FACULTY OF AGRICULTURE

SYLLABUS SCHEME

For

B.Sc.(Hons) Agriculture
(Semester I-VIII)

From Batch 2021 Onwards

First Semester

B.Sc. (Hons) Agriculture
From Batch 2021 Onward

Study Scheme and Syllabus of B.Sc. (Hons) Agriculture Syllabus Batch 2021Onwards

Semester I

Course code	**Course Title**	Load Allocation		Marks Distribution		Total	Credits
		L	P	Internal	External		
BSAG-21101	Fundamentals of Horticulture	1	0	40	60	100	1
BSAG-21102	Fundamentals of Soil Science	2	0	40	60	100	2
BSAG-21103	Introduction to Forestry	1	0	40	60	100	1
BSAG-21104	Comprehension & Communication Skills in English	1	0	40	60	100	1
BSAG-21105	Fundamentals of Agronomy	2	0	40	60	100	2
BSAG-21106(A)	Introductory Biology*	2	0	40	60	100	2
BSAG-21106(B)	Elementary Mathematics**	2	0	40	60	100	2
BSAG-21107	Agricultural Heritage	1	0	40	60	100	1
BSAG-21108	Rural Sociology & Educational Psychology	1	0	40	60	100	1
BSAG-21109	Human Value and Ethics	1	0	Satisfactory/Unsatisfactory			Non credit
BSAG-21110	Fundamentals of Horticulture (Practical)	0	2	20	30	50	1
BSAG-21111	Fundamentals of Soil Science (Practical)	0	2	20	30	50	1
BSAG-21112	Introduction to Forestry (Practical)	0	2	20	30	50	1
BSAG-21113	Comprehension & Communication Skills in English (Practical)	0	2	20	30	50	1
BSAG-21114	Fundamentals of Agronomy (Practical)	0	2	20	30	50	1
BSAG-21115	Introductory Biology (Practical)	0	2	20	30	50	1
BSAG-21116	NSS/NCC/Physical Education and Yoga Practices			Satisfactory/Unsatisfactory			Non credit
Total		14	14	480	720	1200	19

B.Sc. (Hons) Agriculture Syllabus Batch 2021 Onwards

BSAG-21101 Fundamentals of Horticulture

Internal Marks : 40 **L T P**
External Marks : 60 **1 0 0**
Total Marks : 100

Objectives: Students will learn about the principles and methods of basic fundamental Horticultural techniques for the cultivation of fruits crops.

Unit I

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;

Unit II

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.

Suggested Books.

1. Hayes, W.P. Singh Ranjit: Fruits Growing in India,Kitabstan, Allahabad
2. Lal Girdhari&Siddappe Tandon: Preservation of Fruits & Vegetables, ICAR, New Delhi
3. NagiMalkiat: Home Preservation of Fruits & Vegetables, PAU, Ludhiana
4. Bal, J.S: Fruit Growing, Kalyani Publishers.
5. Chatopadhie, T.K.: A Text Book of Pomology (Vol.I) Kalyani Publishers
6. Jitender Singh: Horticultural Terminology. Kalyani Publishers
7. Jitender Singh: Basic Horticulture. Kalyai Publishers
8. Amar Singh: Fruit Physiology and Production. Kalyani Publishers
9. Reily. H.E.: Introductory Horticulture. Cengage Learning; 6 edition (November 1, 2000)
10. Gupta S.N.: Instant Horticulture. Jain Brothers.

BSAG-21102 Fundamentals of Soil Science

Internal Marks : 40 **L T P**
External Marks : 60 **2 0 0**
Total Marks : 100

Objectives: 1. To impart basic knowledge about soil as a natural body, padological and edaphological concepts of soil. Soil genesis, rocks, mineral and soil formation etc.
2. To improve the elementary knowledge of soil taxonomy classification and soils of India.
3. To learn about soil physical, chemical and biological properties and processes in relation to plant growth etc.

Unit I

Soil as a medium of growth, Pedological and edaphological concepts of soil; Soil genesis: soil forming rocks and minerals; weathering, processes and factors of soil formation; Soil Profile, components of soil; Soil physical properties: soil-texture, structure, density and porosity, soil colour, consistence and plasticity; Elementary knowledge of soil taxonomy, classification, soils of India; Soil water retention, movement and availability; Soil air, composition, gaseous exchange, problem and plant growth.

Unit II

Soil temperature: source, amount and flow of heat in soil; effect on plant growth, Soil reaction-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability; soil colloids-inorganic and organic; silicate clays: constitution and properties; sources of charge; ion exchange, cation exchange capacity, base saturation; soil organic matter: composition, properties and its influence on soil properties; humic substances - nature and properties; soil organisms: macro and micro organisms, their beneficial and harmful effects; Soil pollution - behaviour of pesticides and inorganic contaminants, prevention and mitigation of soil pollution.

Suggested Books

1. Biswas T.D., Mukherjee S.K. 2001. Textbook of Soil Science, Tata Mc-Graw Hill Education
2. Das D.K. 2013. Introductory Soil Science, Kalyani Publishers, Ludhiana
3. Brady N.C., Weil R.R. 2014. The Nature and Properties of Soils, 14th edition, Pearson Education
4. Sehgal Jawahar L., Introductory Pedology-Soil Genesis, Survey and Classification, 2012, Kalyani Publishers, Ludhiana
5. Metting FB. 1993. Soil Microbial Ecology – Applications in Agricultural and Environmental Management. Marcel Dekker Inc., New York.

BSAG-21103 Introduction to Forestry

Internal Marks : 40 **L T P**
External Marks : 60 **1 0 0**
Total Marks : 100

Objectives: This subject provides information about the tree measurements and benefits of agroforestry over traditional agriculture

Unit I

Introduction – definitions of basic terms related to forestry, objectives of silviculture, forest classification, salient features of Indian Forest Policies. Forest regeneration, Natural regeneration -natural regeneration from seed and vegetative parts, coppicing, pollarding, root suckers; Artificial regeneration – objectives, choice between natural and artificial regeneration, essential preliminary considerations. Crown classification. Tending operations – weeding, cleaning, thinning – mechanical, ordinary, crown and advance thinning.

Unit II

Forest mensuration – objectives, diameter measurement, instruments used in diameter measurement; measurement of volume of felled and standing trees, age determination of trees. Agroforestry – definitions, importance, criteria of selection of trees in agroforestry, different agroforestry systems prevalent in the country, shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens. Cultivation practices of two important fast growing tree species of the region. Rejuvenation of forest trees.

Suggested Books

1. Dhakad, Ashok Kumar, Forestry: At A Glance, 2016, International Book Distributors.
2. K.Manikandan, S.Parbhu, Indian forestry , 2018, Jain Brothers-New Delhi.
3. Reddy, S.R. &Nagamani, C. 2017. Introduction to Forestry. Kalyani Publishers, Ludhiana.
4. Sagwal, S.S. 2016. Introductory Forestry. Kalyani Publishers, Ludhiana.
5. GopalaswamiComplete Gardening in India, 1970, Kossali Press, Banglore.
6. Lanchastor S. Percy Gardening in India, 1977, Oxford and IDE Publishing Co., New Delhi.
7. Randhawa, M.S. Beautiful Gardens, Govt. of India Publications.
8. Randhawa, M.S. Beautiful Trees, Govt. of India Publications.
9. Sagreiya, K.P. 2013. Forests and Forestry. National Book Trust, India.

BSAG-21104 Comprehension and Communication Skills in English

Internal Marks : 40 **L T P**
External Marks : 60 **1 0 0**
Total Marks : 100

Unit I

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.

Unit II

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.

Suggested Books

1. Dhaama OP, Extension of Rural Welfare.1973, Ram Parsad and Sons, Agra.
2. Sandhu AS. Technical Writing, PAU, Ludhiaan.

BSAG-21105 Fundamentals of Agronomy

Internal Marks : 40 **L T P**
External Marks : 60 **2 0 0**
Total Marks : 100

Objectives: 1. To study about basic knowledge of tillage, crop nutrition and irrigation methods,
2. Weeds and its classification and management
3. Crop rotation and crop management techniques in problematic areas.

Unit I

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 and its measurement.

Unit II

Weeds- importance, classification, crop-weed competition, concepts of weed management; principles and methods, allelopathy. Growth and development of crops, factors affecting growth and development, plant ideotypes, crop rotation and its principles, adaptation and distribution of crops, harvesting and threshing of crops.

Suggested Books

1. Balasubramaniyan, P. and Palaniappan, S.P. 2001. Principles and Practices of Agronomy. Agrobios, Jodhpur.
2. Aldrich R.J. and Kramer R.J. 1997. Principles in Weed Management. Panima Publishing corporation, New Delhi.
3. Reddy S.R., Principles of Agronomy, Kalyani Publication.
4. Ashton F.M. & Crafts A.S. 1981. Mode of Action of Herbicides. 2nd Ed. Wiley Inter-Science, US.
5. Pearson ,Handbook of Agriculture ICAR, New Delhi.
6. Reddy. T. & Reddy S.. Principles of Agronomy,Kalyani Publication.
7. Gupta O.P. 2007. Weed Management – Principles and Practices.Agrobios.Mandal RC. 1990. Weed, Weedicides and Weed Control - Principles and Practices. Agro-Botanical Publication, Viyas Nagar, India. 8. Zimdahl R.L. 1999. Fundamentals of Weed Science. 2nd Ed. Academic Press, New York.
9. Fageria, N.K. 1992. Maximizing Crop Yields. Marcel Dekker, New York.
10. Havlin, J.L, Beaton, J.D., Tisdale, S.L. and Nelson, W.L. 2006. Soil Fertility and Fertilizers (7th Ed). Prentice Hall, New Delhi.

BSAG-21106(A) Introductory Biology

Internal Marks : 40 **L T P**
External Marks : 60 **2 0 0**
Total Marks : 100

Objectives: To provides introductory knowledge about living beings to students.

Unit I

Introduction to the living world, diversity and characteristics of life, origin of life, Evolution and Eugenics. Binomial nomenclature and classification Cell and cell division.

