



**Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311**

Study Scheme & Syllabus

As per Choice Based CreditSystem (CBCS)

For

B.Sc (Hons.) Agriculture (First to Eighth Semester)

Program Code: AG 311



RIMT UNIVERSITY MANDI GOBINDGARH, PUNJAB

Syllabus applicable for admissions in 2018 onwards



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

TABLE OF CONTENTS

S. No.	Content	Page No.
1.	Section 1: Vision and Mission of the University	
2.	Section 2: Vision and Mission of the Department	
3.	Section 3: About the Program	
4.	Section 4: Program Educational Objectives (PEOs) , Program Outcomes (POs) and Program Specific Outcomes (PSOs)	
5.	Section 5: Curriculum / Scheme with Examination Scheme	
6.	Section 6: Detailed Syllabus with Course Outcomes	



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

SECTION 1

Vision & Mission of the University

VISION

To become one of the most preferred learning places and a centre of excellence to promote and nurture future leaders who would facilitate the desired change in the society.

MISSION

- To impart teaching and learning through cutting-edge technologies supported by the world class infrastructure.
- To empower and transform young minds into capable leaders and responsible citizens of India instilled with high ethical and moral values.



SECTION 2

Vision and Mission of the Department

VISION

To visualize a great future for the youth with innovative nature, research culture and ethics so that they can meet the global challenges and improve the quality of human life.

MISSION

- To meet the need of students by providing educational experiences in the field of agriculture.
- To focus on offering a broad undergraduate and postgraduate curriculum consisting of various subjects in Agricultural Science like Agronomy, Plant Protection, Agribusiness Economics, Agricultural Education, Agricultural System Technology, Horticulture, Animal Science *etc.*
- To integrate educational experience that blends fundamentals, research and hands-on experience.



SECTION 3

About the Program

Our B.Sc (Hons.) Agriculture is a 4-year undergraduate course that primarily focuses on research and practices in agricultural science, dealing with disciplines like Genetics and Plant Breeding, Agricultural Microbiology, Soil Science, Plant Pathology, etc. It is an Outcome Based Education model which is a 4 year, 8 Semester Full time Program of 180* credit hours with a Choice Based Credit System (CBCS) and Grading Evaluation System. It is a professional degree recognized by the Government of India in the field of agricultural science. This course aims to provide training to implement modern agricultural techniques and innovations from lab to farmer's field.

Credit System

Pass%	Minimum Requirement	Grade Table			
		Range	Grade	Grade Points	Qualitative Meaning
50	25%	90-100	O	10	Outstanding
		80-89	A	9	Excellent
		70-79	B	8	Good
		60-69	C	7	Average
		50-59	P	6	Pass
		Less than 50	F	0	Fail
		Absent	AB	0	AB

SECTION 4

Program Educational Objectives (PEOs), Program Outcomes (POs) and Program Specific Outcomes (PSOs)

PROGRAMME EDUCATION OBJECTIVES (PEOs)

PEO1	To provide the in depth knowledge in agriculture and allied subjects required to solve common problems in management of crop cultivation, improvement, livestock rearing and their marketing.
PEO2	To develop a good teaching-learning environment for higher studies and help in selection of professional careers in government and private organization, agro-based industries, educational/ research/extension, institutes etc.
PEO3	To develop the skills for leadership, ethical integrity, and professional engagement in agriculture and allied sciences.
PEO4	To provide ample information about natural and other resources through a course curriculum for the betterment of life.



PROGRAMME OUTCOMES (POs)

PO 1	Knowledge Enhancement: Demonstrate knowledge and understanding of essential facts, concepts, principles and theories relating to Soil Science, Agronomy, Horticulture, Genetics and Plant Breeding, Plant Pathology, Entomology and other such areas of agriculture.
PO 2	Professional Enhancement: Understanding the value and processes of life-long learning and professional development.
PO 3	Entrepreneurship Skills: Understanding the processes of setting up and managing viable business ventures.
PO 4	Communication & Extension Skills: Developing appropriate communication skills for effective transfer of knowledge and technologies through extension programs.
PO 5	Team Work: Play effective roles in multidisciplinary teams.
PO 6	Educational Leadership: Recognize and meet emerging agriculture challenges of global society in the 21 st century and developing leadership and strong linkages in the agro-industrial setup.
PO 7	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the scientific practice.
PO 8	Computational Skills: Recognize, analyze problems and plan strategies for their solutions with the help of computer skills.
PO 9	Data Handling: Collect, analyze and interpret scientific data.
PO 10	To make students competitive in pursuing higher studies.
PO 11	To provide knowledge on commercial agricultural production practices.
PO 12	This programme will also help students to enhance their employability for jobs in different sectors.



