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PAPER – II (IRRIGATION WATER MANAGEMENT)

BSAG302	Irrigation Water Management	3L:2T:1P	Credit hrs 3
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Course Outcome

- Analyze the relationship between irrigation and food production at global, regional and farm level, especially related to crop water use and water use efficiencies.
- To understand and analyze the irrigation scheduling techniques for different crops.
- To categorize the critical stages of irrigation in different crops.
- To develop various stream flow measurement techniques.
- To select the various irrigation systems for the benefits on given geographic conditions.

Course content:

Water resources of India, source of irrigation, irrigation water demand, supply and resources development of irrigation, soil moisture and its characteristics soil water potential, retention and movement of soil water. Water intake and infiltration. Importance of water in plants life, plant water status, absorption, transportation and transpiration, moisture sensitive stage, water availability and nutrient up take. Scheduling of irrigation based on soil moisture status. Physiological stages of crop and meteorological parameters, irrigation under limited water supply conditions. Methods of irrigation; surface irrigation, flooding, furrow, border and basin irrigation. Irrigation; drip and sprinkler irrigations. Water stress and plant growth effect of water stress on physio-morphological characteristics and productivity of plant, deficit irrigation and strategy for optimizing yield. Water quality standards and its suitability for irrigation, water use efficiency, agronomic technique to boost water use efficiency, factors affecting water use-efficiency. Irrigation management in soils with low intake rate, saline and alkali soil, soil with shallow ground water table and in poorly drained soil. Water requirement of crops, factors affecting the water requirement of crops, method of determining water requirement, effective rainfall, potential evapotranspiration and consumptive use. Irrigation of principal crops critical stages of crops, depth and schedule of irrigation, reducing irrigation requirement of major crops.

Practicals

Soil moisture measuring instruments, measurement of soil and plant water status with the help of different instruments. Measurement of irrigation water and efficiency of different methods. Use of meteorological data in scheduling irrigation, scheduling of irrigation on the basis of ET demand of crops, measurement of ground water, irrigation water quality determination, exercise on field capacity, PWP, Bulk density, consumptive use, irrigation water requirement irrigation plant form farm and fertilizer application with pressurized irrigation system.

References:

1. Irrigation: Theory & Practices by A.M. Michael.
2. Water Management: Principles and Practices by R.A. Singh and S.R. Singh.
3. Irrigation by A.M. Michael and T.P. Ojha.
4. Conserving Soil – By M.P. Butler.
5. Elements of Soil conservation by H.H. Bennett.
6. Soil conservation in India by Rama Rao.
7. Hand Book of Agriculture – ICAR Publication.
8. Introduction to agronomy and soil and water management by V.G. Vaidya and K.R. Sahatrabudhe.
9. Irrigation practice and Water Management by L.D. Doneen and D.W. Westcot, FAO, 1984.

PAPER – III (PRINCIPLES OF PLANT BREEDING & BREEDING OF FIELD CROPS)

BSAG303	Principles of Plant Breeding & Breeding of Field Crops	4L:3T:1P	Credit hrs 4
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Course Outcome

- To know about the basics of plant breeding and to apply the methods of plant breeding in hybridization programme
- To learn, explain and propose the application of plant breeding in agricultural crops
- Creation and development of hybrids in different crops
- Understand and apply the procedure of variety release and notification
- Maximize the future prospects and application of new technologies in the field of plant breeding

Historical development of plant breeding plant breeding concept, nature and role of plant breeding major achievements and future prospects, genetics in relation of plant breeding, modes of reproduction, self incompatibility and male sterility. Plant Breeders materials domestication, centers of origin, centers of density acclimatization and components of genetic variation and heritability. Breeding methods in self pollinated crops: Introduction, selection pure line theory, multilane varieties, hybridization techniques and handling of segregating populations, Hardy-Weinberg law, Methods of breeding cross pollinated crops system of mating heterosis and inbreeding depression development of inbred lines and hybrids and synthetic varieties, breeding methods in asexually propagated crops, clonal selection and hybridization polyploidy in relation to plant breeding, mutation breeding methods, uses nature of gene mutation mutagenic agents, induced mutation in plant breeding, breeding for important biotic and abiotic stresses, and use of biotechnology implant breeding, procedure for release of new varieties.

Crop systematic, species relationship, floral biology and inheritance of economically important characters, breeding objectives development of varieties with desired yield, adaptability, stability, disease and pest resistance and quality (Physical, chemical, nutritional) and marketing Important varieties along with parentage and characteristics, future thrust area in varieties improvement in crops like wheat, rice, maize, soybean, fieldpea, pigeon pea, urbean and rapeseed mustard, sunflower, groundnut, sorghum, sugarcane, potato, cotton and tobacco.

Practicals

Germplasm of various crops, floral structure and biology of self pollinated and cross pollinated crops. Self incompatibility, emasculation and hybridization techniques in self pollinated crops. Study of variation in segregating population for qualitative and quantitative traits, Methods of calculating mean, range, variances, standard deviation etc. and important designs used in plant breeding experiments. Study of component of genetic variation and genet advance; heterosis and inbreeding depression, prediction of performance of double cross hybrids comparative study of selection, method. In self pollinated crops, induction of polyploidy through colchicines and other methods. Induction of mutation through chemical mutagens eg. EMS etc. Germplasm, breeding trials in field and selection feature of the popular varieties of the region of crops viz. wheat, barley, pea, maize, sugarcane, rapeseed, custard, sunflower, oat, potato, urbean and cotton.

References:

1. Essentials of Plant Breeding, By Singh, Phundan, Kalyani Publishers Ludhiana/ New Delhi.
2. Plant Breeding, Singh, B.D. Kalyani Publishers. New Delhi / Ludhiana.
3. Principles of Plant Breeding, Allard, R.W.
4. Practical Manual in Plant breeding, Singh, R.K. and Singh B.D. Kalyani Publishers. New Delhi/ Ludhiana.
5. Breeding asian Field Crops, Poehlman, J.N. and Borthakur, D.N., Oxford and IBH Pub. Co., New Delhi, (English & Hindi Edition).

PAPER – IV (SOIL FERTILITY AND NUTRIENT MANAGEMENT)

BSAG304	Soil Fertility and Nutrient Management	3L:2T:1P	Credit hrs 3
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Course outcomes:

- To explain soil as a medium for plant growth.
- Summarise the biochemical processes regulating the nutrient cycle and deduce its effect on human health.
- Classify plant nutrients which plays major role in plant growth.
- Compile various fertilization systems and its benefits.
- Plan out and defend schedule for fertilization of a given crop.

Course content:

History of plant nutrition and soil fertility, soil fertility and productivity, problems of soil fertility in India, plant growth and development, factors affecting plant growth; essential plant nutrients, their role and deficiency and toxicity symptoms; Ion exchange phenomena in soil and its role in plant nutrient availability; movement of nutrients from soil to plant roots, their uptake and translocation.

Chemistry of soil nitrogen- Nitrogen cycle, mineralization and immobilization, properties and use of inorganic and organic nitrogenous fertilizers in crop production. Chemistry of phosphorus in soil, phosphate fixation and availability chemistry of potassium in soil, potassium fixation and availability; properties and use of phosphorus and potassium fertilizers, chemistry of calcium, magnesium and sulphur in soil, their sources and usage; soil fertility evaluation and fertilizer recommendations; biofertilizers; integrated nutrient management ; methods and time of application of fertilizers, efficient of fertilizers.

Practicals

Estimation of total and different inorganic forms of nitrogen in soil. Determination of available nitrogen, phosphorus, potassium sulphate and micronutrients in soil. Estimation of cation exchange capacity and exchangeable bases in soil. Interpretation of soil test data/report.


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Determination of moisture, total N, water soluble P and soluble K in fertilizers, Rapid plant tissue test and use of soil water plant test kit. Field trip for studying visual symptoms of nutritional disorders in plants.

Reference:

1. Soil Conditions and Plant Growth by MB Russel Published by English Language Book Society/Longman.
2. Nature and Properties of Soils by NC Brady
3. Management of Soil Quality for Sustainable Agriculture by B Mishra Atlas Book & Periodicals, New Delhi.
4. Fundamentals of Soil Science by ISSS, New Delhi.
5. Soil Chemistry by Bear.
6. Soil Fertility and Fertilizer by Tisdale Nelson and Buston.
7. Soil Fertility and Plant Nutrition by Kanwar and Chopra. 8. Introduction to soil and Plant Growth by Donahue.

PAPER – V (AGRICULTURE MARKETING & INTERNATIONAL TRADE)

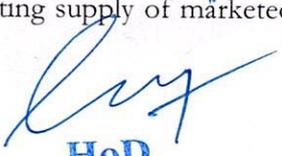
BSAG305	Agri. Marketing and International Trade	3L:2T:1P	Credit hrs 3
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Course outcomes:

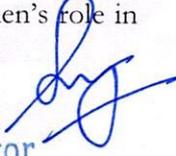
- Optimization of Resource use and Output Management: An efficient agricultural marketing system leads to the optimization of resource use and output management. An efficient marketing system can also contribute to an increase in the marketable surplus by scaling down the losses arising out of inefficient processing, storage and transportation.
- A well designed system of marketing can effectively distribute the available stock of modern inputs, and thereby sustain a faster rate of growth in the agricultural sector.
- Increase in Farm Income: An efficient marketing system ensures higher levels of income for the farmers by reducing the number of middlemen or by restricting the commission on marketing services.
- Growth of Agro-based Industries: An improved and efficient system of agricultural marketing helps in the growth of agrobased industries and stimulates the overall development process of the economy.

Course content:

Concepts of marketing, human needs and marketing the marketing mix, the marketing strategy, product planning, promotion Physical distribution and pricing, marketing and different levels of development, function of prices and role of price in economic development, marketing planning and organizational elements of marketing mix, Concept of market segment, market segmentation, basis of market segmentation, Types of markets, classification and characteristics of agricultural market; Demand for farm products; determinants of consumer behavior, consumers of farm products factors affecting demand and consumption of farm products; supply of farm produces; product decision and strategies, product life cycle and new product development, characteristics of farm firm, farm products and farm production, spatial and temporal distribution of farm products, marketed and marketable surplus, factors affecting supply of marketed surplus and marketable surplus of farm products; women's role in


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agricultural produce marketing; pricing and promotion strategies market structure, determination of price under alternates market structures, price movement overtime seasonal cyclical and trend marketing communication, advertising, publicity, personnel selling and cales promotion; Marketing function, exchange function's buying and rolling physical function storage, transportation and processing; facilitating functions- packaging, branding, financing, market information, grading etc. Management of marketing functions, marketing channels; stages of marketing, selection and management of marketing channels for farm products; meaning and components of marketing cost, price spread and market margins, Marketing efficiency, concept and measurements of marketing efficiency; Role of government in Agricultural marketing, public sector institutions. CACP, FCL, CWC, DMI, Far price shops, Exim Bants etc. The concept and importance of inter-regional and International trade; emerging scenario of international trade in Agricultural commodities; basic theories of international trade; concept of terms of trade and BOP, implications of new GATT agreement (WTO).