Unit II

Morphology of flowing plants. Seed and seed germination. Plant systematic- viz; Brassicaceae, Fabaceae and Poaceae. Role of animals in agriculture.

Suggested Books

1. Dutta C. 2000; Book of Botany. Oxford University Press: New Delhi.
2. Vidyarthi S. 2002; Text Book of Botany. S. Chand and Company: New Delhi.
3. Bhatia K.N. Widge R. 2010; Introduction of Botany, Trueman Publishers: Jalandhar.
4. Dhami, P.S. Srivastava H.N. Chopra G. Pradeep's A Textbook of Biology for Class 11 (Latest Edition).
5. Arora B.B. and Sabharwal, A. K. 2014; Moderns ABC of Biology for Class XI
6. Esau K. 1977; Anatomy of Seed Plants. John Wiley & Sons: New York
7. Fahn, A. 1990; Plant Anatomy. Pergamon Press: Oxford
8. Metcalfe, C.R. Chalk, L. 1950; Anatomy of Dicotyledons. Clarendron Press: Oxford
9. Singh S.P. Tomar B.S. 2014; Cell Biology, 10th Ed., Rastogi Publications, New Delhi
10. Saxena R.K. Saxena S. 2008; Comparative Anatomy of Vertebrates, 2nd Ed., Viva Books Publishers, New Delhi.

BSAG-21106(B) Elementary Mathematics

Internal Marks : 40 **L T P**
External Marks : 60 **2 0 0**
Total Marks : 100

Objectives: To study the basics of strait lines, circle, Differential and Integral Calculus

Unit I

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 (x1, y1) & (x2,y2), 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 $x2 + y2 = a2$.

Unit II

Differential Calculus: Definition of function, limit and continuity, Simple problems on limit, Simple problems on continuity, Differentiation of xn , ex , 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).

Integral Calculus: Integration of simple functions, Integration of Product of two functions, 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**.**

Suggested Books

1. Algebra by D. C. Kapoor & Gurbax Singh
2. Algebra by T. N. Nagpal & K. K. Gupta.
3. Comprehensive Calculus by R. S. Dehiya.
4. New Style Calculus for T. D. C. – I.
5. New Style Co-ordinator Geometry by R. K. Sondhi
6. Trignometryby Jiwan
7. Mensuration by Pic Point.

BSAG-21107 Agricultural Heritage

Internal Marks : 40 **L T P**
External Marks : 60 **1 0 0**
Total Marks : 100

Objectives: To improve knowledge of precision farming and Indian agricultural heritage of present, past and modern era through indigenous and traditional knowledge about crop production in India and world.

Unit I

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;

Unit II

Agriculture scope; Importance of agriculture and agricultural resources available in India; National agriculture setup in India; Current scenario of Indian agriculture; Indian agricultural concerns and future prospects.

Suggested Reading

1. Reddy. T. & Reddy S.. Principles of Agronomy, Kalyani Publication.
2. Pearson, Handbook of Agriculture ICAR, New Delhi.
3. D. Kumari. M. Veeral, A TEXT BOOK ON AGRICULTURAL HERITAGE OF INDIAAgrotech Publishing Academy, 2013,.
4. Utpal Giri, Md. Hedayetullah, A text book of Agricultural Heritage, Scientific Publishers, 2020.

BSAG-21108 Rural Sociology & Educational Psychology

Internal Marks : 40 **L T P**
External Marks : 60 **1 0 0**
Total Marks : 100

Objectives: The main objective of this course is to study the students about scientific and systematic manner of the Rural Society in order to help in the task of planning for the reconstruction of the rural social life and aware their educational psychology.

Unit I

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.

Unit II

Educational psychology: Meaning & its importance in agriculture extension. Behavior: Cognitive, affective, psychomotor domain, Personality, Learning, Motivation, Theories of Motivation, Intelligence.

Suggested Books

1. Akshay Ramanlal Desai,Rural Sociology in India, Popular parkashan, Bombay
2. S.L. Doshi,P.C. Jain, Rural Sociology, Rawat Publication.
3. Sushila Mehta, A Study of Rural Sociology in India, S. Chand Publications.
4. . Shyama Charan Dube. Indian village Cornell University Press.

BSAG-21109 Human Value and Ethics

Internal Marks : 40 **L T P**
External Marks : 60 **1 0 0**
Total Marks : 100

Objectives: To improve the knowledge about human values and ethics, goal and mission of life, self exploration, self satisfaction, success and spirituality.

Unit I

Values and Ethics-An Introduction. Goal and Mission of Life. Vision of Life. Principles andPhilosophy. Self Exploration. Self Awareness. Self Satisfaction. Decision Making. Motivation.Sensitivity. Success. Selfless Service.

Unit II

Case Study of Ethical Lives. Positive Spirit. Body, Mind andSoul. Attachment and Detachment. Spirituality Quotient. Examination.

Suggested books:

1. M.Govindrajan, S. Natrajan& VS Senthil Kumar 2013, Professional Ethics & Human Values. Prentis Hall India Learning Pvt. Ltd.
2. RS Nagrajan, 2017, A Text Books on Professional Ethics & Human Values, New age International Publishers.
3. AN Tripathi, 2015, Human values, New ageInternational Publishers.
4. SK Chakraborty & D. Chakraborty, 2016,Human values & Ethics: In search of organizational Integrity, Himalaya Publishing House.
5. Abhay Saxana& Sanjeev Kumar Sharma, 2015, Human Values & Professional Ethics,New age International Publishers.

BSAG-21110 Fundamentals of Horticulture (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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.

BSAG-21111 Fundamentals of Soil Science (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

Study of soil profile in field, Study of soil sampling tools, collection of representative soil sample, its processing and storage, Study of soil forming rocks and minerals, Determination of soil density, moisture content and porosity, Determination of soil texture by feel and Bouyoucos Methods, Studies of capillary rise phenomenon of water in soil column and water movement in soil, Determination of soil pH and electrical conductivity, Determination of cation exchange capacity of soil, Study of soil map, Determination of soil colour, Demonstration of heat transfer in soil, Estimation of organic matter content of soil.

BSAG-21112 Introduction to Forestry (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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

BSAG-21113 Comprehension and Communication Skills in English (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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 and extempore.

BSAG-21114 Fundamentals of Agronomy (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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 attributing 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.

BSAG-21115 Introductory Biology (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

Morphology of flowering plants – root, stem and leaf and their modifications. Inflorence, 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.

BSAG-21116 NSS / NCC / Physical Education and Yoga Practices

1. Teaching of skills of Football/basketball/kabaddi/badminton/table tennis/yoga – demonstration, practice of the skills, correction, involvement in game situation, teaching of rules of the game (For girls teaching of Tennikoit)
2. Teaching – Meaning, Scope and importance of Physical Education
3. Teaching – Definition, Type of Tournaments
4. Teaching – Physical Fitness and Health Education
5. Construction and laying out of the track and field (*The girls will have Tennikoit and Throw Ball).

Second Semester

B.Sc. (Hons) Agriculture
From Batch 2021 Onward

Semester II

Course code	**Course Title**	Load Allocation		Marks Distribution		Total	Credits
		L	P	Internal	External		
BSAG-21201	Fundamentals of Genetics	2	0	40	60	100	2
BSAG-21202	Agricultural Microbiology	1	0	40	60	100	1
BSAG-21203	Soil and Water Conservation Engineering	1	0	40	60	100	1
BSAG-21204	Fundamentals of Crop Physiology	1	0	40	60	100	1
BSAG-21205	Fundamentals of Agricultural Economics	2	0	40	60	100	2
BSAG-21206	Fundamentals of Plant Pathology	3	0	40	60	100	3
BSAG-21207	Fundamentals of Entomology	3	0	40	60	100	3
BSAG-21208	Fundamentals of Agricultural Extension Education	2	0	40	60	100	2
BSAG-21209	Communication Skills and Personality Development	1	0	40	60	100	1
BSAG-21210	Fundamentals of Genetics (Practical)	0	2	20	30	50	1
BSAG-21211	Agricultural Microbiology (Practical)	0	2	20	30	50	1
BSAG-21212	Soil and Water Conservation Engineering (Practical)	0	2	20	30	50	1
BSAG-21213	Fundamentals of Crop Physiology (Practical)	0	2	20	30	50	1
BSAG-21214	Fundamentals of Plant Pathology (Practical)	0	2	20	30	50	1
BSAG-21215	Fundamentals of Entomology (Practical)	0	2	20	30	50	1
BSAG-21116	Fundamentals of Agricultural Extension Education (Practical)	0	2	20	30	50	1
BSAG-21217	Communication Skills and Personality Development (Practical)	0	2	20	30	50	1
Total		16	16	420	780	1200	14

Semester II

BSAG-21201 Fundamentals of Genetics

Internal Marks : 40 **L T P**
External Marks : 60 **2 0 0**
Total Marks : 100

Objective: The course is aimed at imparting knowledge on the fundamental aspects of genetics and its applications, describing cell division and the functions of the genetic material, illustrating the molecular mechanisms of inheritance and gene regulation.

Unit I

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.

Unit II

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.

Suggested Books

1. Bhatia, K.N. and Neelam, Dhand. Cell Biology & Genetics. A Trueman Pub., Jallandhar.
2. Campbell, N. A. and Reece J. B. (2011). Biology. IX Edition, Pearson, Benjamin, Cummings.
3. De Roberts, E.D.P. and De Robertis, Jr. E.M.F. 2006, Cell and Molecular Biology, Lippincott Williams & Wilkins, USA.
4. Douglas, J. Futuyma (1997). Evolutionary Biology. Sinauer Associates.
5. Gardner B.J, Simmons M.J, Smusted D.P Principles of Genetics.

BSAG-21202 Agricultural Microbiology

Internal Marks : 40 **L T P**
External Marks : 60 **1 0 0**
Total Marks : 100

Objectives: To teach the study and importance of microbial population in agriculture.