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO 1	Apply knowledge of basic science through Agricultural microbiology, Plant biochemistry and Biotechnology.
PSO 2	Impart knowledge and understanding of fundamental concepts of crop production, its management and need for sustainable development.



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

SECTION 5

Curriculum / Scheme with Examination Grading Scheme

SEMESTER WISE SUMMARY OF THE PROGRAMME: B.Sc. (Agriculture)

S. No.	Semester	No. of Contact Hours	Marks	Credits
1.	I	29+2NC	1700	23+1NC
2.	II	32+2NC	2000	23+1NC
3	III	29	1600	22
4	IV	32	1800	23
5	V	33	1700	23
6	VI	33+4NC	1800	22+2NC
7	VII	40	100	20
8	VIII	40	100	20
	Total	268+8NC	10800	176+4NC



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

EXAMINATION GRADING SCHEME

Marks Percentage Range	Grade	Grade Point	Qualitative Meaning
80-100	O	10	Outstanding
70-79	A+	9	Excellent
60-69	A	8	Very Good
55-59	B	7	Good
50-54	B	6	Above Average
45-49	C	5	Average
40-44	P	4	Fail
0-39	F	0	Fail
ABSENT	AB	0	Fail

Percentage Calculation: CGPA *10



FIRST SEMESTER

Subject		Contact Hours/Week			Credit	Evaluation Scheme (% of Total Marks)					Exam Duration (Hours)
Code	Title	L	T	P		CW A	LW A	MTE	ET E	Total	
Core Courses											
AAGR 1101	Fundamentals of Agronomy	3	---	---	3	16	---	24	60	100	3
	Lab	---	---	2	1	---	60	---	40	100	3
AHRT1101	Fundamentals of Horticulture	1	---	---	1	16	---	24	60	100	3
	Lab	---	---	2	1	---	60	---	40	100	3
ASOL 1101	Fundamentals of Soil Science	2	---	---	2	16	---	24	60	100	3
	Lab	---	---	2	1	---	60	---	40	100	3
ABCH 1101	Fundamentals of Plant Biochemistry & Biotechnology	2	---	---	2	16	---	24	60	100	3
	Lab	---	---	2	1	---	60	---	40	100	3
ASOC1101	Rural Sociology and Educational Psychology	2	---	---	2	16	---	24	60	100	3
	Lab	---	---	---	---	---	---	---	---	---	---
AEXT1101	Agricultural Heritage	1	---	---	1	16	---	24	60	100	3
	Lab	---	---	---	---	---	---	---	---	---	---
ABIO 1101*	Introductory Biology	1	---	---	1	16	---	24	60	100	3
	Lab	---	---	2	1	---	60	---	40	100	3
BMAT 1101*	Elementary Mathematics	2	---	---	2	16	---	24	60	100	3
	Lab	---	---	---	---	---	---	---	---	---	---
Ability Enhancement Compulsory Courses											
BHUM 1101	Comprehension & Communication skills in English	2	---	---	2	16	---	24	60	100	3
	Lab	---	---	2	1	---	60	---	40	100	3



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Skill Enhancement Compulsory Courses

ASOC 1102	Human Values & Ethics	1	---	---	1	16	-----	24	60	100	3
	Lab	---	---	---	---	---	---	---	---	---	---
NCC/NSO/NSS /Yoga**	NCC/NSO/NSS/Yoga	---	---	---	---	---	---	---	---	---	---
	Lab	---	---	2	1	---	60	-----	40	100	3
Total		15/ 16	0	10/1 2	23 + 1 (NC)						

* **Non medical students have to study Biology/ Medical students have to study Maths.**

** **Non-gradual course**

L-- Lecture

T-- Tutorial

P---Practical

CWA Class work Assessment

LWA Lab work Assessment

MTE Mid Term Exam

ETE End Term Exam



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

SECTION 6

Detailed Syllabus with Course Outcomes

SYLLABUS

SEMESTER-I



SUBJECT TITLE: Fundamentals of Agronomy

SUBJECT CODE: AAGR 1101

SEMESTER: I

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	2	4

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course Objectives: The course entails to educate the students about the basic knowledge of Agronomy