Practicals

Plotting and study of demand and supply curves and calculation of their elasticity. Relationship between market arrivals and prices of some selected agricultural commodities and their temporal behavior. Acquaintance with pricing methods. Visit to local agricultural markets and cooperative marketing societies study their organization, functioning and performance. Collection of data from the agricultural markets for some selected commodities to study the marketing margins and costs. Class discussion on marketing practices and problems related to major farm produce cereals, pulses, off seeds, livestock and livestock products. Application of comparative cost advantage principle in international trade.

References:

1. Acharya, S.S. and Agrawal, N.L. Agricultural Marketing in India, Oxford and IBH Publishing Co, New Delhi
2. Memoria, C.B. and Joshi, R.L., Principles and Practice of marketing in India, Kitab Mahal, Allahabad.
3. Agrawal, N.L. Bhartiya Krishi Ka Arthtantra, Rajasthan Hindi Granth Academy, Jaipur (Hindi).
4. Arora, Vijay Pal Singh, Prakashan Nideshalay, G.B. Pant University of Agriculture & Technology, Pantnagar (Hindi).
5. Kahlon, A.S, and Tyagi R.S. Agricultural Price Policy in India, Allied Publishers Private Limited, New Delhi.
6. Maji, C.C. and Bhattacharya, A, GATT and Agricultural Exports Hopes and Realities, NCAP, New Delhi.
7. Tripathi .Export in economic growth, International Book House.
8. Singh, Gursharan Kainth, Export potential of Indian Agriculture. Regency Publications, New Delhi.
9. Nagpal, Current, Issues in the World Trsde Policies, International Book House, New Delhi.
10. Kohls, R. L. and N. Uhl. Joseph (1980). Marketing of Agricultural Products, Collier Macmillan, New York.
11. Shephard, G. E. Agricultural Price Analysis. Iowa State University Press, Ames, Iowa.
12. Taha, A and Hamdy (1999). Operations Research : An Introduction. Prentice Hall, New Delhi


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PAPER – VI (FIELD CROPS 11 (KHARIF))

BSAG306	Field Crops I (Kharif)	3L:2T:1P	Credit hrs 3
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Course Outcome

- To discuss and apply the cultural practices of field crops.
- To apply the modern techniques and concepts of crop production
- To understand and apply the basic concepts of agronomic principles & much more than crop to crop management approaches
- To formulate the description and classification, economy, crop cycle and environmental requirements of crops
- To analyse geographical distribution and economic importance of kharif season field crops among farmers

Course Content:

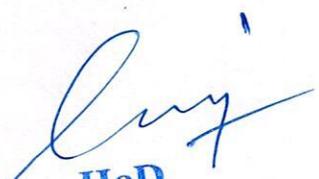
Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices yield of kharif crops. Cereals-rice, maize, sorghum pearl millet and finger millet; pulses – pigeon pea, mungbean and urdbeans oilseeds groundnut, sesame and soybean; fibre crops cotton, jute and sunhemp; and forage crops sorghum, maize, cowpea, cluster bean and napier.

Practicals

Rice nursery preparation and their transplanting. Sowing of soybean, pigeon pea, mungbean, maize, ground nut and cotton. Effect of seed on germination and seedling vigour of soybean/groundnut. Effect of sowing depth on germination soybean. Identification of weeds in rice, maize and soybean fields and study of weed control experiments in these crops. Top dressing of nitrogen in maize and rice and study of fertilizer experiments on rice, maize, sorghum millets. Study-of yield contributing characters, yield calculation, harvesting and yield estimation of above crops. Study of crop varieties and important agronomic experiment. Study of forage experiments.

References:

1. Bharat ki Fasle – Chhidda Singh and Om Prakash.
2. Bharat ki Pramukh Fasle – Kalicharan Sharma.
3. Kharif and Rabi ki Fasle – Om Prakash.
4. Sasya Vigyan – Jagannath Singh.
5. Hand Book of Agriculture: ICAR.
6. Scientific crop production: C. Thakur.
7. Field Crops: Y.M. Iyer.


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PAPER – VII (CROP DISEASE AND THEIR MANAGEMENT)

BSAG307	Crop Diseases and their Management	3L:2T:1P	Credit hrs 3
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Course outcomes:

- Explain and discuss the identification of disease, their causal organism and the life cycle.
- Evaluate the concept of disease cycle, mechanism of disease development, dissemination and transmission of plant pathogens, Epidemiology and Disease forecasting
- Application of plant disease management- chemical control, biological control and development of transgenic for controlling plant diseases
- To impart knowledge on detection and diagnosis of plant diseases and to discover its management
- Categorization of nature of damage seasonal incidence of crops

Course content:

Wheat disease rusts, loose nut, kernallunt, powdery mildew, alternaria blight, yellow ear rot, ear cocile, Rice disease blast, brown spot, bacterial blight, sheath blight khaira and tungro; Maize disease stalk rots, downy mildews, leaf spots and Heininthosporium leaf sports; Sorghum disease smuts. Grain mold, anthracites and strgaa; Bajra disease downy mildews and ergot; Sugarcane disease redrot, smut, and with Groundnut disease early and late leaf sports, Sclerotium stem rot, seedling rot and seedling blight; Sunflower disease Sclerotinia stem rot and Alternaria blight; mustard disease. Alterniaria blight, white rust, downy mildew, Sclerotinia stem rot, and bacterial rot; soybean disease Rhizoctonia blight, pod blight, seed rot, bacterial pustule seedling blight and mosaic; pigeonepea diseases Phytophthora blight, wilt and sterility mosaic; Gram diseases Wilt, grey mould and Ascochyta blight; Lentil disease rust and wilt; Cotton disease anthocnose; vascular wilt, and black gram; Tobacco diseases damping off early and late blight, black scarf, common scab, bacterial wilt and virus diseases; Tomato diseases damping off, late and early blight, wilts root knot and virus diseases; Brinjal diseases Phomopsis blight, fruit rot, Sclerotimia rot, bacteria wilt and rot knot, Chilies diseases anthracnose and virus diseases, vegetable crucifer diseases damping off, Downey mildew, and black not, vegetable cucurbit diseases powdery mildew and rust, Bean diseases anthracnose, blights, and virus diseases; Mango diseases Mango malformation. Powdery mildew and bacterial blight; Apple diseases scab, collar rot, powdery mildew; fire blight, stem black and brown, pink diseases, Papaya diseases stem and foot rot, leaf curl, and mosaic, Citrus diseases canker, anthracnose, citrus decline and virus disease; Peach and pear disease leaf curl, brown rot, and scab; Guava wilt, anthracrose and stem canker.

Practicals

Colour preservation of diseased plant materials and dry preservation concept and methods, study of the three wheat rust (black rust, brown rust and yellow rusty, specimens of plants with references to symptomatology and casual fungi. Study of the loose smut and kernel bunt diseases of wheat comparative differences between causal fungi and symptoms, study of bacterial blight of rice with references to symptomatology and casual bacterium microscopic studies. Differential staining and identification of plant pathogenic bacteria. Study of sorghum smuts, ergot of bajra and downey ,mildew of bajra symptomatology and morphological characteristics of the casual fungi, study of red rot of sugarcane and cercospora leaf spots, of groundnut symptomatology and characteristics of the casual fungi. Histopathological studies of *Albugo candida* causing white rust of mustard. Mungbean yellow

mosaic symptoms and transmission through vector, *Bemisia tabaci*. Histopathological studies of wilts (*Fusarium oxysporum*) of chickpea and cotton. Study of the late blight and early blight and mosaic diseases of potato and isolation and microscopic study of root knot nematode. *Meloidogyne incognita*. Study of mango malformation and powdery mildew of mango; etiology and histopathology and study of citrus canker apple scab and guava application of fungicides; sprayers and dusters and disease measurement concerning presence, incidence and severity etc.

References:

1. Pod rog shastra - S.M. Kumar
2. Pod rog vigyan - B.P. Singh
3. Plant diseases - R.S. Singh
4. Plant Pathology - R.S. Mehrotra
5. Diseases of Crop Plants in India - G. Rangaswami

B.SC. AGRICULTURE SEMESTER – IV

PAPER – I (ECONOMIC ENTOMOLOGY)

BSAG401	Economic Entomology	3L:2T:1P	Credit hrs 3
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Course Outcome

- To understand the beneficial and harmful insects and discuss its uses and harmful effects among the farmers
- To examine the economic loss done by the various insects in agriculture field
- To examine and analyze the symptoms of different pest attack in different crops.
- To classify the various methods of pest control
- To analyse the production, cultivation & marketing of the product of beneficial pests

Course content:

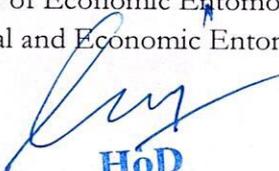
How insects become pest economic importance of insects, classification of pests, principles and methods of pest control, viz, physical mechanical, cultural, legal, genetical chemical. Biological, principles and methods of insecticidal applications, Apiculture, Sericulture and lac cultivation with special reference to equipment used insect pests and diseases, production and marketing.

Practicals

Insecticide formulation; application, equipment, their handling and maintenance. Identification of commonly available natural enemies, honey bee, silkworm and lac insect species and their rearing. Visit to institutes devoted to bee keeping, sericulture and lac insects.

References:

1. Elements of Economic Entomology: V. V. Ramamurthy
2. Ecological and Economic Entomology: Brian Freeman


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PAPER – II (INTRODUCTION TO PLANT BIOTECHNOLOGY)

BSAG402	Introduction to Plant Biotechnology	2L:1T:1P	Credit hrs 2
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Course Outcome

- To understand and discuss the tissue culture techniques used in agriculture
- To know the preparation and application of cultures
- To learn and analyze the germplasm conservation and cryopreservation
- To impart knowledge about molecular markers with their utility in agriculture
- To determine the role of biotechnology in the field of agriculture

Course Content

Introduction: History of Plant tissue culture and biotechnology, scope and importance of agricultural biotechnology, Gene technology, Tissue and cell culture: Media, various modes of culture and their application. Organ culture cell suspension culture, Callus culture, Micropropagation methods; Organogenesis and embryogenesis, their significance, Anther culture; haploid production, diploidization and their significance, Proto plasts isolation, fusion, somatic hybridization and hybrids, Somaclonal variation and its use in crop improvement, Germplasm storage and cryopreservation, Secondary metabolite production, Introduction to genetic engineering and genetechnology. Gene transfer methods: Physical Chemical and Agrobacterium dependent methods, Generation of transgenic plants and their identification, Molecular markets, RGLP, RAPD, Simple sequence repeats etc, Role of biotechnology in crop improvement.

Practicals

Plant tissue culture laboratory working procedure. Preparation of nutrient culture medium. Study of different micropropagation approaches viz, meristem shoot tip culture, exillary fud etc. Organogenesis is tissue culture and other approaches.