Unit I

Introduction. Microbial world: Prokaryotic and eukaryotic microbes. Bacteria: cell structure, chemoautotrophy, photo autotrophy, growth. Bacterial genetics: Genetic recombination transformation, conjugation and transduction, plasmids, transposon.

Unit II

Role of microbes in soil fertility and crop production: Carbon, Nitrogen, Phosphorus and Sulphur cycles. Biological nitrogen fixation- symbiotic, associative and asymbiotic. Azolla, blue green algae and mycorrhiza. Rhizosphere and phyllosphere. Microbes in human welfare: silage production, biofertilizers, biopesticides, biofuel production and biodegradation of agro-waste.

Suggested Books

1. Pelczar , M.T. 1995; Microbiology, Tata Mc Graw Hill Publishing, New Delhi.
2. Stainer, R.Y.1995; General Microbiology, MacMillan Press, London.
3. Dubey, R.C. and Maheshwari, D.K. 2010; A text book of Microbiology, S. Chand and Company Ltd, New Delhi.
4. Darralyn M., David S., Phillip A., 2001; Introduction to Microbiology, Black Well Publication Ltd. USA. 5. Reddy N.P. Eswara, Surendra V. 2015; An Introduction to Microbiology, Kalyani Publishers, Ludhiana 6. Rao A.S. 2009; Introduction to Microbiology, Prentice Hall India
7. Rangaswami G. Bagyaraj D.J. 2014; Agricultural Microbiology, Prentice Hall India SinghR.P.2007; General Microbiology, Kalayani Publishers.

BSAG-21203 Soil and Water Conservation Engineering

Internal Marks : 40 **L T P**
External Marks : 60 **1 0 0**
Total Marks : 100

Objectives: To study the basics of conservation techniques of soil and water.

Unit I

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.

Unit II

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.

Suggested Books

1.Biswas TD & Narayanasamy G. (Eds.) 1996. Soil Management in Relation to Land Degradation and Environment. Bull. Indian Society of SoilScience No. 17.
2 Doran JW & Jones AJ. 1996. Methods of Assessing Soil Quality. Soil Science Society of America, Spl Publ. No. 49, Madison, USA.
3.Gurmal Singh, Venkataramanan C, Sastry G & Joshi BP. 1990. Manual of Soil and Water Conservation Practices. Oxford & IBH.Hudson N. 1995. Soil Conservation. Iowa State Univ. Press.
4. Indian Society of Soil Science 2002. Fundamentals of Soil Science. ISSS, New Delhi.Oswal MC. 1994. Soil Physics. Oxford & IBH.

BSAG-21204 Fundamentals of Crop Physiology

Internal Marks : 40 **L T P**
External Marks : 60 **1 0 0**
Total Marks : 100

Objectives: To study the basic metabolic activities of crop physiology such as water absorption, transpiration, photosynthesis, respiration, plant growth hormones and its importance in agriculture.

Unit I

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;

Unit II

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.

Suggested Books

1. G.R. Noggle and G.J. Fritz, 1986. Plant Physiology, Prentic Hall of India Pvt. Ltd.
2. H.N. Srivastava 2004. Plant Physiology. Pradeep's Publications, Jalandhar.
3. J.B. Salisbury and C.W. Ross 1992. Plant Physiology, Wadswar Publishing Company, Belmont,California 4. N.K. Gupta &Sunita Gupta, 2004. Plant Physiology. Oxford & IBH Publication, New Delhi
5. R.L. Agarwal, 1995. Seed Technology, Oxford & IBH Publication, New Delhi.
6. S.N. Pandey & B.K. Sinha (1995). Vikas Publishing House Pvt. Ltd., New Delhi 7. V.K. Jain 2014. Fundamental of Plant Physiology. S. Chand & Company Pvt. Ltd., New Delhi.

BSAG-21205 Fundamentals of Agricultural Economics

Internal Marks : 40 **L T P**
External Marks : 60 **2 0 0**
Total Marks : 100

Course objectives: To study the different principles of economics and its importance in agriculture

Unit I

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 behaviour. 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, 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.

Unit II

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:* concepts, short run and long run cost curves. Supply: Stock v/s supply, law of 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 socioeconomic 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, supply, general price index, inflation and deflation. Banking: Role in modern economy, types of banks, functions of commercial and central bank, credit creation policy.

Suggested Books

1. C. Eicher and L. Witt:Agriculture in Economic Development. Vora and Co., Mumbai
2. R.N. Soni: Leading Issues in Agricultural Economics. Sohan Lal Nagin Chand &Co., Jalandhar.
3. Sadhu and Singh: Fundamentals of Agricultural Economics. Himalaya Publishing House, Mumbai.

BSAG-21206 Fundamentals of Plant Pathology

Internal Marks : 40 **L T P**
External Marks : 60 **3 0 0**
Total Marks : 100

Course objectives: To study the different fungicidal, bacterial, viral and MLO's plant diseases. Its symptoms, control measures and significance in agriculture.

Unit I

Introduction: Importance of plant diseases, scope and objectives of Plant Pathology. History of Plant Pathology with special reference to Indian work. Terms and concepts in Plant Pathology. Pathogenesis. Causes/factors affecting disease development: disease triangle and tetrahedron and classification of plant diseases. Important plant pathogenic organisms, different groups**:** fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasmas, viruses, viroids, algae, protozoa, phanerogamic parasites and nematodes with examples of diseases caused by them. Diseases and symptoms due to abiotic causes. *Fungi*: general characters, definition of fungus, somatic structures, types of fungal thalli, fungal tissues, modifications of thallus, reproduction (asexual and sexual). Nomenclature, Binomial system of nomenclature, rules of nomenclature, classification of fungi. Key to divisions, sub-divisions, orders and classes.

Unit II

Bacteria and mollicutes: general morphological characters. Basic methods of classification and reproduction. *Viruses*: nature, structure, replication and transmission. Study of phanerogamic plant parasites. *Nematodes:* General morphology and reproduction, classification, symptoms and nature of damage caused by plant nematodes (*Heterodera, Meloidogyne, Anguina, Radopholus* etc.) Growth and reproduction of plant pathogens. Liberation / dispersal and survival of plant pathogens. Types of parasitism and variability in plant pathogens. Pathogenesis. Role of enzymes, toxins and growth regulators in disease development. Defense mechanism in plants**.** Epidemiology: Factors affecting disease development. Principles and methods of plant disease management. Nature, chemical combination, classification, mode of action and formulations of fungicides and antibiotics.

Suggested Books

1.Black, J.G. 1999. Microbiology – Principles and Explorations. John Wiley & Sons. Inc. Singapore.
2. Singh, R.S. 1998. Plant Diseases. Oxford IBH Publishing Co. Pvt. Ltd., New Delhi.
3. Stainer, R.Y., Ingraham, J.L., Wheelis, M.L. and Painter, P.R. 1989. General Microbiology. Macmillan.
4. Singh, R. P. 2005. Plant Pathology. Kalyani Publishers, New Delhi.
5. Mehrotra, R.S. & Aggarwal, Ashok. 2015 Plant Pathology. McGraw Hill Education (India) Private Limited.
6. Michael J. Pelczar, Jr., E.C.S. Chan, Noel R. Krieg, 2010. Microbiology. Tata McGraw Hill Education Private Limited.
7. Pandey , B.P. 1982. Plant Pathology: Pathogens and Plant disease. S. Chand Publication.

BSAG- 21207 Fundamentals of Entomology

Internal Marks : 40 **L T P**
External Marks : 60 **3 0 0**
Total Marks : 100

Course objectives: 1 Understand insect adaptation and evolutionary processes.
2 Learn the basic external morphology of insects and how it is used in classification.
3 Learn the basic internal anatomy of insects, and how it is adaptive. • Learn about different methods of pest control.
4 Understand how insects adapt behaviorally and ecologically.
5 Understand how insects affect humans medically, economically and socially.

Unit 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, secretary (Endocrine) and reproductive system, in insects. Types of reproduction in insects. Major sensory organs like simple and compound eyes, chemoreceptor. 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.

Unit II

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, Tettigonidae, 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, Papiloinidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera: Tenthridinidae, Apidae. Trichogrammatidae, lchneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae,Muscidae, Tephritidae.

BSAG-21208 Fundamentals of Agriculture Extension Education

Internal Marks : 40 **L T P**
External Marks : 60 **1 0 0**
Total Marks : 100

Course Objective: The fundamental objective of this course is to educate the students about develop the rural people economically, socially and culturally by means of education and to provide relevant education to the students in agriculture, processing and allied sciences and different developmental programmes.

Unit I

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.

Unit II

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

Suggested Books

1. Dahama, O.P., Extension of Rural Welfare, 1973, Ram Prasad and Sons, Agra.
2. Grewal, J.S. and Tamber, R.S., Introduction to Extension Education, 1970, Punjab Agricultural University, Ludhiana.
3. Rudramoorthy, B., Extension in Planned Social Change, 1964, Applied Publication, Bombay.
4. Sandhu, A.S.,Extension Programme, Planning, 1971, P.A.U., Ludhiana.

BSAG-21209 Communication Skills and Personality Development

Internal Marks : 40 **L T P**
External Marks : 60 **1 0 0**
Total Marks : 100

Unit I

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.

Unit II

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.

BSAG-21210 Fundamental of Genetics (Practical)

Internal Marks : 20 **L T P**
External Mrks : 30 **0 0 2**
Total Marks : 50

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.

BSAG-21211 Agricultural Microbiology (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

Introduction to microbiology laboratory and its equipments; Microscope- parts, principles of microscopy, resolving power and numerical aperture. Methods of sterilization. Nutritional media and their preparations. Enumeration of microbial population in soil- bacteria, fungi, actinomycetes. Methods of isolation and purification of microbial cultures. Isolation of *Rhizobium* from legume root nodule. Isolation of *Azotobacter* from soil. Isolation of *Azospirillum* from roots. Isolation of BGA. Staining and microscopic examination of microbes.

BSAG-21212 Soil and Water Conservation Engineering (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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.