Contents of Syllabus

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	Agronomy and its scope, seeds and sowing, tillage and tilth, crop density and geometry, Crop nutrition, manures and fertilizers, nutrient use efficiency.	14
UNIT-II	Water resources, soil plant water relationship, crop water requirement, water use efficiency, irrigation- scheduling criteria and methods, quality of irrigation water, water logging. Weeds- importance, classification, crop weed competition, concepts of weed management-principles and methods.	15
UNIT-III	Herbicides- classification, selectivity and resistance, allelopathy. Growth and development of crops, factors affecting growth and development, plant ideotypes, crop rotation and its principles, adaptation and distribution of crops, crop management technologies in problematic areas, harvesting and threshing of crops.	16
PRACTICAL:		
	Identification of crops, seeds, fertilizers, pesticides and tillage implements, Effect of sowing depth on germination and seedling vigour, Identification of weeds in crops, Methods of herbicide and fertilizer application, Study of yield contributing characters and yield estimation, Seed germination and viability test, Numerical exercises on fertilizer requirement, plant population, herbicides and water requirement, Use of tillage implements-reversible plough, one way plough, harrow, leveler, seed drill, Study of soil moisture measuring devices, Measurement of field capacity, bulk density and infiltration rate, Measurement of irrigation water.	30

Course Outcomes:

After taking the course, students will be able to:

1. To understand the basics of agriculture dealing with all aspects of crop cultivation and production.
2. Knowledge about Indian Agriculture and importance, present status, scope and future prospect.
3. To know about various cropping seasons of India and identification of important crops and crop seeds.



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

4. To study crop cultivation practices for the purpose of producing food for humans, feed for animals as well as raw materials for the industry.

Recommended Books:

1. De, Gopal Chandra, Fundamentals of Agronomy. Oxford & IBH Publishing Co., New-Delhi 1989
2. ICAR, Handbook of Agriculture, Indian Council of Agricultural Research, New-Delhi 1989
3. Michael, A.M. and Ojha, T.P. Principles of Agricultural Engineering, Vol.II Jain Brothers, New Delhi. 1986
4. Morachan, Y.B., Crop production and management, Oxford & IBH Publishing Co., New-Delhi 1986

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Fundamentals of Horticulture

SUBJECT CODE: AHRT 1101

SEMESTER: I

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	2	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objectives: Students will be introduced to the subject of horticulture which would prepare them to study higher courses in the series.

Contents of Syllabus

Sr. No	Contents	Contact Hours
THEORY:		
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	5
UNIT-II	Principles of orchard establishment; Principles and methods of training and pruning; Juvenility and flower bud differentiation; unfruitfulness; pollination, pollinizers and pollinators; fertilization and parthenocarpy	5
UNIT-III	Kitchen gardening; garden types and parts; lawn making; medicinal and aromatic plants; species and condiments; use of plant bio-regulators in horticulture. Irrigation & fertilizers application-method and quantity.	6
PRACTICAL:		
	Identification of garden tools. Identification of horticultural crops. Preparation of seed bed/nursery bed. Practice of sexual and asexual methods of propagation. Layout and planting of orchard plants. Training and pruning of fruit trees. Transplanting and care of vegetable seedlings. Making of herbaceous and shrubby borders. Preparation of potting mixture, potting and repotting. Fertilizer application in different crops. Visits to commercial nurseries/orchard.	30

Course Outcomes:

After taking the course, students will be able to:

1. To identify plant vegetative structure
2. To understand the basic principles, processes and plant propagation methods.
3. To learn about plant propagation techniques and harvesting.
4. To learn how horticulture relates to the economy and environments, both currently and in the future.



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Recommended Books:

1. Parthasvathy. V. A. Chattopadhyay. P.K. and Bose. T.K. (2006) Plantation Crops. Naya Prokash, Kolkatta.
2. Bose. T.K., Kabir.J., Das.P. & Joy.P.P.(2000) Tropical Horticulture. Naya Prokash. Calcutta
3. Bal. J.S.(1997) Fruit Growing. Kalyani Publisher, New Delhi
4. Singh. S.P. (1997) Commercial Fruits. Kalyani Publishers, New Delhi

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Fundamentals of Soil Science