Reference:

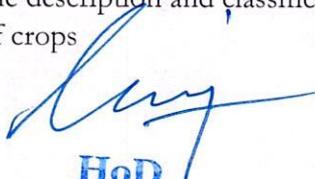
1. Introduction to Plant Biotechnology : P.K. Gupta
2. Biotechnology : B.D. Singh
3. Introduction to Plant Biotechnology : Chawla
4. Plant Tissue culture: S.K. Das, ICAR Publication Bhojwani
5. Plant Biotechjnlology (Vol. 1 to 4) : Y.P.S. Bajaj

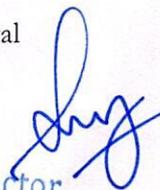
PAPER – III (FIELD CROPS II (RABI))

BSAG403	Field Crops II (Rabi)	3L:2T:1P	Credit hrs 3
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Course outcome:

- To discuss and apply the cultural practices of field crops.
- To apply the modern techniques and concepts of crop production.
- To understand and apply the basic concepts of agronomic principles & much more than crop to crop management approaches
- To formulate the description and classification, economy, crop cycle and environmental requirements of crops


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- To analyse geographical distribution and economic importance of Rabi season field crops among farmers

Course content:

Origin geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of rabi crops; cereals wheat, barley and triticale; pulses chickpea, lentil, peas, frenchbean; Oil seeds, rapeseed and mustard, sunflower, safflower and linseed; sugar crops sugarcane and sugarbeet, Regional medicinal and aromatic crops such as mentha, lemon grass, citronella, palma rosa, Isabgol and posts, potato and tobacco, Forage crops berseem, Luceme and Oat.

Practicals

Sowing of wheat sugarcane and sunflower. Top dressing of nitrogen in wheat and study of fertilizer experiments on wheat and mustard. Identification of weeds in wheat and grain legumes, application of weedicides and study of weed control experiments. Morphological characteristics of wheat, sugarcane, chickpea and mustard. Yield contributing characters of wheat. Yield and quality analysis of sugarcane. Crop distribution in the state and the region, important agronomic experiments of rabi crops and visit to research stations related to rabi crops.

References:

1. Kharif and Rabi ki Fasle – Om Prakash.
2. Sasya Vigyan – Jagannath Singh.
3. Hand Book of Agriculture: ICAR.
4. Scientific crop production: C. Thakur.
5. Field Crops: Y.M. Iyer.

Paper – IV (Agricultural Cooperation, Finance and Business Management)

BSAG404	Agriculture Co-operation, Finance and Busi. Mgt.	3L:2T:1P	Credit hrs 3
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Course outcomes:

- To Understand and analyze the application of agriculture business & management
- To understand and discuss about the marketing strategies used in agriculture among farmers
- To get acquainted with rural and urban banks and to classify the government policies, subsidies in front of farmers for promotion
- To Understand NABARD banks and AFC, problems and issues in institutional agricultural credit system.
- To understand and discuss about the types of management decisions, decision making techniques and processes.


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Course content:

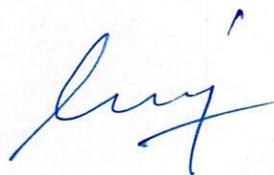
Cooperation- Meaning, significance under Indian agricultural conditions, objectives principles of cooperatives. Agricultural cooperation in India credit marketing consumer and multi- purpose cooperatives, farming cooperatives, processing cooperatives, cooperative warehousing, role of ICA, NCU, NCDC, NAFED etc. women cooperatives. Agriculture finance meaning, scope and significance, credit needs of Indian agriculture, economic principles in capital acquisition and use decisions, preparation and analysis of financial statements, balance sheet and income statement, cost of credit, Access for women to agricultural credit facilities. Agricultural credit market- institutional and noninstitutional sources of credit, cooperatives credit system, commercial banks and regional rural banks, NABARD and AFC, problems and issues in institutional agricultural credit system. Business management environment of agricultural business, tasks of a professional manager, management system and processes, types of management decisions, decisions, decision making techniques and processes, organizational culture and management ethics.

Practicals

Estimation of credit requirement of farm, preparation and analysis of the balance sheet and income statement, appraisal of the loan, interest and performance of cooperative, commercial banks and RRBs, analysis of the relevant published data. Class seminars and discussion on selected topics. Visits of commercial bank, cooperative bank, agricultural cooperative societies and agri-business units in order to impart first hand knowledge of their management and working.

References:

1. Kahion, A.S. and Karam Singh, Managing Agricultural Finance Allied Publishers Pvt., Ltd., New Delhi.
2. Johl S.S. and Moore C. V. Essentials of Farm Financial Management. Today and tomorrow's Printers and publishers.
3. Mathur B.S., Cooperation in India. Sahitya Bhawan, Agra, New Delhi.
4. Kamat, G.S. (1978). New Dimension of Co-operative Management, Himaliyan Publishing House, Bombay.
5. Krishnaswami, O.R. (1978). Fundamentals of Cooperation, S. Chand & Company Ltd., New Delhi
6. Lee. F. Warren, Aaron G. Nelson and W.G. Murray (1980). Agricultural Finance. Iowa State University Press Ames. Iowa.
7. Pandey, U.K. (1990). An Introduction to Agricultural Finance, Kalyani Publishers, New Delhi.
8. Reddy, S. and Raghu Ram, P. (1980). Agricultural Finance and Management, Oxford and IBH, New Delhi.



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Paper – V (INSECT PESTS AND THEIR MANAGEMENT)

BSAG405	Insect Pest and their Management	3L:2T:1P	Credit hrs 3
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Course Outcome

- Classify and explain the pests in different crops
- Understand and evaluate the methods and procedure of insect pest management
- Justify the symptoms of different pest attack
- Application of control measures in different crops
- Distinguish between the harmful & beneficial insects

Course content

Nature and extent of damage, life cycle seasonal history, host range, distribution and management of the major insect pests attacking field crops; Cereals, pulses, oilseeds, fiber, sugar crops, Horticultural crops; brinjal, okra, potato, tomato, cole crops, leguminous vegetables, cucurbits, chillies sweet potato, leafy vegetables, onion and garlic, colocasia, yarn. Fruit crops (tropical/sub tropical); jack fruit, papaya, coconut and date palm, mango, citrus, litchi, banana, guava, peach, pear, plum, apricot, chestnut, almond. Plantation and garden crops: marceptics, spices and condiments. Stored grain and household pests; Locust and other major polyphagous insects, Rodents and mites of agricultural importance.

Practicals

Nature of damage, life cycle and seasonal cycle and seasonal cycles of insect pests attacking field, vegetable and fruit crops including stored grains: rodents and mites, their nature of damage, life cycle and management. Visit to cold storage research and Training institutes and Horticultural research station.

Reference:

1. General and Applied Entomology- B.V. David and T.N. Ananthkrishnan.
2. Agricultural Entomology for Indian Students- Khanna, S.S.
3. Agricultural Entomology – Mathur and Upadhyay.
4. Krishi Keet Vigyan – Sharma, J.P.
5. Applied Entomology by P.G. Ferumone and Alka Prakash.
6. A text book of applied Entomology Vol. I & II- K.P. Shrivastava.
7. Pesticide application equipments – O.S. Bindra & Harcharan Singh.
8. Introduction to Insect Pest Management Metcalf, R.L. and Luchmann, W. John Willy and Sons Pub.



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Paper – VI (FRUIT AND PLANTATION CROPS)

BSAG406	Fruit and Plantation Crops	3L:2T:1P	Credit hrs 3
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Course outcomes:

- Analysing the importance of cultivation practices of fruit crops.
- Describe about the cultivation practices of plantation crops.
- Study about application of Post harvest management of different crops.
- Development of knowledge about the major insects, pests and disease of fruit and plantation crops, their symptoms and their control measures.
- Develop an understanding about the access of storage and marketing of different fruits & plantation crops.

Course content:

Importance and scope of fruit and plantation crop industries in India Cultivation practices of important fruit and plantation crops with reference to their origin, soil and climatic requirements; botany, important cultivars, plant propagation practices, resources and planting. Care and management in respect of irrigation, nutrition and other cultural operations including training and pruning, nutrient deficiencies of fruit plant and their collection, inter cropping, major cultivation problem and their control measures, harvesting, yield, storage and marketing; application of plant bioregulators; postharvest and technology of plantation crops. Management of major insect- pests and disease, principles and methods of evaluation of fruit trees, project formulation and evaluation, commercial orchard.

Practicals

Introduction of fruit plants-vernacular and botanical names, families, distinguishing vegetables, floral, fruit characters, lifting and packing of fruit plants from nursery, nursery operations lifting and shifting plants, weeding and hoeing; orchard layout and planting; plant propagation methods sexual and sexual; seed treatment, seed sowing and germination, planting; cuttings and preparation of seed beds, study of bud intake and success in manuring operations in the orchards, training and pruning of fruit plants, use of plant bio-regulators in fruit set, fruit drop, fruit growth and fruit ripening, harvesting, handling, sorting, grading, packing and storage. Visit to temperate fruit research station/tea nursery and garden.

References:

1. Production Technology of Fruit and Plantation Crops: M. Kavino, V. Jegadeeswari, R.M. Vijayakumar and S. Balakrishnan
2. Textbook on Fruit and Plantation Crops: V. Ponnuswami, M. Kumar, V. Arumugam, S. Ramesh Kumar and C. Krishnamoorthy



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Paper – VII (LIVESTOCK PRODUCTION)

BSAG407	Livestock Production	3L:2T:1P	Credit hrs 3
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Course outcome:

- Identifying the importance and role of livestock in the national economy.
- Describing measures and factors affecting the milking, feeding and meat production of livestock.
- Analysing the factors affecting the anatomical and behavioural systems of livestock.
- Discovering and demonstrating the principles of housing and space required for different livestock species in order to maintain sanitation and control livestock diseases.
- Explaining the methods of breeding and feeding of livestock and setting up measures to keep their record.

Course content:

Place of livestock in the national economy, efficient livestock development programme of government of India, importance of exotic and Indian breeds of cattle, buffalo, sheep, goat and swine. Measures and factors affecting livestock fertility, reproductive behaviour like estrus, parturition, farrowing, milk secretion, milking of animal and factors affecting milk yield and composition of milk. Selection and breeding of livestock for higher milk and meat production. Feeding and management of calves, growing of heifers and milch animal and other classes and types of animals. Housing principles, space requirement for different species of livestock. Disease control and measures of measure livestock diseases, sanitation and care. Breeding feeding and production records.

Practicals

Identification, handling and restraining of animals, judging and cutting, feeding and ration formulation, visit to livestock farms, economics of livestock production.