BSAG-21213 Fundamentals of Crop Physiology (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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).

BSAG-21214 Fundamentals of Plant Pathology (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

Acquaintance with various laboratory equipments and microscopy. Collection and preservation of disease specimen. Preparation of media, isolation and Koch's postulates. General study of different structures of fungi. Study of symptoms of various plant diseases. Study of representative fungal genera. Staining and identification of plant pathogenic bacteria. Transmission of plant viruses. Study of phanerogamic plant parasites. Study of morphological features and identification of plant parasitic nematodes. Sampling and extraction of nematodes from soil and plant material, preparation of nematode mounting.

BSAG-21215 Fundamentals of Entomology (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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.

BSAG-21216 Fundamentals of Agricultural Extension Education (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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.

BSAG-21217 Communication Skills and Personality Development (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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.

Third Semester

B.Sc. (Hons) Agriculture
From Batch 2021 Onward

Semester III

Course code	**Course Title**	Load Allocation		Marks Distribution		Total	Credits
		L	P	Internal	External		
BSAG-21301	Crop Production Technology – I (Kharif Crops)	1	0	40	60	100	1
BSAG-21302	Fundamentals of Plant Breeding	2	0	40	60	100	2
BSAG-21303	Agricultural Finance and Cooperation	2	0	40	60	100	2
BSAG-21304	Agri- Informatics	2	0	40	60	100	2
BSAG-21305	Farm Machinery and Power	1	0	40	60	100	1
BSAG-21306	Production Technology for Vegetables and Spices	2	0	40	60	100	2
BSAG-21307	Environmental Studies and Disaster Management	3	0	40	60	100	3
BSAG-21308	Statistical Methods	1	0	40	60	100	1
BSAG-21309	Livestock and Poultry Management	2	0	40	60	100	2
BSAG-21310	Crop Production Technology – I (Kharif Crops) (Practical)	0	2	20	30	50	1
BSAG-21311	Fundamentals of Plant Breeding (Practical)	0	2	20	30	50	1
BSAG-21312	Agricultural Finance and Cooperation (Practical)	0	2	20	30	50	1
BSAG-21313	Agri- Informatics (Practical)	0	2	20	30	50	1
BSAG-21314	Farm Machinery and Power (Practical)	0	2	20	30	50	1
BSAG-21315	Production Technology for Vegetables and Spices (Practical)	0	2	20	30	50	1
BSAG-21316	Environmental Studies and Disaster Management (Practical)	0	2	20	30	50	1
BSAG-21317	Statistical Methods (Practical)	0	2	20	30	50	1
BSAG-21318	Livestock and Poultry Management (Practical)	0	2	20	30	50	
Total		14	18	540	810	1350	25

BSAG-21301 Crop Production Technology – I (Kharif Crops)

Internal Marks : 40 **L T P**
External Marks : 60 **1 0 0**
Total Marks : 100

Course Objectives: Students will learn about intensive cropping system of kharif crop and integrated farming system.

Unit I

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Kharif crops; Cereals – rice, maize and sorghum;, Pulses - pigeonpea, mungbean, urdbean and soybean.

Unit II

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Kharif crops; Oilseeds- groundnut; Fibre crops- cotton & jute; Forage crops-sorghum, cowpea, cluster bean and napier.

Suggested books

1. Handbook of agriculture – ICAR
2. Package of practices for kharif crops- PAU
3. Text book of field crop production- food grains – ICAR
4. Text book of field crop production – commercial crops - ICAR

BSAG-21302 Fundamentals of Plant Breeding

Internal Marks : 40 **L T P**
External Marks : 60 **2 0 0**
Total Marks : 100

Course Objective: Plant breeding help increasing food production by making students familiar with mineral deficiency and control pest crops.

Unit I

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-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;

Unit II

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.

Suggested books

1. Plant Breeding Principles and Methods by B. D. Singh – Kalyani publishers
2. Principles and Practices Plant Breeding by J. R. Sharma - McGraw Hill Publishing company Limited
3. Introduction to Plant Breeding by R. C. Choudhary- Oxford and IBH. Publishing Company

BSAG-21303 Agricultural Finance and Cooperation

Internal Marks : 40 **L T P**
External Marks : 60 **2 0 0**
Total Marks : 100

Course Objective: Students learn about agriculture credit system and their benefits in agriculture.

Unit I

Agricultural Finance- meaning, scope and significance; Credit needs and its role in Indian agriculture. Agricultural credit: meaning, definition, need and its classifications. 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 developments in agricultural credit.

Unit II

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.

Suggested books

1. Cooperation in India- .F. Banerjee
2. Agricultural Economics by Joginder Singh – Kalyani publishers
3. All-India Rural Credit Survey Review Committee Report – RBI
4. All India Debt and Investment Survey, various issus, NSSO

BSAG-21304 Agri- Informatics

Internal Marks : 40 **L T P**
External Marks : 60 **2 0 0**
Total Marks : 100

Course objective : Agri Informatics help students to understand weather data analysis with the help of MS office and other climate predictions

Unit I

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.

Unit II

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.

Suggested books

Extension communication and Management – G.I. Ray
Education and Communication for Development – O.P.Dharma and O.P.Bhatnagar
Extension Education – Ranjit Singh

BSAG-21305 Farm Machinery and Power

Internal Marks : 40 **L T P**
External Marks : 60 **1 0 0**
Total Marks : 100

Course Objectives: In this subject students learn the latest farm equipments and their working in related to different agriculture process.

Unit I

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,

Unit II

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.

Suggested books

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

BSAG-21306 Production Technology for Vegetables and Spices

Internal Marks : 40 **L T P**
External Marks : 60 **2 0 0**
Total Marks : 100

Course objectives: In this subject students are familiar with production technique of vegetable and spices crops.

Unit I

Importance of vegetables & spices in human nutrition and national economy, kitchen gardening, classification of vegetable crops, Origin, area, climate, soil, improved varieties and cultivation practices such as time of 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;

Unit II

Origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders, of important vegetable and spices Bulb crops such as Onion, Garlic; Root crops such as Carrot, Radish, Beetroot; Tuber crops such as Potato; Leafy vegetables such as Amaranth, Palak. Perennial vegetables).

Suggested Books

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

BSAG-21307 Environmental Studies and Disaster Management

Internal Marks : 40 **L T P**
External Marks : 60 **3 0 0**
Total Marks : 100

Course objective: In this subject students are familiar with nature and ecosystem

Unit I

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 nonrenewable 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)

Unit II

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

Suggested books

1. Changing Scenario of Punjab Agriculture-An Ecological Perspective- Joginder Singh, G.S.Dhaliwal & N.S.Randhawa CRRID Nov.1997.
2. Environmental Hazards and Disasters: Contexts, Perspectives and Management -Bimal Kanti Paul John Wiley & Sons .
3. Disaster Management and Risk Reduction: Role of Environmental Knowledge - Anil K. Gupta, Sreeja S. Nair, Sandhya Chatterji, Narosa Publishing House

BSAG-21308 Statistical Methods

Internal Marks : 40 **L T P**
External Marks : 60 **1 0 0**
Total Marks : 100

Course Objectives: In this subjects students learn about agriculture data statistics and its methods of calculation.

Unit I

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

Unit II

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.

Suggested books

1. Statistical methods for agricultural workers- R.S. Chandel
2. Research Methodology – C R Kothari and Gaurav Garg

BSAG-21309 Livestock and Poultry Management

Internal Marks : 40 **L T P**
External Marks : 60 **2 0 0**
Total Marks : 100

Course objectives : Students are learn about basics of animal husbandry and their rearing techniques.

Unit I

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.

Unit II

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.

Suggested books

1. A textbook of Animal Husbandry- G.C. Banerjee
2. Dairy Bovine Production – C.K.Thomas and NSR Shastry
3. Livestock Production Management – CK Thomas and NSR Shastry
4. Handbook of Animal Husbandry – ICAR Publication
5. Poultry Production Management- R A Singh

BSAG-21310 Crop Production Technology – I (Kharif Crops) (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

Rice nursery preparation and, transplanting, 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.

BSAG-21311 Fundamentals of Plant Breeding (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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. 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.

BSAG-21312 Agricultural Finance and Cooperation (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

Determination of most profitable level of capital use. Optimum allocation of limited amount of capital among different enterprises. 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.

BSAG-21313 Agri- Informatics (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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.

BSAG-21314 Farm Machinery and Power (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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 Familiarization with different intercultivation equipment, Familiarization with harvesting and threshing machinery.

BSAG-21315 Production Technology for Vegetables and Spices (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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.

BSAG-21316 Environmental Studies and Disaster Management (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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.

BSAG-21317 Statistical Methods (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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

BSAG-21318 Livestock and Poultry Management (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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.

Fourth Semester

B.Sc. (Hons) Agriculture
From Batch 2021 Onward

Semester IV

Course code	Course Title	Load Allocation		Marks Distribution		Total	Credits
		L	P	Internal	External		
BSAG-21401	Crop Production Technology –II (Rabi Crops)	1	0	40	60	100	1
BSAG-21402	Production Technology for Ornamental Crops, MAP and Landscaping	1	0	40	60	100	1
BSAG-21403	Renewable Energy and Green Technology	1	0	40	60	100	1
BSAG-21404	Problematic Soils and their Management	2	0	40	60	100	2
BSAG-21405	Production Technology for Fruit and Plantation Crops	1	0	40	60	100	1
BSAG-21406	Principles of Seed Technology	1	0	40	60	100	1
BSAG-21407	Farming System & Sustainable Agriculture	1	0	40	60	100	1
BSAG-21408	Agricultural Marketing Trade & Prices	2	0	40	60	100	2
BSAG-21409	Introductory Agro-meteorology & Climate Change	1	0	40	60	100	1
BSAG-21XXX	Elective Course-I*	2	0	40	60	100	2
BSAG-21410	Crop Production Technology –II (Rabi Crops) (Practical)	0	2	20	30	50	1
BSAG-21411	Production Technology for Ornamental Crops, MAP and Landscaping (Practical)	0	2	20	30	50	1
BSAG-21412	Renewable Energy and Green Technology (Practical)	0	2	20	30	50	1
BSAG-21413	Production Technology for Fruit and Plantation Crops (Practical)	0	2	20	30	50	1
BSAG-21414	Principles of Seed Technology (Practical)	0	2	20	30	50	1
BSAG-21415	Agricultural Marketing Trade & Prices (Practical)	0	2	20	30	50	1
BSAG-21416	Introductory Agro-meteorology & Climate Change (Practical)	0	2	20	30	50	1
BSAG-21XXX	Elective Course-I (Practical)*	0	2	20	30	50	1
Total		13	18	560	840	1400	22

BSAG-21401 Crop Production Technology –II (Rabi Crops)

Internal Marks : 40 **L T P**
External Marks : 60 **1 0 0**
Total Marks : 100

Course objectives: In this subject students learn about various field crops and their cultivation.