SUBJECT CODE: ASOL 1101

SEMESTER: I

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	2	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: Students will be introduced to the subject of Soil Science which would prepare them to study higher courses in the series.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	Soil as a natural body, pedological and edaphological concepts of soil; Soil genesis: soil forming rocks and minerals; weathering, processes and factors of soil formation; Soil Profile, components of soil; Soil physical properties: soil-texture, structure, density and porosity, soil colour, consistence and plasticity; Elementary knowledge of soil taxonomy classification and soils of India.	9
UNIT-II	Soil water retention, movement and availability; soil air, composition, gaseous exchange, problem and plant growth; source, amount and flow of heat in soil; soil temperature and plant growth; 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.	11
UNIT-III	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.	10
PRACTICAL:		
	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.	30



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Course Outcomes:

After taking the course, students will be able to:

1. To learn about soil structure, texture and their effect on plant's health.
2. To study about soil formation, classification, physical, chemical properties.
3. To provide knowledge about soil forming rocks and minerals, their weathering and soil forming processes and climatic factors affect them.
4. To aware the students about causes, effects and remedies to prevention and mitigation of soil pollution.

Recommended Books:

1. Sharma, N.L. & Singh, T.B.(1996) Soil Science , Rama pub. House, Barot Merrut (U.P)
2. Das, D.K. (2002) Introductory Soil Science, Kalyani publisher, New Delhi 2002
3. Mehra R.K.(2004) Text book of Soil Science, ICAR, New Delhi 2004
4. Biswas, T.D. and Mukherjee, S.K. (2006) Text book of soil science. Tata McGraw Hill publishing Co. Ltd, New Delhi 2006

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Fundamentals of Plant Biochemistry and Biotechnology
SUBJECT CODE: ABCH 1101
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	2	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: To acquaint the students with basic knowledge of Plant Biochemistry & Biotechnology.

Contents of Syllabus

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	Importance of Biochemistry. Properties of Water, pH and Buffer. Carbohydrate: Importance and classification. Structures of Monosaccharides, Reducing and oxidizing properties of Monosaccharides, Mutarotation; Structure of Disaccharides and Polysaccharides. Lipid: Importance and classification; Structures and properties of fatty acids; storage lipids and membrane lipids. Proteins: Importance of proteins and classification; Structures, titration and zwitterions nature of amino acids; Structural organization of proteins. Enzymes: General properties; Classification; Mechanism of action; Michaelis & Menten and Line Weaver Burk equation & plots; Introduction to allosteric enzymes.	10
UNIT-II	Nucleic acids: Importance and classification; Structure of Nucleotides, A, B & Z DNA; RNA: Types and Secondary & Tertiary structure. Metabolism of carbohydrates: Glycolysis, TCA cycle, Glyoxylate cycle, Electron transport chain. Metabolism of lipids: Beta oxidation, Biosynthesis of fatty acids. Concepts and applications of plant biotechnology: Scope, organ culture, embryo culture, cell suspension culture, callus culture, another culture, pollen culture and ovule culture and their applications;	9
UNIT-III	Micro-propagation methods; organogenesis and embryogenesis, Synthetic seeds and their significance; Embryo rescue and its significance; somatic hybridization and cybrids; Somaclonal variation and its use in crop improvement; cryo-preservation. Introduction to recombinant DNA methods: physical (Gene gun method), chemical (PEG mediated) and Agrobacterium mediated gene transfer methods; Transgenics and its importance in crop improvement; PCR techniques and its applications; RFLP, RAPD, SSR; Marker Assisted Breeding in crop improvement; Biotechnology regulations.	11
PRACTICAL:		
	Preparation of solution, pH & buffers, Qualitative tests of carbohydrates and amino acids. Quantitative estimation of glucose/ proteins. Titration methods for estimation of amino acids/lipids, Effect of pH, temperature and substrate concentration on enzyme action, Paper chromatography/ TLC demonstration for separation of amino acids/ Monosaccharides. Sterilization techniques. Composition of various tissue culture media and preparation of stock solutions for MS nutrient medium. Callus induction from various explants.	30



	Micro-propagation, hardening and acclimatization. Demonstration on isolation of DNA. Demonstration of gel electrophoresis techniques and DNA finger printing.	
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Course Outcomes:

After taking the course, students will be able to:

1. To learn about the role of cell organelles and their functions.
2. To study about various functions of biomolecules and their importance in cell.
3. To identify the deficiency symptoms of biomolecules.
4. To learn about the application of plant tissue culture in crop improvement.