References:

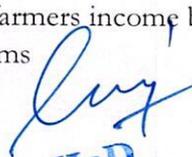
1. A Textbook of Animal Husbandry - G.C. Banerjee.
2. Handbook of Animal Husbandry - ICAR, Krishi Anusandhan Bhawan, New Delhi.
3. Poultry Production - B. Panda and S.C. Mahapatra.
4. Livestock Production and Management – N.S.R. Sastry and C.K. Thomas

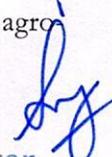
Paper – VIII (RAINFED AGRICULTURE)

BSAG408	RAINFED AGRICULTURE	2L:1T:1P	Credit hrs 2
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Course Outcome

- To design soil and water conservation techniques in arid and semi-arid regions.
- To modify and introduce new technology for increasing and sustaining yield in dry land areas
- To select and apply different cropping systems for better productivity in water scarce areas.
- To compare and analyze different drainage, land grading and storage of excess water in flood prone areas
- To improve farmers income by creating multiple income sources by adopting different agro forestry systems


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Course content:

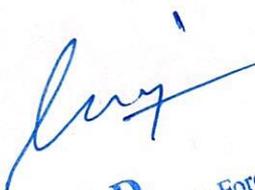
History of rainfed agriculture, magnitude of its problem and delineating criteria for rainfed and drylands, soil and climatic conditions prevalent in rainfed area. Water stress in relation to crop productivity, concept of crop productivity and plant type for rainfed farming areas and crop improvement for efficient water use, drought resistance in crop plants. Efficient utilization of water through soil and crop management practices; reducing water losses through mulching and use of anti-transpirants, their kinds, mode of action and effect on crop yield. Increasing water storage by reducing run off and increasing infiltration through mechanical and cultural measures, water harvesting techniques, watershed management. Efficient management of rainfed crops; land preparation, seeding and crop density, selection of efficient crops and their varieties, alternate cropping and land use strategies, soil fertility management and fertilizer use techniques, weed control and interculture operation, mid season correction for mitigating the aberrant weather, agro techniques for hilly tracts.

Practicals

Climatic conditions prevalent at the various dryland research centres of the country and delineating criteria for rainfed and drylands; Pattern of rainfall in different dryland tracts of the country; onset and withdrawal of the monsoon, amount, intensity and distribution, and studies of the effective cropping season; critical analysis of rainfall and estimation of moisture index, probable seeding time and possible drought period, crops and application and effect on soil and crop growth; seedling emergence survival and initial growth of crops at different moisture regimes. Seed soaking, seed treatment with chemicals and depth of seeding under moisture stress on emergence and seedling vigour, methods of fertilizer application in dryland areas; Effect of plant density, thinning, leaf removal under moisture stress condition on crop growth. Study of the salient features of a model water shed; methods of measurement and determination of run-off; alternate land use strategies: Agroforestry, grass legume forage and alley cropping system; Visit to dry land research stations and operational research projects to expose students to the latest agro techniques, and watershed management practices.

Reference :

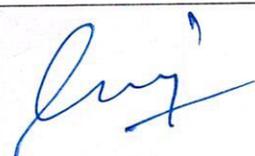
1. Hand book of Agriculture – ICAR
2. Soil Erosion and Conservation – By R.P. Tripathi and H.P. Singh.
3. Soil Conservation in India- Rama Rao.
4. Principals of Agronomy- Raddy and Raddy
5. Principals of Agronomy- S.R.Raddy
6. Dryland Farming – Arupratan Ghosh & P.K.Jana
7. Principals and practices of dryland Agriculture – K. Govindan & V. Thirumurugan


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Semester – V						
Course No.	Course Title	Credit Hrs	Theory		Practical	Total
			Ex.	Int.		
BSAG 501	Poultry Management	2+1	35	15	25	75
BSAG 502	Mushroom Cultivation	1+1	35	15	25	75
BSAG 503	Elementary Crop Physiology	2+1	35	15	25	75
BSAG 504	Farm Machinery and Power	2+1	35	15	25	75
BSAG 505	Farm Mgt. and Natural Resource Economics	2+1	35	15	25	75
BSAG 506	Fundamentals of Extension Education and Rural Development	2+1	35	15	25	75
BSAG 507	Post Harvest Mgt. & Processing of Fruits and Vegetables	2+1	35	15	25	75
BSAG 508	Practical Crops Production – I	0+2	0	0	75	75
Total		13+9 = 22	245	105	250	600

Semester – VI						
Course No.	Course Title	Credit Hrs	Theory		Practical	Total
			Ex.	Int.		
BSAG 601	Farming System and Sustainable Agriculture	2+1	35	15	25	75
BSAG 602	Conservation and Management of soil and water resources	1+1	35	15	25	75
BSAG 603	Ornamental Horticulture	2+1	35	15	25	75
BSAG 604	Environmental Science	2+1	35	15	25	75
BSAG 605	Silviculture and Agro Forestry	2+1	35	15	25	75
BSAG 606	Seed Production and Processing Technology	2+1	35	15	25	75
BSAG 607	Practical Crops Production – II	0+2	0	0	75	75
Total		12+8 = 20	210	90	225	515


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B.SC. AGRICULTURE SEMESTER – V
Paper – I (POULTRY MANAGEMENT)

BSAG 501	Poultry Management	3L: 2T: 1P	Credit hrs 3
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Course Outcome:

- To identify, classify, collaborate and study the characteristics of the breeds of poultry
- To understand and develop the methods of Rearing, breeding and feeding of poultry birds
- Analysis of incubation, hatching, brooding, production and marketing of broilers and eggs.
- Compilation and application of knowledge about vaccination, causes and prevention of poultry diseases
- To develop the methods of preservation of eggs and their access to the market.

Course Content

Important Breed characteristics of poultry, their methods of rearing, breeding, leeding and management. Incubation hatching and breeding, vaccination and prevention of diseases. Preservation and marketing of eggs, its economics and keeping quality. Broiler production and rearing, hatchery management.

Practicals

Visit to poultry farm, economics of poultry management, identification of important poultry breeds.

Reference :

1. Modern Poultry Management: Herbert Howes
2. Poultry diseases, Production and its management: Sarita Sharma

Paper – II (MUSHROOM CULTIVATION)

BSAG 502	Mushroom Cultivation	3L: 1T: 1P	Credit hrs : 2
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Course Outcomes:

- Discuss different varieties of fungi which are commonly eaten and identification of their characteristics
- Apply the techniques used in the culture of edible mushrooms
- Selection and analysis of important types of Mushroom and their growing conditions
- To estimate and develop the techniques of harvesting and yield of a mushroom crop.
- Select the value added products of Mushroom i.e. preparation of Mushroom Pickle, Powder and different items of food.

Course content:

First record of cultivated edible fungi, definition of mushrooms, present scenario of mushroom cultivation uses nutritional and medicinal values of mushrooms, general morphological features and important characters for identification of different edible mushrooms and biological backgrounds for mushroom breeding. Definition of spawn and their types, methods of spawn production raising cultures, preparation of spawn media/master culture/commercial grade spawn, characteristics of good

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spawn, storage of spawn. Cultivation of *Agricus* species: Compost and its formulations, preparation of compost using short and long methods of composting, turning schedules, compost microflora and different temperatures zones. Spawning and methods of spawning. Preparation of casing mixture and its sterilization, identification, isolation and management of different diseases, pests and competitors/moulds. Methods of harvesting mushrooms, after care of harvested fruit bodies, after care of beds and crop rooms on ruminant of crop. Cultivation of *Pleurotus*, *Volvareilla*, *Lentinus* and *Auricularia* sp: Types of substrate, substrate preparation and its sterilization; spawn and methods of spawning, spawn run and cropping, harvesting and packing, processing of mushrooms: Different methods- canning, dehydration, freeze drying and bringing etc.

Practicals

Preparation of spawn, preparation of casing material, identification of various type of edible mushrooms. Post harvest handling of various kinds of mushrooms such as canning, dehydration, drying etc.

Reference:

1. Modern Mushroom Cultivation : A. A Richards
2. Mushroom Culture: Dr. C.D. Thapa, DR. V. Prakasan and Sh. Mohinder Singh

Paper – III (ELEMENTARY CROP PHYSIOLOGY)

BSAG 503	Elementary Crop Physiology	3L: 2T: 1P	Credit hrs: 3
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Course Outcomes

- To distinguish the physiological processes, plant responses and environmental factors affecting growth and productivity of the agricultural crops
- To organize learning of basic concepts in crop growth and development among farmers
- To examine the major functions and processes occurring in plants
- To understand and analyze plant metabolism (photosynthesis, respiration, and mineral nutrition), water relations, gas exchange, and physiology of growth and development, and plant responses to environmental stress
- To describe and use the basic techniques for studying plant physiology

Course content:

An introduction to plant physiology, plant cell an introduction, laws of thermodynamics, diffusion and osmosis, the concept of water potential, cell water relations, absorption of water, transpiration, stomatal physiology, ascent of sap, ion uptake and metabolic utilization of mineral ions, deficiencies of mineral ions in plants, photosynthesis, respiration, fat metabolism, physiology of growth and development, growth regulators, physiological parameters influencing the productivity of major cereal, pulse and oilseed crops.


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Practicals

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

Reference:

- 1 Plant Physiology : S.N. Pandey & B.K. Sinha
- 2 Plant Physiology : P.S. Gill
- 3 Plant Physiology : H.S. Shrivastava
- 4 Fundamentals of Plant Physiology : V.K. Jain
- 5 A Text Book of Plant Physiology : V. Verma
6. Plant Physiology : Frank B. Salisbury and Clean W. Rose
7. Plant Physiology : RM Devlin & F.S. Withan
8. Plant Physiology : RGS Bidwell

Paper – IV (FARM MACHINERY AND POWER)

BSAG 504	Farm Machinery and Power	3L: 2T: 1P	Credits hrs 3
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Course outcome:

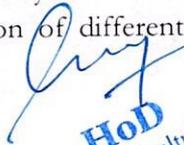
- Knowledge and application of different types of engines and associated processes
- Apply concepts regarding cost associated with farm machinery
- Study of sources of farm power and mechanization and application of same in agriculture
- Understanding and analyzing concept of machinery and types of tools used for different types of farm processes
- To identify the need of farm mechanization in India

Course content:

Sources of farm power including non-conventional sources, farm mechanization, tillage, primary and secondary tillage equipment, specialized tillage tools, seeding and fertilizer machinery, specialized sowing and planting machine, inter culture equipment, plant protection equipment, harvesting and threshing machinery, chaff cutter. Estimation of operating cost of farm equipment. Basic engine types, parts of I.C. engine, working of different engine systems, types of tractors, working of different tractor systems.

Practicals

Study and identification of parts of a country plough, mould board plough, disc plough and different type of barrows, Study of seed-cum-fertilizer drill and its calibration. Study of sugarcane and potato planter, identification of different plant protection equipment, study of a tractor drawn reaper and


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different types of threshers. Identification of different types of engines and their parts. Acquaintance of different system and controls. Tractors and practice in tractor driving.