Unit I

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-rapeseed, mustard and sunflower;

Unit II

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

Suggested Books

1. Handbook of agriculture – ICAR
2. Package of practices for kharif crops- PAU
3. Text book of field crop production- food grains – ICAR
4. Text book of field crop production – commercial crops - ICAR

BSAG-21402 Production Technology for Ornamental Crops, MAP and Landscaping

Internal Marks : 40 **L T P**
External Marks : 60 **1 0 0**
Total Marks : 100

Course objectives : Students are learn about basics of ornamental plants and their cultivation practices.

Unit I

Importance and scope of ornamental crops, medicinal and aromatic plants (MAP) and landscaping. Principles of landscaping. Landscape uses of trees, shrubs and climbers. Production technology of important cut flowers like rose, gerbera, carnation, lilium and orchids under protected conditions and gladiolus, tuberose, chrysanthemum under open conditions.

Unit II

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, basil, rose, geranium, vetiver. Processing and value addition in ornamental crops and MAPs produce.

Suggested Books

1. Chadha KL. 2001. Handbook of Horticulture.
2. Arora JS. Introductory Horticulture, Kalyani Publisahers.
3. Arora JS. Cut flowers, Kalyani Publisahers.
4. Bal JS. Introductory Floriculure, Kalyani Publisahers.

BSAG-21403 Renewable Energy and Green Technology

Internal Marks : 40 **L T P**
External Marks : 60 **1 0 0**
Total Marks : 100

Course objectives : Students are learn about basics of solar energy and other artificial sources

Unit I

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, bio-alcohol, bio-diesel and bio-oil production and their utilization as bioenergy resource, introduction of solar energy, collection and their application,

Unit II

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.

Suggested books

1.Robert P. Morgan, Larry J. Icerman Renewable Resource Utilization for Elsevier, 22-Oct-2013 -
Business & Economics - 424 pages.
2. Pravin Chandra Trivedi, Niranjan Sharma Plant Resource Utilization and Conservation Pointer Publishers, 01-Oct-2010 - Botany, Economic - 390 pages.
3. Prasenjit Mondal, Ajay K. Dalai Sustainable Utilization of Natural Resource
https://books.google.co.in/books?isbn=1498761844

BSAG-21404 Problematic Soils and their Management

Internal Marks : 40 **L T P**
External Marks : 60 **2 0 0**
Total Marks : 100

Course Objectives: 1. To impart basic knowledge about soil as a natural body, padological and edaphological concepts of soil. Soil genesis, rocks, mineral and soil formation etc.
2. To improve the elementary knowledge of soil taxonomy classification and soils of India.
3. To learn about soil physical, chemical and biological properties and processes in relation to plant growth etc.

Unit I

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.

Unit II

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 (MPT): bio-remediation through MPTs of soils, land capability and classification, land suitability classification. Problematic soils under different Agro-ecosystems.

Suggested Books

1.Biswas TD & Narayanasamy G. (Eds.) 1996. Soil Management in Relation to Land Degradation and Environment. Bull. Indian Society of SoilScience No. 17.

2 Doran JW & Jones AJ. 1996. Methods of Assessing Soil Quality. Soil Science Society of America, Spl Publ. No. 49, Madison, USA.

3.Gurmal Singh, Venkataramanan C, Sastry G & Joshi BP. 1990. Manual of Soil and Water Conservation Practices. Oxford & IBH.Hudson N. 1995. Soil Conservation. Iowa State Univ. Press.

4. Indian Society of Soil Science 2002. Fundamentals of Soil Science. ISSS, New Delhi.Oswal MC. 1994. Soil Physics. Oxford & IBH.

BSAG-21405 Production Technology for Fruit and Plantation Crops

Internal Marks : 40 **L T P**
External Marks : 60 **1 0 0**
Total Marks : 100

Objectives: Students familiar with cultivation practices of fruit and plantation.

Unit I

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

Unit II

Importance and scope of fruit and plantation crop industry in India; Importance of rootstocks; Production technologies for the cultivation of major fruits- minor fruits- date, ber, pineapple, pomegranate, jackfruit, strawberry, plantation crops- tea and coffee.

Suggested books

1. Chadha KL. 2001. Handbook of Horticulture.
2. Arora JS. Introductory Horticulture, Kalyani Publisahers.
3. Arora JS. Cut flowers, Kalyani Publisahers.
4. Bal JS. Introductory Floriculure, Kalyani Publisahers.

BSAG-21406 Principles of Seed Technology

Internal Marks : 40 **L T P**
External Marks : 60 **1 0 0**
Total Marks : 100

Unit I

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.

Unit II

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.

Suggested books

1. Chadha KL. 2001.Seed science.
2. Arora JS. Seed technology of field crops.
3. Arora JS. Cut flowers, Kalyani Publisahers.
4. Bal JS. Introductory Floriculure, Kalyani Publisahers.

BSAG-21407 Farming System & Sustainable Agriculture

Internal Marks : 40 **L T P**
External Marks : 60 **1 0 0**
Total Marks : 100

Unit I

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

Unit II

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.

Suggested Books

1.Biswas TD & Narayanasamy G. (Eds.) 1996. Soil Management in Relation to Land Degradation and Environment. Bull. Indian Society of SoilScience No. 17.

2 Doran JW & Jones AJ. 1996. Methods of Assessing Soil Quality. Soil Science Society of America, Spl Publ. No. 49, Madison, USA.

3.Gurmal Singh, Venkataramanan C, Sastry G & Joshi BP. 1990. Manual of Soil and Water Conservation Practices. Oxford & IBH.Hudson N. 1995. Soil Conservation. Iowa State Univ. Press.

4. Indian Society of Soil Science 2002. Fundamentals of Soil Science. ISSS, New Delhi.Oswal MC. 1994. Soil Physics. Oxford & IBH.

BSAG-21408Agricultural Marketing Trade & Prices

Internal Marks : 40 **L T P**
External Marks : 60 **1 0 0**
Total Marks : 100

Unit I

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:

Unit II

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.

Suggested Books

1. C. Eicher and L. Witt:Agriculture in Economic Development. Vora and Co., Mumbai
2. R.N. Soni: Leading Issues in Agricultural Economics. Sohan Lal Nagin Chand &Co., Jalandhar.
3. Sadhu and Singh: Fundamentals of Agricultural Economics. Himalaya Publishing House, Mumbai.

BSAG-21409 Introductory Agro-meteorology & Climate Change

Internal Marks : 40 **L T P**
External Marks : 60 **1 0 0**
Total Marks : 100

Unit I

Meaning and scope of agricultural meteorology; Earth atmosphere- its composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze; 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;

Unit II

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.

Suggested Books

1. C. Eicher and L. Witt:Agriculture in Economic Development. Vora and Co., Mumbai
2. R.N. Soni: Leading Issues in Agricultural Economics. Sohan Lal Nagin Chand &Co., Jalandhar.
3. Sadhu and Singh: Fundamentals of Agricultural Economics. Himalaya Publishing House, Mumbai.
4. Koppen. Fundamentals of Agronomy.
5. Agronomy of Field crops RR Reddy.

BSAG-21410 Crop Production Technology –II (Rabi Crops) (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

Sowing methods of wheat, gram, rapeseed, mustard, berseem 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 experiments of rabi crops at experimental farms. Study of rabi forage experiments, oil extraction of medicinal crops, visit to research stations of related crops.

BSAG-21411 Production Technology for Ornamental Crops, MAP and Landscaping (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

Identification of Ornamental plants. Identification of Medicinal and Aromatic Plants (MAP). 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.

BSAG-21412 Renewable Energy and Green Technology (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

Familiarization with renewable energy gadgets and solar 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. 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.

BSAG-21413 Production Technology for Fruit and Plantation Crops (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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.

BSAG-21414 Principles of Seed Technology (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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: potato, tomato, chilli, onion, muskmelon, okra, carrot, cauliflower. 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.

BSAG-21415 Agricultural Marketing Trade & Prices (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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.

BSAG-21416 Introductory Agro-meteorology & Climate Change (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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 wind rose. Measurement, tabulation and analysis of rain. Measurement of open pan evaporation and evapotranspiration. Computation of PET and AET.