Recommended Books:

1. Lehninger A.L,(2004) Principles of Biochemistry, Freeman and Company, USA
2. Goodwin, T W and Mercer EI. (1998) Introduction to Plant Biochemistry, Progamon Press Inc. Deffered UK
3. Sahney S K and Singh R R.(2002) Introductory Practical Biochemistry, Narosa Publishing House, New Delhi
4. Yadav VK and Yadav N. (2007) Biochemistry and Biotechnology-A Laboratory Manual, Pointer Publishers, Jaipur

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Comprehension and Communication Skills in English

SUBJECT CODE: BHUM 1101

SEMESTER: I

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	2	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course aims at imparting basic knowledge relating to comprehension and communication in English language.

Sr. No	Contents	Contact Hours
THEORY		
UNIT-I	Comprehension skills: Reading comprehension, Vocabulary building: word roots, antonyms and synonyms; homonyms and homophones. Use of Idiomatic language: similes, metaphors and alliteration.	09
UNIT-II	Communication skills- Phonetics: articulation of sounds, consonants, vowels, stress, pitch and intonation. Phonology: phonemes, allophones, syllable structure and phonological rules. Morphology: morphemes, allomorphs and word formation.	10
UNIT-III	Writing skills- functional grammar, agreement of verb with subject, mechanics of good correspondence: letter writing, effective business correspondence, preparation of curriculum vitae, job applications. Syntax, common errors in sentence construction, precis and diary writing.	11
PRACTICAL		
	Practice in phonetic transcription. Listening to recorded conversation aimed at testing the listening comprehension of students. Listening to audio and video presentations on phonetic sounds and imitating them to comprehend the correct pronunciation of syllablii. Use of intonation and voice modulation in deliverance of speeches, presentations and short talks. Powerpoint presentation on a given topic related to agriculture. Facing interviews; face to face conversations; preparing flashcards for commentaries and public speaking; Reading comprehension passages using compare/contrast and cause effect method. Drafting precis, curriculum vitae, letters; job applications and diary entries.	30

Course Outcomes:

After taking the course, students will be able to:

1. Students will introduce themselves to the class and begin getting to know one another and will apply communication strategies by preparing and participating in class discussions.
2. Students will identify the needs of communication that helps us in everyday life.
3. Students can differentiate the action, interaction and transaction models of communication.
4. Students can demonstrate critical and innovative thinking.



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Recommended Books:

1. Ludlow and Panthon (2001). *The Essence of Effective Communication*. Prentice Hall of India
2. Kohli A.L. (1997). *New Design English Grammar, Reading and Writing Skills*. Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,
3. Thomson and Marlinet (2000). *A Practical English Grammar*. World press.

Instruction to Question Paper setter The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Rural Sociology and Educational Psychology

SUBJECT CODE: ASOC1101

SEMESTER: I

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	0	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course will acquaint the students with rural social set up and basics of educational psychology

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	Sociology and Rural sociology: Definition and scope, its significance in agriculture extension.	09
UNIT-II	Rural society, Social Groups, Social Stratification, Culture concept, Social Institution, Social Change & Development.	10
UNIT-III	Educational psychology: Meaning & its importance in agriculture extension. Behavior: Cognitive, affective, psychomotor domain, Personality, Learning, Motivation, Theories of Motivation, Intelligence.	11
PRACTICAL:		
	N.A.	

Course Outcomes:

After taking the course, students will be able to:

1. Students will understand concept of rural sociology, its importance in agricultural extension, characteristics of Indian rural society.
2. Students will understand social groups, culture, social values, leadership and training.
3. Students will understand concept of educational psychology, intelligence, personality, motivation, teaching and learning.
4. Acquaint with characteristics of rural society, village institutions and social organizations.

Books:

1. Bhatia, H.R. A (1965)Text Book of Educational Psychology. Asia Publishing House, New Delhi
2. Chitamber, J.B.(1990) Introductory Rural Sociology: Willey Easter Ltd. New Delhi.
3. Dhama, O.P. & Bhatnagar, O.P., Education & Communication for Development, Oxford and IBH Publishing Company, New Delhi, 1985
4. Desai, A.R. Rural Sociology in India, Vora & Co. Publisher Pvt. Ltd., Bombay 1953

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

SUBJECT TITLE: Agricultural Heritage

SUBJECT CODE: AEXT 1101

SEMESTER: I

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	0	1

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: To familiarize the students with Indian agricultural heritage

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	Introduction of Indian agricultural heritage, status of farmers in society; advice by sages to kings on their duties towards farmers, soil management in ancient, medieval & pre-modern India and its relevance in modern day sustainable agriculture.	5
UNIT-II	Heritage of crop & water management, plant growth and development & plant protection through vrikshayurveda and traditional knowledge. Heritage of medicinal plants and their relevance today, seed health in ancient & medieval history and its relevance to present day agriculture	6
UNIT-III	Description of Indian civilization and agriculture by travelers from China, Europe and United States, our journey in agriculture. Green revolution and its impact and concerns, vision for the future.	5
PRACTICAL:		
	N.A.	