Reference:

1. Michael, A.M. and Ojha, T.P. 2004. Principles of Agricultural Engineering, Vol. I, Jain Brothers, New Delhi.
2. Jain, S.C. And Rai, C.R. 2001. Farm Tractor – Maintenance & Repair.
3. Culpin, C. 1978. Farm Machinery Granada Publishing Ltd., London.
4. Kepner, R.A., Bainer, R. and Barger, E.L. 1987. Principles of Farm Machinery, C.B.S. Publishers and Distributors, New Delhi.
5. Smith, H.P. and Wilkes, L.H. 1979. Farm Machinery and Equipment, Tata McGraw-Hill Publishing Co. Ltd., New Delhi.
6. Ali, Irsad. 2000. Farm Machinery and Surveying Kitab Mahal Pvt. Ltd., Allahabad.
7. Moses, B.O., Frost, K.R. 1968. Farm Power, John Wiley and Sons. Inc., New Delhi.
8. Liljedhl, B.L. 1979. Tractors and their Power Units, John Willey and Sons. New York.
9. Ravindranath, N.H. and Hall, D.D. 1995. Biomass, Energy and Environment: A Developing Country Perspective from India. Oxford University Press, New York.
10. Pimentel, D. 1980. Handbook of Energy Utilization in Agriculture, CRC Press, Boca Ralon, Florida, USA.
11. OECD/IEA, 1991. Guidelines for the Economic Analysis of Renewable Energy Technology and its Applications. International Energy Agency, France.

Paper – V (Farm Management and Natural Resources Economics)

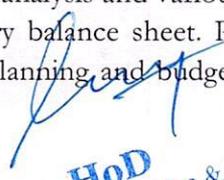
BSAG 505	Farm Mgt. and Natural Resource Economics	3L: 2T: 1P	Credit hrs: 3
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Course Outcomes:

- Understand and choose the fundamental of management with reference to agribusiness.
- To gain knowledge on Agricultural marketing, challenges and prospects for improving agricultural marketing system.
- Promote basic understanding on the concepts of business environment and to analyze relation of impact of environment on business.
- Understand and identify the importance of rural markets.

Course Content:

Meaning, concept, objectives, nature and scope of farm management. Meaning and definition of farm, structure and characteristics of farm business. Different types of farms and factors determining types and size of farm. Basic principles of farm management factor – factor and product-product relationships, law of equimarginal returns and law of comparative advantage. Meaning and concept of cost, types of cost and their importance in farm management decision making. Concepts of farm returns. Farm business analysis and various measures of efficiency. Importance of farm business records and accounts, inventory balance sheet. Profit and loss accounts of farm. Status of farm inputs land, labour, capital. Farm planning and budgeting meaning and importance of farm plan and farm budget,


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partial and complete budgeting, formulation of farm plan and budget. Concept, subject matter and importance of natural resources economics. Classification of natural resources and the basic terms ecosystem, biomass, biosphere, reserves, rate of use, environment, pollution etc. and concepts of natural resources of economics-ecology. Natural resources management and conservation, issues in natural resource use of management the benefit cost approach to natural resource problems. Time element in decision making and benefit cost analysis. The basic theory of natural resource economics efficiency in private market economy, externalities in natural resource use and alternative solution thereof, Important issues in economics and management of land, water and forest resources and the environment. Natural resources administration and policy formulation.

Practicals

Preparation of farm layout including determination of cost of fencing, application of different farm management principles concerning resources allocation, determination of most profitable level of an input use, least cost combination of inputs, optimum enterprise combination through empirical data and computation. Application of cost principles in the estimation of cost of crop and livestock enterprises and preparation of farm plan and budget. Estimation of cost of cultivation of major important crops of the area. Collection and analysis of relevant data on various natural resources in the country and review and discussion of case studies. Methodology of economic analysis of project in the context of natural resource projects.

References:

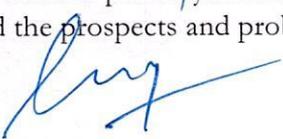
1. Wills, Walter, J. 1979. An Introduction to Agri-business Management. The Interstate Printing and Publishers, Inc. Bombay.
2. Mondy/Sharplin, Management: Concept, Practices and skills, Educational Publishers, Jaipur.
3. W. David Downey, John, K. Trockey Agri-Business Management, Mc FRAWHILL International Book Company, New Delhi.
4. Kenneth D. Dubt. Principles of Management in Agricultural Business, Reston Publishing Company, Prentice Hall Company, Reston, Virgins.
5. Mansfield, Edwin (1998). Managerial Economics. Wiley.

Paper – VI (Fundamentals of Extension, Education and Rural Development)

BSAG 506	Fundamentals of Extension Education and Rural Development	3L: 2T: 1P	Credit hrs: 3
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Course outcomes:

- To build expertise in the field of extension education and rural development.
- Comprehend & analyze the relationship between extension education with rural development.
- Acquire Knowledge & apply extension and rural development programmes.
- Select leaders and develop leadership attributes in local individuals hailing from the rural areas. And formulate programme planning, organization and management of rural institutions.
- Explain, discuss & solve panchayat structure of rural India, community development programmes and the prospects and problems of rural development in India.


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Course content:

Meaning, concept and process of extension education, objectives, principles and philosophy of extension. History of extension work. Education-formal and non-formal. Components of behaviourknowledge, attitude, skills and motivation. Principles and steps in teaching learning process, learning situation, Implications of teaching.

Concept need and steps in programme planning. Principles of programme planning, programme planning process. Panchayati Raj Institute, reorganization and its role in programme planning. Extension evaluation its meaning, principles, steps, techniques and criteria. Critical analysis of various extension programme.

Meaning and importance of rural leadership, Types, selection and qualities, training of leadership. Meaning of administration, public administration and extension administration. Coordination and team work. Organization POSDCORB, organization and management of NES and reorganized extension system. Rural development programme: an over view of CD programme before 1952, agricultural/rural development programme ADP, LAAP, CADP, HYVP, SFDA, hill area development programme, integrated tribal development project, integrated dryland farming project, integrated child development scheme, IRDP, TRYSEM, JRY, DWCRA, *mahila uthan yojana*, *Sunishchit rojgar yojana*. Role of voluntary organizations in rural development, women in agriculture and rural development.

Practicals

Visit to block/extension training centre, acquaintance with university extension system, study of rural development programmes in villages, evaluation of extension programme, visit and study of Panchayati Raj Institution.

Reference :

1. Govt. of India: "Extension Education in Community Development" Directorate of Extension, Ministry of Food and Agri., Govt. of India New Delhi.
2. Supe S.V. "An Introduction to Extension Education," Oxford & IBH Publishing Company Pvt., Ltd., 66 Janpath, New Delhi 110001.
3. Dahama, O.P. & Bhatnagar "Extension and Communication for Development" Exford & IBH Publishing Company, 66-Janpath, New Delhi 110001/
4. Dahama, O.P., Communication & Extension (Revised Edition) Ram Prasad & Sons, Agra.
5. Dahama, O.P. "Extension & Rural Welfare", Ram Prasad & Sons, Agra.

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Paper – VII (Post Harvest Management & Processing of Fruits and Vegetables)

BSAG 507	Post Harvest Mgt. & Processing of Fruits and Vegetables	3L: 2T: 1P	Credits hrs: 3
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Course outcomes:

- Illustrate and apply the Post-harvest management of main horticultural crops
- To compare interactions between the biological crop system post-harvest, the surrounding environment and the influencing technical factor
- To design storage and cold chain management of crops
- Analyze the processing and marketing of fruits and vegetables
- To formulate future post-harvest challenges by adaptive knowledge

Course content:

Importance of PHM for fruits and vegetable. Total production, consumption pattern and Pest harvest losses in fruits and vegetables. Maturity and ripening process, biochemical changes after harvesting, quality management for fresh marketing and processing. Storage of fruits and vegetables – ambient, low temperature and controlled atmosphere storage system. Packaging of fresh and processed products. Transportation system, mode of marketing, sorting, grading and handling. Pretreatment of fresh produce for marketing and processing. General principles and methods of preservation preparation of jam, marmalade, tomato products pickles and chutney, drying fruits and vegetables, fruit beverages juices, squashes, nectars, cordials, by products of fruits and vegetables processing industries such as vinegar, cider. Canned fruits and vegetable products, frozen fruits and vegetables, government policies regulation and specifications for fresh and processed products. Export promotion agencies and their role in export of fresh and processed products.

Practicals

Determination of respiration rate and detection of post harvest disorders/diseases. Marketing losses in fresh produce. Calculation of refrigeration lode for processing/storage. Effect of packaging material/transport system on their quality. Preparation of jam, jellies, chutneys/sauces, ketchup and pickles. Canning dehydration and freezing of fruits and vegetables. Chemical analysis of fresh and processes products and visit to mandi, export terminals and processing industries.

Reference:

1. “Phal Parirakshan – Siddhant Evam Vidhiya” – Dr. Shyam Sundar Shrivastava, Central Book House, Raipur.
2. “Fruit and Vegetable Preservation: Principles and Practices” – Dr.R.P. Shrivastava and Dr. Sanjeev Kumar, IBDC, New Delhi.
3. “Preservation of Fruits and Vegetables” – G.S.Siddappa, I.C.A.R. New Delhi.
4. “Home Scale Processing and Preservation of Fruits and Vegetables” – C.F.T.R.I. Mysore.
5. “Phal Parirakshan – Siddhant Evam Vidhiya” – Dr. Shyam Sundar Shrivastava, Central Book House, Raipur.
6. “Phal Aur Sabjiyon Ka Parikshan” † Dr.Dalpat Singh Khurdiya, ICAR, New Delhi.


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Paper – VIII (PRACTICAL CROPS PRODUCTION - I)

BSAG 508	Practical Crops Production – I	3L: 0T: 3P	Credit hrs: 2
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Course outcomes:

- In the course study students will be acquainted with the knowledge of profitable crop production technology.
- Course content will help to students/farmers about ruminative crop production techniques.
- It helps to adopt diversified farming system according to available farming situation.
- It will assist to encourage the sustainable agriculture system.
- Profitable based farming system can we adopted with the help of course content

Course Content:

Complete Practical acquaintance relating to scientific production technique of major field crops of the season including sowing weeding hoeing fertilizer and manure application, harvesting etc.



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B.S.C. AGRICULTURE SEMESTER – VI Paper – I (FARMING SYSTEM AND SUSTAINABLE AGRICULTURE)

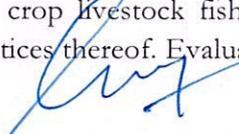
BSAG 601	Farming System and Sustainable Agriculture	3L: 2T: 1P	Credit hrs: 3
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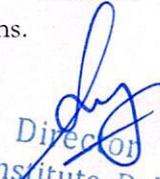
Course outcomes:

- Analyze the major aspects of agricultural practices and traditions through time and throughout the world
- Outline and apply the relationships among culture, economics, politics, science, and agricultural development
- Describe and Analyze the cross-cultural interactions and exchange that linked the world's people and facilitated agricultural development is also expected
- Demonstrate and analyze how agricultural scientists are attempting to minimize agricultural pollution and sustain food production adequate for the world's population
- To acquaint the student from agricultural as well as other disciplines with conventional and alternative agricultural production practices throughout the world and their effect on long-term sustainability and environmental quality.