Fifth Semester

B.Sc. (Hons) Agriculture
From Batch 2021 Onward

Semester V

Course code	Course Title	Load Allocation		Marks Distribution		Total	Credits
		L	P	Internal	External		
BSAG-21501	Principles of Integrated Pest and Disease Management	2	0	40	60	100	2
BSAG-21502	Manures, Fertilizers and Soil Fertility Management	2	0	40	60	100	2
BSAG-21503	Pests of Crops, Stored Grains and their Management	2	0	40	60	100	2
BSAG-21504	Diseases of Field and Horticultural Crops and their Management -I	2	0	40	60	100	2
BSAG-21505	Crop Improvement-I (Kharif Crops)	1	0	40	60	100	1
BSAG-21506	Entrepreneurship Development and Business Communication	1	0	40	60	100	1
BSAG-21507	Geo-informatics, Nano-technology and Precision Farming	1	0	40	60	100	1
BSAG-21508	Intellectual Property Rights	1	0	40	60	100	1
BSAG-21509	Elective Course-II*	2	0	40	60	100	2
BSAG-21XXX	Principles of Integrated Pest and Disease Management (Practical)	0	0	40	60	100	1
BSAG-21510	Manures, Fertilizers and Soil Fertility Management (Practical)	0	2	20	30	50	1
BSAG-21511	Pests of Crops, Stored Grains and their Management (Practical)	0	2	20	30	50	1
BSAG-21512	Diseases of Field and Horticultural Crops and their Management -I (Practical)	0	2	20	30	50	1
BSAG-21513	Crop Improvement-I (Kharif Crops) (Practical)	0	2	20	30	50	1
BSAG-21514	Entrepreneurship Development and Business Communication (Practical)	0	2	20	30	50	1
BSAG-21515	Geo-informatics, Nano-technology and Precision Farming (Practical)	0	2	20	30	50	1
BSAG-21516	Practical Crop Production – I (Kharif crops) (Practical)	0	4	20	30	50	2
BSAG-21XXX	Elective Course-II (Practical)*	0	2	20	30	50	1
Total		14	20	540	810	1350	23

BSAG-21501 Principles of Integrated Pest and Disease Management

Internal Marks : 40 **L T P**
External Marks : 60 **2 0 0**
Total Marks : 100

Course objectives: Train students to about IPM activities in crops to control pests.

Unit I

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.

Unit II

Introduction to conventional pesticides for the insect pests and disease management. Surveillance and forecasting of Insect pest and diseases. Implementation and impact of IPM (IPM module for Insect pest and disease. Safety issues in pesticide use. Political, social and legal implication of IPM. Case histories of important IPM programmes. Case histories of important IPM programmes.

Suggested Books

1. Alexopoulus, C.J., Mims, C.W. and Blackwell, M. 1996. *Introductory Mycology*. John Willey & Sons.Inc., Singapore.
2. Black, J.G. 1999. *Microbiology – Principles and Explorations*. John Wiley & Sons. Inc. ingapore.
3. Singh, R.S. 1998. *Plant Diseases*. Oxford IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Stainer, R.Y., Ingraham, J.L., Wheelis, M.L. and Painter, P.R. 1989. *General Microbiology*.

BSAG-21502 Manures, Fertilizers and Soil Fertility Management

Internal Marks : 40 **L T P**
External Marks : 60 **2 0 0**
Total Marks : 100

Course objectives: To study students about soil health and fertility management.

Unit I

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 (FCO), 1982.

Unit II

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 macro 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.

Suggested Books

1. PC, Das 1976. Manures and fertilizers. Kalyani Publishers, New Delhi.
2. SS, Shinda . Soil fertility and Management. Kalyani Publishers, New Delhi

BSAG-21503 Pests of Crops, Stored Grains and their Management

Internal Marks : 40 **L T P**
External Marks : 60 **2 0 0**
Total Marks : 100

Course objectives: To study about various pest in stored grain crops and there management.

Unit I

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 crops, vegetable crops, fruit crops, plantation crops, ornamental crops, spices and condiments.

Unit II

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

Suggested Books

1Mathur and Upadhaya. A text book iof Entomology.Aman Publishers House Meerut.
Srivastava, K.P. & Dhaliwal, G.S. (2011), A textbook of Applied Entomology, Vol.-II, Kalyani Publishers,
India
2. Dhaliwal, G.S. (2015), Elements of Agricultural Entomology, Kalyani Publishers, India
3. Pedigo, L.P. (2002). Entomology and Pest Management, Prentice Hall.
4. Tembhare, D.B. (2009). Modern Entomology. Himalaya Publication House.
5. Atwal, A.S. and Dhaliwal, G.S. (2009). Agricultural Pests of South Asia their Management, Kalyani

BSAG-21504 Diseases of Field and Horticultural Crops and their Management –I

Internal Marks : 40 **L T P**
External Marks : 60 **2 0 0**
Total Marks : 100

Unit I

Symptoms, etiology, disease cycle and management of major diseases of following crops.
Field Crops: Rice: blast, brown spot, bacterial blight, sheath blight, false smut, 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;

Unit II

Symptoms, etiology, disease cycle and management of major diseases of following crops.
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.

Suggested Books

1.Singh, R. P. 2005. *Plant Pathology*. Kalyani Publishers, New Delhi.
2. Murray. T. D, Parry. D. W. and N. D. Cattlin, *handbook* of *diseases of small grain cereal crops*. 16cm × 24 cm. 142 pp. London, UK: Manson Publishing 1998. ISBN 1-874545-39-1.
3. Hardcover – 2014 by Kalita M.K. *Diseases of Field Crops and their Management.*
4. Hriday Chaube and V. S. Pundhir 2006. *Crop diseases and their management*.
5. Singh, R.S. 1998. *Plant Diseases*. Oxford IBH Publishing Co. Pvt. Ltd., New Delhi.
6. Stainer, R.Y., Ingraham, J.L., Wheelis, M.L. and Painter, P.R. 1989. *General Microbiology*. Macmillan.
7. Mehrotra, R.S. & Aggarwal, Ashok. 2015 *Plant Pathology.* McGraw Hill Education (India) PrivateLimited.
8. Michael J. Pelczar, Jr., E.C.S. Chan, Noel R. Krieg, 2010. *Microbiology*. Tata McGraw Hill EducationPrivate Limited.
9. Pandey , B.P. 1982. *Plant Pathology: Pathogens and Plant disease.* S. Chand Publication.

BSAG-21505 Crop Improvement-I (Kharif Crops)

Internal Marks : 40 **L T P**
External Marks : 60 **2 0 0**
Total Marks : 100

Course objective: To study in details crop improvement of crops for yield and quality**.**

Unit I

Centers of origin, distribution of species, wild relatives of different cash crops of cereals, pulses, oilseeds, fibres, fodders, vegetable and horticultural crops; Plant genetic resources, its utilization and conservation, study of genetics of qualitative and quantitative characters; Important concepts in breeding of self-pollinated, cross-pollinated and vegetatively propagated crops;

Unit II

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 Pigeon pea, etc. Ideotype concept and climate resilient crop varieties for future.

Suggested Books

1. Chahal G.S and Gosal S.S. 2002. Principles and procedure of Plant Breeding Biotechnological andconventional approaches. Alpha Science International Publisher.
2. Hayes, H. K., Immar, F. R. and Smith, D.C. 1955. Methods of Plant Breeding. 2ed. McGraw-Hill, Publisher.
3. Poehlman, J.M. and Borthakur, D. 1969. Breeding Asian Field crops with special reference to cropsin India. Oxford and IBH Publishing.
4. Singh B.D. 1999. A Text book of Plant Breeding. Kalyani Publishers.
5. Singh B.D. 2016. Plant Breeding- Principles and Methods. Kalyani Publishers / Lyall Book.
6. Singh Phundan. 2008. Essentials of Plant Breeding. Kalyani Publishers.
7. Yadav, R. K. and Krishna, R. 2016. Experimental Science of Genetics and Plant Breeding. Kalyani Publishers / Lyall Book Depot.

BSAG-21506 Entrepreneurship Development and Business Communication

Internal Marks : 40 **L T P**
External Marks : 60 **2 0 0**
Total Marks : 100

Course objective: To introduce new concepts of Entrepreneurship Development and agri business management strategies.

Unit I

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/ Agri-enterprises, Entrepreneurial Development Process; Business Leadership Skills;

Unit II

Developing organizational skills (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.

Suggested books

1. Fundamentals of Agribuisness management by Shoji Lal Bairaw, Kalyani Publishers
2. Enterprenurship Development By VC Pandey.

BSAG-21507 Geo-informatics, Nano-technology and Precision Farming

Internal Marks : 40 **L T P**
External Marks : 60 **2 0 0**
Total Marks : 100

Course Objective : To emphasize on the importance of conservation and Precision farming

Unit I

Precision agriculture: concepts and techniques; issues and concerns for Indian agriculture. Geo-informatics- definition, concepts, tool and techniques; their use in Precision Agriculture. Crop differentiation, Yield monitoring, soil mapping, fertilizer recommendation using geospatial technologies; Spatial data and their management in GIS; Remote sensing concepts and application in agriculture; Image processing and interpretation;

Unit II

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.

Suggested Books

1. Handbook of agriculture – ICAR
2. Package of practices for kharif crops- PAU
3. Text book of field crop production- food grains – ICAR
4. Text book of field crop production – commercial crops - ICAR

BSAG-21508 Intellectual Property Rights

Internal Marks : 40 **L T P**
External Marks : 60 **2 0 0**
Total Marks : 100

Course objective: The main objective of this course is to equip students and stakeholders with knowledge of IPR related to protection system, their significance and use of IPR as a tool for wealth and value creation in a knowledge based economy.

Unit I

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.

Unit II

Origin, history and features of 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.

Suggested Books

1. Erbisch FH and Maredia K.1998. Intellectual Property Rights in Agricultural Biotechnology. CABI.
2. Intellectual Property Rights: key to New Wealth Generation. 2001 NRCCS& Asthectic Technologies.
3. KK Reddy. Intellectual Property Rights. Kalyani Publishers, New Delhi.

BSAG-21509 Principles of Integrated Pest and Disease Management (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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 etc. Identification and nature of damage of important insect pests and diseases and their management. Crop (agroecosystem) dynamics of a selected insect pest and diseases. Development and validation of IPM module (paddy and cotton). Crop monitoring attacked by insect, pest and diseases. Awareness campaign at farmers fields.

BSAG-21510 Manures, Fertilizers and Soil Fertility Management (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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.

BSAG-21511 Pests of crops, stored grains and their management (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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. 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

BSAG-21512 Diseases of Field, Horticultural Crops and their Management -I (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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.

BSAG-21513 Crop Improvement-I (Kharif Crops) (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

Floral biology, emasculation and hybridization techniques in different crop species; viz., Rice, Jute, Maize, Sorghum, Pearl millet, Ragi, Pigeon pea, Urd bean, Mung bean, Soybean, Groundnut, Sesame, Castor, Cotton, Cowpea, Brinjal, Okra and Cucurbits. Maintenance breeding of different kharif crops. 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 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.