Course Outcomes:

After taking the course, students will be able to:

1. Students will learn about the ancient agricultural practices.
2. Students will understand its relevance to modern agriculture practices.
3. Students will learn about the traditional technical knowledge.
4. Students will learn about the developments in agriculture and vision for the future.

Recommended Books

1. Dhama, O.P. & Bhatnagar, O.P., Education and Communication for Development, Oxford & IBH Publishing Co. New-Delhi. 1985
2. Kelsey, L.D. & Hearne, C.C., Cooperative Extension Work: Cornell University Press, New York, USA. 1963
3. Ray, G.L., Extension Communication and Management, Naya Prakash, 206 Bidhan Sarni, Calcutta-6. 2003
4. Reddy, A.A., Extension Education, Shri Laxmi Press, Bapatala. 1993

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

SUBJECT TITLE: Human Values and Ethics

SUBJECT CODE: ASOC 1102

SEMESTER: I

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	0	1

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The students will be taught about significance of human values and ethics with an aim to inculcate these in them.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	Values and Ethics-An Introduction. Goal and Mission of Life. Vision of Life. Principles and Philosophy.	5
UNIT-II	Self Exploration. Self Awareness. Self Satisfaction. Decision Making. Motivation. Sensitivity. Success. Selfless Service.	5
UNIT-III	Case Study of Ethical Lives. Positive Spirit. Body, Mind and Soul. Attachment and Detachment. Spirituality Quotient. Examination.	6
PRACTICAL:		
	N.A.	

Course Outcomes:

After taking the course, students will be able to:

1. Students will understand the significance of value inputs in a classroom and start applying them in their life and profession.
2. Students will learn to distinguish between values and skills.
3. Students will understand the role of a human being in ensuring harmony in society and nature.
4. Students will learn to distinguish between ethical and unethical practices.

Recommended Books:

1. R.R. Gaur, R. Sangal and G.P. Bagaria (2010) A Foundation Course in Human Values and Professional Ethics
2. [Govindarajan M](#) Professional Ethics and Human Values 2013

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Introductory Biology

SUBJECT CODE: ABIO 1101

SEMESTER: I

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	2	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to teach basic biology to the students from non medical stream.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	Introduction to the living world, diversity and characteristics of life, origin of life, Evolution and Eugenics.	5
UNIT-II	Binomial nomenclature and classification. Cell and cell division. Morphology of flowering plants	5
UNIT-III	Seed and seed germination. Plant systematic- viz; Brassicaceae, Fabaceae and Poaceae. Role of animals in agriculture.	5
PRACTICAL:		
	Morphology of flowering plants – root, stem and leaf and their modifications. Inflorescence, flower and fruits. Cell, tissues & cell division. Internal structure of root, stem and leaf. Study of specimens and slides. Description of plants - Brassicaceae, Fabaceae and Poaceae.	30

Course Outcomes:

After taking the course, students will be able to:

1. Students will recognize and be able to apply basic ethical principles to applied biological/biomedical practice and will understand the role of biological/biomedical science, scientists, and practitioners in society.
2. Students will be able to explain the process of organic evolution and its underlying principles and mechanisms.
3. Students will be able to explain the fundamental biological processes of metabolism, homeostasis, reproduction, development.
4. Students will be able to explain the importance of biodiversity at the genetic, organism, community, and global scales.