Course content:

Definition and concepts of farming system. Historical developments in farming system. Farming systems in India based on cultivation system viz. shifting, regulated, semi-permanent and permanent cultivation on rainfed and irrigated lands with perennial crops; grazing systems, enterprise mix, resources, technology and orientation. The types of farming system, geographical distribution, general characteristics including relevant case studies, weaknesses as well as development path of each system. Concepts, importance, need and indicators of sustainability. Ecological basis of sustainability/resource management. A profile of Indian agriculture in terms of availability of natural resources and their carrying capacity, demographic compulsions, increasing fuel and fodder needs, problems of soil health, land degradation and conservation of natural resources including soil and water as part of sustainable resource management. Maintenance of the production base in irrigated agriculture. Modernization of agriculture and its relation with sustainability, natural resource centered versus commodity led production system, low versus excessive external input agriculture (LELA v/s HELA), necessity and limits of using external inputs in LELA with particular references to artificial fertilizers, pesticides, improved seeds, irrigation and mechanization and their implication on sustainability. Basic ecological principles of low external input sustainable agriculture (LEISA), securing favorable soil condition for plant growth, optimizing nutrient availability and cycling, managing flow of solar radiation, water and air, exploiting complementarily, synergies and combining mixing crop, mixing livestock and integrating crops and livestock including aquaculture, exploiting indigenous plants and animals. Some promising LEISA techniques and practices – improved manure handling, composting, green manuring and biofertilizers, crop residue management and strategic use of mineral fertilizers. Mulching, wind breaks, water harvesting, tied ridging, strip cropping. Permeable contour line barriers and water ponds. Practical Inter-cropping trap and decoy crops, constructed traps, repellents, biological control and strategic use of pesticides in crop and natural medicines in animal health care. Bio-intensive gardening, contour farming, integrated crop livestock fish farming, integrated forage production and farmer – centered techniques and practices thereof. Evaluation of constraint and optimization of farming systems.


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Reference:

1. Jayanthi, C., Devasenapathy, P. and Vennila, C. 2008. Farming System : Principles & Practices. Satish Serial Publishing House.
2. Rangasamy, A. Annadurai, K., Subbian, P. and Chinnusamy, J. 2002. Farming system in the tropics. Kalyani Publishers, New Delhi.
3. Farm Management: R.K. Tandon and S.P. Dondhyal.
4. Principles and Practices of Agronomy: S.S. Singh.
5. Crop management: Indian society of Agronomy and ICAR.

Paper – II (Conservation and Management of Soil and Water Resources)

BSAG 602	Conservation and Management of soil and water resources	2L: 1T: 1P	Credit hrs: 2
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Course outcomes:

- Explain and apply the concept of soil- water content, movement, storage, & plant availability
- To distinguish between salinity and sodicity in irrigated agricultural systems and learn the measures to correct it
- To analyse the quantitative problems in soil water management.
- Identify and evaluate the primary causes and consequences of a wide range of soil degradation problems, including soil acidity and alkalinity, erosion, salinity and sodicity, and nutrient loss
- Develop an ability to collect and evaluate data in practical classes

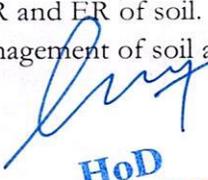
Course content:

Soil resources of India; distribution of waste land problem soils; water resources of India and their utilization in crop production; soil tilth management and relationship with tillage; tilth requirement of different crops; soil impedance layers and their improvement; management of soil water energy state of water in soil and availability to plants; management of soil moisture under different climates; water harvesting techniques, effect of water quality on soil and plants; soil aeration problems and management; soil thermal regimes in relation to crops and their optimization.

Recycling of agricultural and industrial organic wastes; wastelands and their management; reclamation and management of acidic, saline and sodic soils, soil erosion; extent, type and effects; soil conservation techniques, watershed mgt.; application of remote sensing for assessment of soil and water resources.

Practicals

Evaluation of irrigation water quality using water quality indices such as pH, EC RSC and SAR. Tensiometer and their use. Measurement of water holding and field capacities of soil. Preparation of saturation paste and saturation extracts of salt affected soils. Determination of pH, EC, Ca, Mg and Na in saturation extracts Measurement of infiltration rate of soil. Determination of CaCO₃ equivalent of liming material. Estimation of lime requirement of acid soils and gypsum requirement sodic soils. Measurement of ODR and ER of soil. Estimation of water stable aggregate in soil and field trip to study the problems and management of soil and water resources.


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Reference:

1. Michael, A.M. 1997. Irrigation Theory and Practice, Vikash Publisher, New Delhi.
2. Dhruvanarayan, V.V. 1993. Soil Conservation Research in India, Publication and Information Division, ICAR, New Delhi.
3. Israelson, O.W. and Hensen, V.E. 1962. Irrigation Principles & Practices, John Wiley and Sons, Inc., New York.
4. Tideman, E.M. 1999. Watershed Management: Guidelines for Indian Conditions, Omega Scientific Publishers, New Delhi

Paper – III (ORNAMENTAL HORTICULTURE)

BSAG 603	Ornamental Horticulture	3L: 2T: 1P	Credit hrs: 3
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Course Outcome

- Construct general and broad skills in horticultural practices and plant identification
- To extend and apply more specific knowledge in areas of ornamental horticulture including garden maintenance, turf care, arboriculture, landscaping, nursery work, etc
- To illustrate and identify the principles and practices of annual and perennial ornamental plants
- To discuss techniques related to post harvest management of ornamental plants
- Ability to create the project formulation & evaluation

Course content:

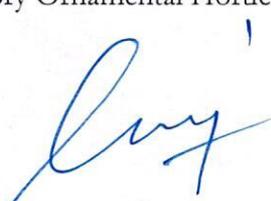
Importance of ornamental gardening in human life, theory and practice of landscape and formal garden for various places, identification, use of ornamental plants for the beautification of private and public places, styles of gardens, formal, informal etc. landscape and town planning, ornamental plants for rural and urban areas, indoor gardening, post culture; bonsai, hanging baskets etc. Principles and practices involved in growing ornamental annual and perennial plants, planning and layout of various parts of garden, herbaceous and shrubbery borders, lilly pots, rock gardens etc. cultivation of important ornamental plants, rose, gladiolus, chrysanthemum, tuberose, orchids, authurium, gerbera, dahlia, fern, palms, cycades, cacti etc. Post harvest technology, project formulation and evaluation.

Practicals

Identification of ornamental plants, preparation, planting and care of lawn seed bed preparation and sowing, potting and repotting of ornamental plants, training and pruning of ornamental plants, cultural practices in important ornamental plants, bonsai culture, planning and layout of gardens, project formulation use of flowers for different purpose, care and maintenance of green house/polyhouse plants and arranging flower show, visit to nurseries and florist centres.

Reference:

1. Fundamentals of Ornamentals Horticulture and Landscape Gardening: Ajai Kumar Tiwari
2. Introductory Ornamental Horticulture by J.S. Arora


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Paper – IV (ENVIRONMENTAL SCIENCE)

BSAG 604	Environmental Science	3L: 2T: 1P	Credit hrs: 3
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Course outcomes:

- Develop a general understanding of the breadth and interdisciplinary nature of environmental issues.
- Develop the qualitative and quantitative research methods to gain empirical evidence bearing on evaluation of environmentally sustainable alternatives.
- Interpret key concepts from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
- To be able to apply concepts and methods from ecological and physical sciences in environmental problem solving.
- Discover a general understanding of the breadth and interdisciplinary nature of environmental issues.

Course content:

Unit – I (BASICS OF ENVIRONMENTAL SCIENCES)

Introduction to Environmental Sciences:

- Definition, scope and importance (the multidisciplinary nature of environmental sciences)
- Need for public awareness on Environment, Role of individual in Environmental protection

Natural Resources (Renewable and Non-renewable Resources):

- Natural Resource conservation: concepts
- Freshwater resources: use and over-exploitation of surface and ground water, conflict over water, hydroelectric projects, problems, traditional methods of harvesting of freshwater resources.
- Mineral resources: use and exploitation, environmental effects of extracting mineral resources, Lime stone quarrying in Uttaranchal
- Food resources: World food problems, changes caused by agriculture and overgrazing, effect of modern agriculture, fertilizer operated problem, water logging, salinity.
- Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.
- Land resources: Land as a resources, land degradation, landslides, soil erosion and desertification.

Ecosystems:

- Concept, structure, and components of an ecosystem.
- Abiotic and biotic variables.
- Ecosystem function, trophic levels, energy flow, food chain, food web, Ecosystem, homeostasis.
- Examples of ecosystems (aquatic: pond, lake, river) □ Terrestrial ecosystem: Forest, mountain □ Ecological succession

Biodiversity and its conservation:

- Introduction:- Definition, genetic, species and ecosystem diversity.
- Bio-geographical classification of India
- Values of biodiversity: 5 Es (Esthetic (Aesthetic), Economic, Environment, Ethical, Emotional).
- Biodiversity at global, national and local levels.
- India as a mega diversity nation, hot spots of biodiversity.
- Himalayan wildlife: Habitat loss/poaching of wildlife, man-wildlife conflicts, and conservation.
- Threatened categories as per IUCN.
- Conservation of biodiversity: *In-situ* and *Ex-situ* conservation of biodiversity.

Unit – II (APPLIED ENVIRONMENTAL SCIENCE)

Environmental Pollution:

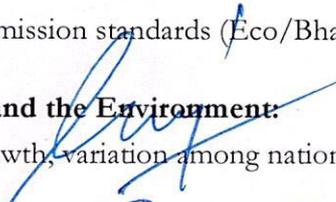
- Definition, causes, effects and measures of Air pollution.
- Water pollution and thermal pollution.
- Marine pollution.
- Noise and radioactive pollution.
- Solid waste and their management (municipal, industrial (hazardous and non-hazardous), problems of solid waste disposal in Uttarakhand and integrated Solid Waste Management (ISWM).
- Environmental hazards in Himalayas (floods, river, blockades, cloud burst, landslides, earthquakes).

Environmental problems and Environmental Protection:

- *Anthropogenic* and natural environmental problems.
- Environmental ethics; issues and possible solutions.
- Climate change, global warming: causes, effects and mitigation (national and international efforts)
- Ozone layer depletion: causes, effects and mitigation. (national and international)
- Environmental Protection Act 1986
- Air (Prevention and Control of pollution) Act, Water (Prevention and control of Pollution) Act.
- Wildlife Protection Act 1972
- Forest Conservation Act 1980
- The Biological Diversity Act 2002
- Issues involved in enforcement of environmental legislation, public awareness, Article 48A and 51A
- Automobile Emission standards (Eco/Bharat), Ecomark

Human Population and the Environment:

- Population growth, variation among nations, population explosion Family Welfare Programme


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- Environment and human health.
- Role of Information Technology in environment and human health.