BSAG-21514 Entrepreneurship Development and Business Communication (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

Visit to entrepreneurship development institute and entrepreneurs. 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.

BSAG-21515 Geo-informatics, Nano-technology and Precision Farming (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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.

BSAG-21516 Practical Crop Production – I (Kharif crops) (Practical)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

Crop planning, raising field crops in multiple cropping systems: Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management. Management of insect-pests and diseases of crops. Harvesting, threshing, drying, winnowing, storage and marketing of produce. Preparation of balance sheet for computation of cost-benefit ratio (C:B) including cost of cultivation, total cost and gross returns.

Sixth Semester

B.Sc. (Hons) Agriculture
From Batch 2021 Onward

Semester VI

Course code	Course Title	Load Allocation		Marks Distribution		Total	Credits
		L	P	Internal	External		
BSAG-21601	Rainfed Agriculture and Watershed Management	2	0	40	60	100	2
BSAG-21602	Protected cultivation and Secondary agriculture	2	0	40	60	100	2
BSAG-21603	Diseases of Field and Horticultural Crops and their Management –I	2	0	40	60	100	2
BSAG-21604	Post harvest Management and value Addition of Fruits and Vegetables	2	0	40	60	100	2
BSAG-21605	Management of Benefical Insects	1	0	40	60	100	1
BSAG-21606	Crop Improvement-II (Rabi Crops)	2	0	40	60	100	2
BSAG-21607	Principles of Organic Farming	1	0	40	60	100	1
BSAG-21608	Farm Management, Production and Resource Economics	2	0	40	60	100	2
BSAG-21609	Principles of Food Science and Nutrition	2	0	40	60	100	2
BSAG-21XXX	Elective Course III	2	0	40	60	100	2
BSAG-21610	Rainfed Agriculture and Watershed Management (Practical)	0	2	20	30	50	1
BSAG-21611	Protected cultivation and Secondary agriculture (Practical)	0	2	20	30	50	1
BSAG-21612	Diseases of Field and Horticultural Crops and their Management –I ((Practical)	0	2	20	30	50	1
BSAG-21613	Post harvest Management and value Addition of Fruits and Vegetables (Practical)	0	2	20	30	50	1
BSAG-21614	Management of Benefical Insects(Practical)	0	2	20	30	50	1
BSAG-21615	Crop Improvement-II (Rabi Crops) (Practical)	0	2	20	30	50	1
BSAG-21616	Principles of Organic Farming (Practical)	0	2	20	30	50	1
BSAG-21617	Farm Management, Production and Resource Economics (Practical)	0	2	20	30	50	1
BSAG-21618	Crop Production –II (Rabi Crops) Practicalk	0	4	20	30	50	2
BSAG-21619	Elective Course III (Practical)	0	2	20	30	50	1
Total		18	20	620	930	1550	29

BSAG-21601 Rainfed Agriculture and Watershed Management

Internal Marks : 40 **L T P**
External Marks : 60 **2 0 0**
Total Marks : 100

Course Objectives: To introduce water harvesting and rainfed agriculture techniques to students and suitable crops for rainfed agriculture

Unit I

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;

Unit II

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.

Suggested Books

1. Hansen, V.E., Israelsen, O.W., and Stringham, G.E. 1979. *Irrigation Principles and Practices* (4thEd.). John Wiley and Sons, New York
2. Lenka D.1999. *Irrigation and Drainage*. Kalyani publishing House, Ludhiana.
3. Michael, A.M. 1978. *Irrigation: Theory and Practice*. Vikas Publishing House, New Delhi.
4. Mishra.R.D. and Ahamed, M.1993. *Manual of Irrigation Agronomy*. Oxford and IBH Publishing Co., New Delhi
5. Paliwal, K.V. 1972. *Irrigation with Saline Water*. WTC, IARI, New Delhi.
6. Panda, S. C. 2003. *Principles and Practices of Water Management*. Agrobios, Jodhpur.
7. Prihar, S. S. and Sandhu.B.S.1987. *Irrigation of Field Crop*s - Principles and practices, ICAR, New Delhi.
8. Sankara Reddi, G.H. and Yellamanda Reddy, T. 2003 *Efficient Use of Irrigation Water.* Kalyani , Ludhiana.
9. Singh, P. and Maliwal, P. L. 2005. *Technologies for Food Security and Sustainable Agriculture*. Agrotech Publishing Academy, Udaipur.

BSAG-21602 Protected cultivation and Secondary agriculture

Internal Marks : 40 **L T P**
External Marks : 60 **2 0 0**
Total Marks : 100

Course Objectives: To impact of growing vegetable and fruit crops under protected environmental conditions.

Unit I

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.

Unit II

Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT 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.

Suggested Books

1.Chandra S and Som V. 2000. Cultivating Vegetables in Greenhouse. Indian Horticulture.
2. Tiwari GN.2003. Green House Technology for Controlled environment. Narosa Publication House**.**
3. Peter Kv.2003. Green House Technology. Kalyani Publishers**.**

BSAG-21603 Diseases of Field and Horticultural Crops and their Management –I

Internal Marks : 40 **L T P**
External Marks : 60 **2 0 0**
Total Marks : 100

Course Objectives: To educate students about various crops diseases and their life cycles**.**

Unit I

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.

Unit II

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.

Suggested Books

1.Singh, R. P. 2005. *Plant Pathology*. Kalyani Publishers, New Delhi.
2. Murray. T. D, Parry. D. W. and N. D. Cattlin, *handbook* of *diseases of small grain cereal crops*. 16cm × 24 cm. 142 pp. London, UK: Manson Publishing 1998. ISBN 1-874545-39-1.
3. Hardcover – 2014 by Kalita M.K. *Diseases of Field Crops and their Management.*
4. Hriday Chaube and V. S. Pundhir 2006. *Crop diseases and their management*.
5. Singh, R.S. 1998. *Plant Diseases*. Oxford IBH Publishing Co. Pvt. Ltd., New Delhi.
6. Stainer, R.Y., Ingraham, J.L., Wheelis, M.L. and Painter, P.R. 1989. *General Microbiology*. Macmillan.
7. Mehrotra, R.S. & Aggarwal, Ashok. 2015 *Plant Pathology.* McGraw Hill Education (India) PrivateLimited.
8. Michael J. Pelczar, Jr., E.C.S. Chan, Noel R. Krieg, 2010. *Microbiology*. Tata McGraw Hill EducationPrivate Limited.
9. Pandey , B.P. 1982. *Plant Pathology: Pathogens and Plant disease.* S. Chand Publication.

BSAG-21604 Post harvest Management and value Addition of Fruits and Vegetables

Internal Marks : 40 **L T P**
External Marks : 60 **2 0 0**
Total Marks : 100

Course Objective: To facilitate deeper understanding on principles and practices of fruits and vegetable technology.

Unit I

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);

Unit II

Value addition concept; Principles and methods of preservation; Intermediate moisture food-Jam, jelly, marmalade, preserve, candy – Concepts and Standards; Drying/ Dehydration of fruits and vegetables –packaging of products.

Suggested Books

1.Arthey D and Dennis C.1996.Vegetable processing. Blackie/Springers.
2.FAO.1997. Fruit and vegetable Processing.FAO.
3.Verma LR and Joshy KH. Post Harvest Handling of fruits and Vegetable. Kalyani Publishers, New Delhi.

BSAG-21605 Management of Beneficial Insects

Internal Marks : 40 **L T P**
External Marks : 60 **2 0 0**
Total Marks : 100

Course Objective : To educate students about beneficial insects their role in agriculture.

Unit I

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.

Unit II

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.

Suggested books

1. Srivastava, K.P. & Dhaliwal, G.S. (2011), A textbook of Applied Entomology, Vol.-II, Kalyani Publishers,
India
2. Dhaliwal, G.S. (2015), Elements of Agricultural Entomology, Kalyani Publishers, India
3. Pedigo, L.P. (2002). Entomology and Pest Management, Prentice Hall.
4. Tembhare, D.B. (2009). Modern Entomology. Himalaya Publication House.
5. Atwal, A.S. and Dhaliwal, G.S. (2009). Agricultural Pests of South Asia their Management, Kalyani
Publishers, India

BSAG-21606 Crop Improvement-II (Rabi Crops)

Internal Marks : 40 **L T P**
External Marks : 60 **2 0 0**
Total Marks : 100

Course Objectives: To improve crop varieties for better quality and yield.

Unit I

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;

Unit II

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.

Suggested Books

1. Chahal G.S and Gosal S.S. 2002. Principles and procedure of Plant Breeding Biotechnological andconventional approaches. Alpha Science International Publisher.
2. Hayes, H. K., Immar, F. R. and Smith, D.C. 1955. Methods of Plant Breeding. 2ed. McGraw-Hill, Publisher.
3. Poehlman, J.M. and Borthakur, D. 1969. Breeding Asian Field crops with special reference to cropsin India. Oxford and IBH Publishing.
4. Singh B.D. 1999. A Text book of Plant Breeding. Kalyani Publishers.
5. Singh B.D. 2016. Plant Breeding- Principles and Methods. Kalyani Publishers / Lyall Book.
6. Singh Phundan. 2008. Essentials of Plant Breeding. Kalyani Publishers.
7. Yadav, R. K. and Krishna, R. 2016. Experimental Science of Genetics and Plant Breeding. Kalyani Publishers / Lyall Book Depot.

BSAG-21607 Principles of Organic Farming

Internal Marks : 40 **L T P**
External Marks : 60 **1 0 0**
Total Marks : 100

Course Objectives: To educate people about benefits of organic farming and detail principles of farming.

Unit I

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.

Unit II

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.

Suggested Books

1. Palanippan SP & Annadorai K.2003. Organic Farming theory and practices.scientific Publication.
2. Dahama AK.2005.Organic farming for Sustainable Agriculture. 2nd Ed. Agribos.