Sustainable Development:

- Definition, concepts and currencies
- Sustainable development of agro-ecosystem (organic farming)
- Sericulture, floriculture, bee keeping
- Sustainable development of hydroenergy in Uttarakhand
- Traditional Ecological knowledge (TEK)

Field Work/Practicals

- Documentation of natural resources of local area (river, forest, lake, pond, mountain, grassland)
- Visit to local polluted sites-urban/rural/industrial/agricultural
- Study of Common plants, birds and mammals
- Study of simple ecosystem (pond, river, lake, hill slopes, etc.) Visit to sanctuaries, national parks and biosphere reserves.

Reference:

1. Introduction to Environmental Science: Susannah Sandrin
2. Principles of Environmental Science: William Cunningham
3. Environmental Science : dr. Y. K. Singh

Paper – V (SILVICULTURE AND AGRO-FORESTRY)

BSAG 605	Silviculture and Agro Forestry	3L: 2T: 1P	Credit hrs: 3
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Course Outcome

- To analyze and check the status of production of food crops, legumes and tuber to meet the rapidly growing food requirements of the Indian population
- Promoting adoption of agroforestry by utilizing the factors associated with this.
- To construct and improve land and forest resources efficiently so that its productivity is increased & restored
- To use available resources efficiently & economically and apply the practical knowledge of silviculture in professional life
- To develop effective models to enhance the supply of timber and firewood to reduce pressure on forest.

Course content:

Introduction basic terms, concepts and scope, national and global need, growth and development of trees and forest stands growth and developmental stages and growth measurements, factors affecting

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tree and stand growth, plant succession kinds and causes, natural and artificial regeneration establishment and care of tree nurseries tending operations cleaning, weeding, thinning, pruning and other cultural operation classification, regeneration and crop characteristics of major Silvicultural systems, basic concepts of rotation, sustainable yield management and multiple use, establishment of forest stands/crops and agroforestry-selection and management of tree and crop species i.e. planting density, geometry and Silviculture, comparison among various land uses-mixed farming, multiple cropping and agroforestry, Interactions between components of agroforests for various resources and productivity. Problems, choice and management of agro-forestry systems in various agro-climatic zones.

Practicals

Identification and judging of tree species for their agro-forestry potentials, growth and development stages of forest trees and shrubs, Qualification of growth (tree height, diameter, volume and increment) in trees, forest types natural regeneration, seed collection, storage and testing. Planning forest nurseries site preparation and planting, computation of biological rotation in tree crop and tree crop interaction studies in agro forestry.

References:

1. Silviculture and Agroforestry pdf - Sri Krishna Nagai Maligai
2. Introduction to Forestry and Agroforestry: K. T Parthiban and Krishna Kumar M. Karthik.

Paper – VI (SEED PRODUCTION AND PROCESSING TECHNOLOGY)

BSAG 606	Seed Production and Processing Technology	3L: 2T: 1P	Credit hrs: 3
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Course Outcomes

- Understanding seed development, germination, vigor, deterioration and identify the relationship between laboratory tests and field performance
- Acquaint the students with the principles of seed production for agronomic and horticultural crops within and outside of the region of adaptation and the techniques used in seed conditioning
- Understand and analyze seed increase systems, seed testing and the laws and regulations related to marketing high quality seed
- To learn and apply the seed legislation & seed law enforcement including IPR and PBR in India and discuss it among stakeholders
- To get information about recent developments in seed industry and elaborate it among the farmers

Course content:

Seed, its importance in green revolution difference between grain and seed, concept of seed quality, steps involved in seed production. Seed technology, its objectives and its role in increasing agriculture production. Seed industry in India. Development of seed programmes, general principles of seed production. Seed replacement rate, multiplication rate, Breeder's, foundation and certified seed, maintenance of genetic purity, Nucleus and breeders seed production of newly released and established

varieties of self pollinated crops, viz, Rice, Wheat Soybean/chickpea, Pigeonpea, Rapeseed and Mustard etc Maintenance of nucleus and breeder's seed in cross pollinated crop varieties, inbreds and noninbreds, maintenance of seed of established varieties. Foundation and certified seed production of maize inbreds, single and double cross hybrids. Hybrid seed production of Sunflower, Sorghum, pearl millet and Rice using male sterility systems. Latest released hybrids of Maize, Sorghum, Bajra and Rice their characteristic feature, seed production of Wheat, Rice, Oats, Soybean, Gram, Urd, Moong, Sunflower, Pigeonpea etc. seed certification, its concepts, roles and goals, seed certification agencies, certified and truthfully labeled seeds. Seed processing, storage and marketing, Minimum seed certification standards for self and cross-pollinated crops. Field and seed inspections objectives, general principles and methods, Seed sampling and seed testing for analytical purity, varietal identification through electrophoreses, Grow out test for cultivar purity, seed legislation and seed law enforcement including IPR, PBR in India, Record developments in seed

Practicals

Seed production in major crops viz, Rice, Wheat, Soybean, pulses, Oil seeds, Maize, Sunflower, Sorghum, Bajra and Forage crops, Seed testing approaches and techniques in cereals, pulses, oilseeds and other crops.

References:

1. Seed Technology : R.L Agarwal
2. Seed Production: Principles and Practices – Lawrence O. Copeland and Miller F. McDonald.

Paper – VII (PRACTICAL CROPS PRODUCTION - II)

BSAG 607	Practical Crops Production – II	2L: 0T: 2P	Credit hrs: 2
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Course outcomes:

- Comprehend the fundamentals of crop production of rabi cereals
- Decide on the crops, fertilizers and irrigation measures for crop production of pulses
- Plan for sustainable crop production of oilseed and forage crops
- Explain crop production of sugarcane, medicinal and aromatic plants
- Correlate parameters involved in crop cultivation and practice rabi crop cultivation

Course content:

Complete Practical acquaintance relating to scientific production technique of major field of the season crop(s) including sowing weeding, hoeing, fertilizer and manure application, harvesting etc.


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Semester – VII						
Course No.	Course Title	Credit Hrs	Theory		Practical	Total
			Ex.	Int.		
BSAG 701	General Economics	2+0	35	15	-	50
BSAG702	Breeding and Improvement of Farm Animals	1+1	35	15	25	75
BSAG 703	Principles of Animal Nutrition	2+1	35	15	25	75
BSAG 704	Element of Food Technology	2+1	35	15	25	75
BSAG 705	Human Food and Nutrition	2+1	35	15	25	75
BSAG 706	Soil Taxonomy, Survey and remote sensing	2+1	35	15	25	75
BSAG 707	Production Technology of Medicinal and Agromatic Plants	0+2	35	15	25	75
Total		14+6 = 20	245	105	150	500

Semester VIII						
BSAG-801	Rural Agriculture Work Experience	0+20	0	0	525	525
Total		0+20	0	0	525	525


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B.SC. AGRICULTURE SEMESTER – VII Paper – I (GENERAL ECONOMICS)

BSAG 701	General Economics	2L: 2T: 0P	Credit hrs: 2
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Course outcomes:

- To know about the marketing strategies and apply in the field of agriculture
- Deals with the study of various laws with regards to agriculture and apply
- Distinguish the differences between macroeconomics and microeconomics
- Study and analyze the economic costs of unemployment and inflation
- Classification of general economic concept

Course content:

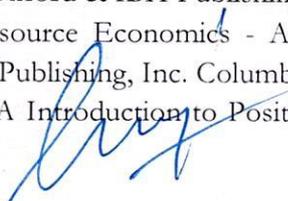
Nature, scope and subject matter of economics, approaches to economic analysis and nature of economic theory, basic terms and concepts; law of demand, determinants of demand, price, cross price and income elasticity of demand and their applications; law of diminishing marginal utility and principle of equi-marginal utility, consumer's equilibrium and derivation of demand curve; factors of production and input-output relationships, law of variable proportions and laws of scale; cost concepts, law of supply, determinants of supply, elasticity of supply; firm's equilibrium and market equilibrium in short run and long run; features of perfectly competitive market, price determination under perfect competition, basic features of monopoly, duopoly, oligopoly and monopolistic competition meaning of distribution, factor market and pricing of factors of production.

Importance of national income, concepts of national income, approaches of measuring national income, difficulties and limitations of national income accounting; importance of population studies, determinants of population, theories of population; barter system of exchange and its problems, classification of money and concepts of money supply, quantity theory of money. GPT, inflation, deflation role of bank money in modern economy, types of banks and their function, credit creation by commercial banks, functions of central bank and instruments of credit control, current changes in banking; concept of economy and economic system, basic feature of capitalistic, socialistic and mixed economic systems, elements of economic planning; international trade, its need and importance, theories of absolute and comparative advantage, exchange rate, TOT, BOP, devaluation of infancy, recent developments in world trade.

Special characteristics of agriculture and its role in economic development, agricultural planning and development in the country. Role of women in Indian Agriculture.

References:

1. Dewett, K.K. 2007. Modern Economic Theory, B.Chand & Co., New Delhi.
2. Agricultural Economics, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi
3. Randall, Allan. 1981. Resource Economics - An Economic Approach to Natural Resources and Environmental Policy, Grid Publishing, Inc. Columbus, Ohio.
4. Lipsey Richard G. 1963. A Introduction to Positive Economics, William Clowes and Sons, Limited, London.


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Paper – II (BREEDING AND IMPROVEMENT OF FARM ANIMALS)

BSAG 702	Breeding and Improvement of Farm Animals	2L: 1T: 1P	Credit hrs: 2
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Course Outcome

- To analyze the breeding methods; inbreeding and out breeding
- To determine & analyze the breeding aspects in farm animals
- Helpful to analyze & evaluate the better health of farm animals
- To formulate the improvement of farm animals' adaptability
- Function & Importance of animal breeding in agriculture.

Course content:

Reproductive systems of farm animals. Qualitative and quantitative inheritance and effect of environment on them. Various qualitative and quantitative traits of livestock. Weinberg law, variation, its measures, genetic, phenotypic and environmental variances. Heritability and repeatability, its measurement and uses. Selection its genetic effect, selection for dominant and recessive gene and quantitative traits, selection differential, response to selection, generation interval and annual rate of gain. Genetic correlation and correlated response. Basic of selection, individual, family, progeny, pedigree and combined selection. Methods of selection for one or more traits random, independent culling level and selection index. Inbreeding its consequences, inbred lines, line breeding, inbreeding coefficient and relationship coefficient, out breeding – various types of our crossing and cross-breeding, species hybridization and development of new breeds.

Practicals

Computation of mean, variance, standard deviation, correlation and regression coefficients, inbreeding coefficients and relationship coefficient in economic traits of livestock, estimation of gene frequency, repeatability and heritability in animal population.

References:

1. A Textbook of Animal Husbandry - G.C. Banerjee.
2. Handbook of Animal Husbandry - ICAR, Krishi Anusandhan Bhawan, New Delhi.
3. Poultry Production - B. Panda and S.C. Mahapatra.

Paper – III (PRINCIPLES OF ANIMAL NUTRITION)

BSAG 703	Principles of Animal Nutrition	3L: 2T: 1P	Credit hrs: 3
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Course Outcome

- Analyze the present status of feeding ruminants in India.
- To classify and differentiate the feeds, forages and, nutrients.
- Explain, build & solve physiological phases in livestock metabolic system.
- Interpret feeding experiments in livestock.
- To enlist key nutrients for animals and analyze their importance.