BSAG-21608 Farm Management, Production and Resource Economics

Internal Marks : 40 **L T P**
External Marks : 60 **1 0 0**
Total Marks : 100

Course objectives: To study about farm production principles and decision making process.

Unit I

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 productproduct 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 labour income and farm business income Importance of farm records andaccounts in managing a farm, various types of farm records needed to maintain on farm, farm inventory, balance sheet, profit and loss accounts.

Unit II

Meaning and importance of farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting. 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. Important issues in economics and management of common property resources of land, water, pasture and forest resources etc.

Suggested books

1.C. Eicher and L. Witt : Agriculture in Economic Development. Vora and Co., Mumbai.
2. R.N. Soni : Leading Issues in Agricultural Economics. Sohan Lal Nagin Chand &Co., Jalandhar.
3. Sadhu and Singh : Fundamentals of Agricultural Economics. Himalaya Publishing House, Mumbai.
4. Charan D. Wadhva : Some Problems of India, Allied, Bombay.
5. Rudder Datt and K.P.Sundharam: Indian Economy, S. Chand & Co. Ltd. New Delhi

BSAG-21609 Principles of Food Science and Nutrition

Internal Marks : 40 **L T P**
External Marks : 60 **1 0 0**
Total Marks : 100
Course Objective: To study health benefits of food and it composition in detail.

Unit I

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.);

Unit II

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.

Suggested Books

1. Graham HD.1980. Food Science. Kalyani Publishers.
2. Madhurio SN.2004. Food safety Concept, reality. Scientific Publication.
3. Dutta RP. 2008. Food Microbiology. New Vishal Publication

BSAG-21610 Rainfed Agriculture and Watershed Management

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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

BSAG-21611 Protected cultivation and Secondary agriculture

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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. 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.

BSAG-21612 Diseases of Field and Horticultural Crops and their Management –I

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory. Field visit for the diagnosis of field problems.

Note: Collection and preservation of plant diseased specimens for herbarium/photographs with systematic position and brief description of symptoms.

BSAG- 21613 Post harvest Management and value Addition of Fruits and Vegetables

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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, tomato products. Quality evaluation of products -- physico-chemical and sensory. Visit to processing unit/ industry.

BSAG-21614 Management of Beneficial Insects

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

Honey bee species, castes of bees. Beekeeping appliances and seasonalmanagement, 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.

BSAG-21615 Crop Improvement-II (Rabi Crops)

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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 descent 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.

BSAG-21616 Principles of Organic Farming

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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

BSAG-21617 Farm Management, Production and Resource Economics

Internal Marks : 20 **L T P**
External Marks : 30 **0 0 2**
Total Marks : 50

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.

Seventh Semester

B.Sc. (Hons) Agriculture
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Semester VII
Rural Agricultural Work Experience and Agro-Industrial Attachment (RAWE & AIA)

Course code	**Course Title**	Load Allocation		Marks Distribution		Total	Credits
		L	P (Weeks)	Internal	External		
BSAG-21701	General Orientation and On campus Training by different faculties	0	3	75	0	75	3
BSAG-21702	Plant Clinic	0	3	75	0	75	3
BSAG-21703	Village Attachment	0	8	200	0	200	8
BSAG-21704	Agro-Industrial Attachment-I	0	3	75	0	75	3
BSAG-21705	Agro-Industrial Attachment-II	0	3	75	0	75	3
	Total		20	500		500	20

BSAG-21701: General Orientation: The students will attend compulsory GoC (General Orientation Course) to be conducted by various faculties. (Agricultural Economics, Soil Science, Agronomy, Horticuture, Entomology, Plant Pathology and Extension Education)

BSAG-21702: Plant clinic (3 weeks) Plant clinic will be established in the farm/department & subject experts will be asked to coordinate the training.

BSAG-21703: Village Attachment Training Programmes (8 weeks):
Appropriate number of villages will be selected and group of students will be allotted a village. Approximately 25 students will be allotted one village and two teachers will assist them in the selected village. Students will study the following interventions in the respective villages allotted to them. 1. Orientation & Survey of the village to study the social-economic profile.
– 1 week
2. Agronomic intervention - 1 week
3. Plant Protection Intervention - 1 week
4. Soil Improvement - 1 week
5. Fruit & Vegetable Production Intervention - 1 week
6. Food Processing and storage intervention - 1 week
7. Extension & Transfer of Technology - 1 week
8. Annual Production Intervention - 1 week
For each intervention, concerned specialized teacher would be assigned the duty so as to ensure comprehensive study of the area. The students will record their observation based on daily field observation recorded in note books and weekly diaries maintained by them to prepare the final report based on these observations.
The timings of the village attachment will be flexible so as to coincide with the main cropping season.

BSAG-21704: Agro-Industrial Attachment-I (3 weeks)
BSAG-21705 Agro-Industrial Attachment-II (3 weeks)
Agro-Industrial Attachment (6 weeks): The students would be attached with two varied Agro-Industries, one at a time for a period of six weeks (3+3) to get an experience of the industrial environment and working.
Students shall be placed in Agro and cottage industries (List attached*)

Activities during agro industrial attachment programmes.
- 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 the 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.

***A student will opt for any two course codes under Agro-Industrial Attachment (BSAG-21704& BSAG-21705) out of the following:**				
Sr. No	**Course Title**	**Course Code**	**No. of weeks**	**Module**
1	Agro Industrial Attachment	Agron.	3	Seed Industry Herbicides formulation
2	Agro Industrial Attachment	Entomolgy	3	Commercial Honey Production, Hive and Apicultural Equipment and Honey Processing Manufacturing Units: Honey Trading, Processing, Packaging, Exporting and Marketing Units.
3	Agro Industrial Attachment	Ento. Plant Pathology	3	Pesticide and Biopesticide Industries (ii) Biocontrol Agents Production Units (iii) Plant Quarantine Station (iv) Virus free tuber
4	Agro Industrial Attachment	Ext. Edu	3	Extension Services of CAO, Deputy Director(Horticulture), Soil Conservation, PAMETI, ATMA, Markfed, DRDA, etc.
5	Agro Industrial Attachment	Flori	3	Commercial Flower Nurseries (ii) Flower Marketing Firms (iii) Flower Seed Production and Landscaping Units.
6	Agro Industrial Attachment	Horticulture	3	Commercial Horticulture
7.	Agro Industrial Attachment	PBG	3	Commercial Hybrid Seed Production Units
8	Agro Industrial Attachment	Soil	3	(i) Fertilizer Industries (ii) Vermicompost Units (iii) Biofertilizer Units
9	Agro Industrial Attachment	Vegetable	3	(i)Commercial Vegetable Nurseries (ii) Farms of Progressive Vegetable Growers
10	Agro Industrial Attachment	Agri. Eco.	3	Commercial Banks, Cooperative Banks, Cooperative Agricultural Service

Evaluation Criterion:

BSAG-21701: General Orientation: An objective type/subjective type exam of 75 marks will be conducted at the end of the semester for evaluation of this component.

BSAG -21702: Plant Clinic (3 weeks)

Assessment Parameters	Evaluators	Max. Marks (100)
Discipline (Conduct and regularity)	Group Incharge	5
Problem observation, Inference and Prescription Writing	Group Incharge	20
Sample Collection and Preservation	Group Incharge/Clinic curator	20
Report writing Skills	Departmental Committee	15
Open Presentation	Departmental Committee	15

BSAG-21703 Village Attachment (8 weeks)

Assessment Parameters	Evaluators	Max. Marks (100)
Regulaity	Group Incharge	20
Discipline/conduct	Group Incharge	20
Social Interaction with Farmers	Group Incharge/Clinic curator	20
Innovative ideas to disseminate information	Departmental Committee	30
Skill in data recording	Departmental Committee	30
Report Writing Skill	Departmental Committee	40
Open presentation	Departmental Committee	40

BSAG-21704 : Agro-Industrial Attachment (3 weeks)
BSAG-21705 : Agro-Industrial Attachment (3 Weeks)

Assessment Parameters	Evaluator	Max. Marks (75)
Discipline, Regularity	Industry officials	10
Weekly Assessment	Industry officials	10
Report writing skill	Departmental Committee	30
Final Presentation/Viva Voce	Departmental Committee and External Evaluator	25

Eight Semester

B.Sc. (Hons) Agriculture
From Batch 2021 Onward

Semester VIII

Experiential Learning Programmes

Modules for Skill development and entreprenurship. A student has to register for two modules from the following package of modules. (Any two)

Course code	Course Title	Load Allocation		Marks Distribution		Total	Credits
		L	P	Internal	External		
	Any two of the following options:-						
BSAG-21801	Production technology Bio-agents and Bio fertilizers		10	250		250	10
BSAG-21802	Mushroom cultivation Technology						
BSAG-21803	Soil, Plant, water and seed testing						
BSAG-21804	Commercial Beekeeping						
BSAG-21805	Floriculture and Landscaping		10	250		250	10
BSAG-21806	Commercial Horticulture						
BSAG-21807	Food Processing						
BSAG-21808	Organic Production Technology						
	Total		20	500		500	20

Semester VIII

Evaluation criterion to be followed for each training component

Parameters	Evaluators	Max. Marks (250)
Discipline, conduct & regularity	Course Coordinator/Instructor	**30**
Monthly Assessment	Course Coordinator/Instructor	**50**
Business Marketing/Networking skills	Course Coordinator/Instructor	**50**
Report writing Skills	Departmental Committee	**70**
Final Presentation	Departmental Committee	**50**

Attendance during Trainings:

The minimum attendance required for all trainings will be 80 percent (as per the college minimum requirement). The attendance of students will be maintained by respective training and course coordinators for Sem-VII (BSAG-21701,BSAG-21702,BSAG-21703, BSAG-21704, BSAG-21705) and Sem-VIII (BSAG-21801 & BSAG-21802) communicated to the office for final evaluation. The students will be eligible for final evaluation only when the attendance requirements are met with. Any student falling short of attendance has to register again with the concerned establishment course coordinator.