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Course Content:

Introduction to expanding field of nutrition, chemical composition of animal and its food, digestive systems and processes of farm animals. Digestion, absorption and metabolism of carbohydrates, lipids and proteins in protein content in various classes of feeds. Concept of essential amino acids for nonruminants and protein quality of feeds. The absorption and metabolism of essential minerals and vitamins; symptoms of their deficiencies; minerals and vitamin content of various classes of feeds. The nutritive evaluation of feeds for energy and protein, digestibility of feeds values of feeds, nutrient requirements of farm animals for maintenance, growth reproduction and lactation. Growth stimulating substances.

Practicals

Study of plant cell, forages and fodders, cereals, cereal offals and oil cakes, animal, avain and marine offals, mineral and vitamin supplements and other feed additives. Least cost ration formulation, proximate analysis of feed samples for moisture, crude protein, crude fat, crude fibre, ash, acid insoluble ash and nitrogen free extractive. Formulation of ration for cattle, buffaloes, sheep, goat, swine and poultry.

Reference:

1. Animal Nutrition in the Tropics - S.K. Ranjhan
2. Principles of Animal Nutrition : Guoyao Wu

Paper – IV (ELEMENTS OF FOOD TECHNOLOGY)

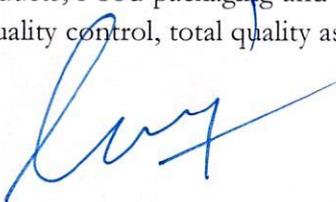
BSAG 704	Element of Food Technology	3L: 2T: 1P	Credit hrs: 3
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Course Outcome

- To use fundamental aspects on Food, Nutrition and its Functions
- To know and estimate the needs of the individuals, and their requirements
- To describe and classify the deficiency diseases due to lack of Macro and Micro nutrients.
- Formulate the Nutritional status of all age groups and their Recommended Dietary Allowances (RDA)

Course content:

Scope and importance of food technology in Indian economy. Handling, transportation and storage of food grains, fresh milk, meat, fish and eggs; physical, chemical and nutritional characteristics of food grains – fresh meat, fish, milk and eggs; role of milling and size reduction in food processing; Use of low temperatures in processing and storage of food grains, fresh milk, meat, fish and eggs; Drying and dehydration of food grains and concentration and evaporation of milk; Food fermentations and their application in food processing. Role of food additives in the processing of food grains, milk, meat, fish, eggs and their products; Food irradiation and its application in extending shelf life of food grains, meat, fish, eggs and their products; Food packaging and its functions; By product's utilization and disposal of food industry wastes; quality control, total quality assurance (TQA) and various systems of TQA.


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Practicals

Milling of wheat and rice and testing quality of milled products; baking of bread, biscuits and cakes; physical and chemical properties of milk, separation of cream and ghee making, preparation of chhena, paneer, khoa, ice cream and cottage cheese. Slaughtering of poultry and pickling of culled meat, Preparation of meat kabab and patties. Evaluation and preservation of fresh eggs, Visit to food industries.

Reference:

1. Elements of Food Technology : Desrosier
2. Food Science and Technology : Vijaya Khader

Paper – V (HUMAN FOOD AND NUTRITION)

BSAG 705	Human Food and Nutrition	3L: 2T: 1P	Credit hrs: 3
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Course Outcome

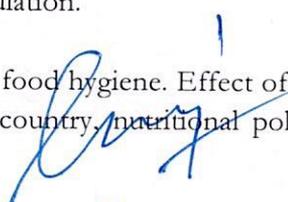
- To explain and analyze the fundamentals of nutrition.
- To explain and analyze the physiological process of metabolism and understanding the role of food and nutrients in health and disease.
- Make use of nutritional science to modify nutrient needs into menus for various groups of people.
- Establish & use the link between food borne infections and hygiene
- Develop a position on a public policy affecting nutrition and food issues and/or health care programs.

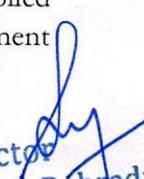
Course content:

Trends in food production and consumption in India. Role of agricultural scientists and food technologist in meeting national nutritional requirements.

Definition of human nutrition, nutrient, nutritional care, health, nutritional status and good nutrition. Food and its functions and functional classification. Calorific value of foods and its measurement. Digestion and absorption of various nutrients present in foods. Energy and nutrient needs of human body. Recommended dietary allowances for various age groups and classes of individuals. Common nutritional problems in India and their causes. Specific nutritional deficiencies and disorders including protein calorie malnutrition, nutritional anaemias, vitamin deficiencies, obesity, atherosclerosis. Clinical symptoms and diagnosis of deficiency disorders. Important food groups and their role in the management of deficiency disorders and diseases. Food habits and their effect on regional balance. Balanced diet and its formulation.

Food borne infections and food hygiene. Effect of processing on the nutritional value of foods. Applied nutritional programme in country, nutritional policies of government. Food fortification, enrichment


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and restoration, supplementary feeding programmes for vulnerable groups. State, national and international agencies dealing with nutritional programmes.

Practicals

Determination of proximate composition, pH, acidity, minerals and vitamins (B¹², BI, and C) in foods. Detection of adulteration in various foods. Determination of calorific value of foods and formulation of balanced diets. Microbiological analysis of foods (SPC, coliform, and yeast and mould count). Signs of malnutrition in animals. Diagnosis of nutritional deficiency disorders in human being.

Reference:

1. Food Science and Nutrition: Sunetra Rodae
2. Principles of Human Nutrition : Martin Eastwood

Paper – VI (SOIL TAXONOMY, SOIL SURVEY AND REMOTE SENSING)

BSAG 706	Soil Taxonomy, Survey and remote sensing	3L: 2T: 1P	Credit hrs: 3
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Course outcomes:

- Improve knowledge about soil classification on the basis of their characteristics.
- Understand and utilize the tools and techniques of soil survey in agriculture.
- To apply the application of remote sensing in agriculture.
- To apply the image interpretation technique in soil and crops classification.

Course content:

Types of soil survey, morphological, physical and chemical properties used in distinguishing and classifying soils. Principles of soil taxonomy, classification system. Soils of India and their classification. Advantages of taxonomic classification of soils.

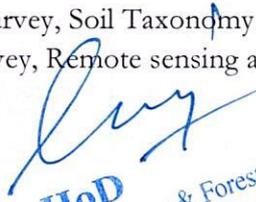
Remote sensing introduction, definition, concept, principles, importance, scope, types, merits and demerits and its application in agriculture and soil classification.

Practicals

Field visit and practice of judging soil texture by feel method; examination of soil profile. Study of base maps used for soil survey, village or cadastral maps, topographic maps, aerial photographs and use of stereoscope, satellite imagery. Examination of soil properties of some important soils of India. Aerial photographs, adjustment of stereoscope. Area estimation of eroded land from F.C.C. (False colour composite). Visit of Remote Sensing application centre/soil survey organization.

Reference:

1. Fundamental of Soil Survey, Soil Taxonomy and Remote sensing: Dilip Kumar Das
2. A textbook of Soil Survey, Remote sensing and Land use planning: Dr. S.G. Savalia


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Paper – VII (Production Technology of Medicinal and Aromatic Plants)

BSAG 706	Production Technology of Medicinal and Aromatic Plants	3L: 0T: 2P	Credit hrs: 3
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Course Outcome:

- To formulate cultivation techniques related to medicinal and aromatic plants
- To analyze standardization through chemical and molecular marker
- To summarize and conclude the uses of various plants in medicinal purpose
- To develop business related to medicinal and aromatic herbs
- To construct effective ideas related to collecting, producing, processing and marketing herbal natural sources

Course content:

Importance and scope of medicinal and aromatic plants, geographical distribution of species, botanical description, management of nurseries, climate and relation to medicinal and aromatic plants, improved varieties, soil and land preparation, intercultural practices, irrigation and insect-pest management, post harvest techniques, harvesting processing, storage and herbage/constituent yield. The following medicinal and aromatic plants shall be covered.

Medicinal Plants: Sarpagandha, poppy, sadabahar, digitailis, dioscora, solanum, brahmi, isabgol, senna, aloe, neem, cinchona and Ipecac.

Aromatic Plants: Essential oils: Mints-menthol mint, pepper mint, Spearmint, bergamot mint; Aromatic grasses lemon grass, palmarosa, citronella, vetiver; Ocimum, geranium, pachauli, dill (Sowa), Cinamon, pine, eucalyptus, sandalwood, liquorice

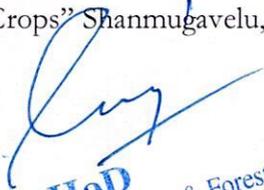
Flower perfume: lavender, rose, rosemary, jasmine

Practicals

Identification and preparation of herbarium, techniques of sowing/planting, study of morphological and chemical characteristics, yield, techniques for quality analysis and visit to related research institution/drug farms and pharmaceutical industries involved in the cultivation and processing of medicinal and aromatic plants.

Reference:

1. "Masalo ki Kheti" – Dr.R.K.Sharma, Dr.D.S.Bhati and Dr.B.N.Bhatta, I.C.A.R., New Delhi.
2. "Sagandhiya Phaudho Ki Kheti" – Virendra Chandra, I.C.A.R., New Delhi.
3. "Spices and Condiments –" – Purthi,J.S. 2006, National Book Trust India A.S.Green Park, New Delhi.
4. "Medicinal and Aromatic Crops", Aaviskar Publishers Distributors, Jaipur, Rajadthan.
5. "Text Book of Plantation Crops, Pillai,K.h. (1984). Vikram Publication New Delhi.
6. "Spices and Plantation Crops" Shanmugavelu, K.G. and Madhaorao, Sterling Road, Nungambakkam.


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B.SC. AGRICULTURE SEMESTER – VIII RURAL AGRICULTURAL WORK EXPERIENCE

BSAG 801	Rural Agriculture Work Experience	20L: 0T: 20P	Credit hrs: 20
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Course outcomes:

- Appreciate the importance of undergoing a practical rural agricultural education programme
- Recommend and solve farmers problems faced during crop production
- Comprehend extension activities and know how technology gets transferred from lab to land
- Advise farmers to undergo soil and water testing and apply recommended dose of fertilizers and grow suitable crops based on their farm's soil and water health
- Manage an agro-industry
- Prepare and present agricultural reports

Course content:

Each student will have a choice to opt any of the four components given below. He/she will submit his/her work in form of a report and present the results in the seminar. The work will be evaluated internally in which seminar will be of 50% marks of the total.

- Agro-based Industries – Seed processing plants and industries, fruit preservation industries, food processing industries etc.
- Plant clinics
- NGO
- Socio economic studies
- Apiculture
- Sericulture
- Mushroom Cultivation
- Attachment with agriculture Departments
- Attachment with Agriculture research institutes/organizations/agencies.


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