Recommended Books:

1. Biology NCERT 2015
2. General Biology I: Molecules, Cells and Genes. Dog Ear Publishing, LLC 2017
3. General Biology II: Organisms and Ecology. Dog Ear Publishing, LLC 2017

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks



SUBJECT TITLE: Elementary Mathematics

SUBJECT CODE: BMAT 1101

SEMESTER: I

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	0	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objectives: The course objective is to teach Elementary Mathematics to the students from medical background.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
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	9
UNIT-II	Circle: Equation of circle whose centre and radius is known, General equation of a circle, Equation of circle passing through three given points, Equation of circle whose diameters is line joining two points (x_1, y_1) & (x_2, y_2) , Tangent and Normal to a given circle at given point (Simple problems), Condition of tangency of a line $y = mx + c$ to the given circle $x^2 + y^2 = a^2$. Differential Calculus : Definition of function, limit and continuity, Simple problems on limit, Simple problems on continuity, Differentiation of x^n , e^x , $\sin x$ & $\cos x$ from first principle, Derivatives of sum, difference, product and quotient of two functions, Differentiation of functions of functions (Simple problem based on it).	10
UNIT-III	Logarithmic differentiation (Simple problem based on it), Differentiation by substitution method and simple problems based on it, Differentiation of Inverse Trigonometric functions. Maxima and Minima of the functions of the form $y=f(x)$ (Simple problems based on it). Integral Calculus : Integration of simple functions, Integration of Product of two functions, Integration by substitution method, Definite Integral (simple problems based on it), Area under simple well-known curves (simple problems based on it). Matrices and Determinants: Definition of Matrices, Addition, Subtraction, Multiplication, Transpose and Inverse up to 3rd order, Properties of determinants up to 3rd order and their evaluation.	11
PRACTICAL:		
	N.A.	



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Course Outcomes:

After taking the course, students will be able to:

1. Students will learn to demonstrate competency in the areas that comprise the core of the mathematics major.
2. Students will be able to understand and write mathematical proofs.
3. Students will be able to use appropriate technologies to solve mathematical problems.
4. Students will be able to construct appropriate mathematical models to solve a variety of practical problems.

Recommended Books:

1. Algebra: Hall & Knight
2. Trigonometry: S.L. Loney
3. Coordinate- Geometry: S. L. Loney
4. Differential –Calculus: Gorakh-Prasad
5. Integral- Calculus : Gorakh-Prasad

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SECOND SEMESTER

** Non-gradual course

Subject		Contact Hours/Week			Credit	Evaluation Scheme (% of Total Marks)					Exam Duration (Hours)	
Code	Title	L	T	P		CWA	LWA	MTE	ETE	Total		
Core Courses												
AFOR1201	Introduction to Forestry	1	---	---	1	16	---	24	60	100	3	
	Lab	---	---	2	1	---	60	---	40	100	3	
APBG1201	Fundamentals of Genetics	2	---	---	2	16	---	24	60	100	3	
	Lab	---	---	2	1	---	60	---	40	100	3	
APPT1201	Fundamentals of Plant Pathology	2	---	---	2	16	---	24	60	100	3	
	Lab	---	---	2	1	---	60	---	40	100	3	
AEXT 1202	Fundamentals of Agricultural Extension Education	2	---	---	2	16	---	24	60	100	3	
	Lab	---	---	2	1	---	60	---	40	100	3	
AFMP 1201	Farm Machinery and Power	1	---	---	1	16	---	24	60	100	3	
	Lab	---	---	2	1	---	60	---	40	100	3	
ASWE 1201	Soil and Water Conservation Engineering	1	---	---	1	16	---	24	60	100	3	
	Lab	---	---	2	1	---	60	---	40	100	3	
ABOT 1201	Fundamentals of Crop Physiology	1	---	---	1	16	---	24	60	100	3	
	Lab	---	---	2	1	---	60	---	40	100	3	
AECN 1201	Fundamentals of Agricultural Economics	2	---	---	2	16	---	24	60	100	3	
	Lab	---	---	---	---	---	---	---	---	---	---	
AMIC1201	Agricultural Microbiology	1	---	---	1	16	---	24	60	100	3	
	Lab	---	---	2	1	---	60	---	40	100	3	
BMAT2353	Basic Statistics	1	---	---	1	16	---	24	60	100	3	
	Lab	---	---	2	1	---	60	---	40	100	3	
Skill Enhancement Compulsory Courses												
NCC/NSO/NSS/ Yoga**	NCC/NSO/NSS/Yoga	---	---	---	---	---	---	---	---	---	---	
	Lab	---	---	2	1	---	60	---	40	100	3	
Total		14	0	20	23+ 1 (NC)							

L-- Lecture

T-- Tutorial

P---Practical

CWA Class work Assessment

LWA Lab work Assessment

MTE Mid Term Exam

ETE End Term Exam



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

SYLLABUS

SEMESTER-II



SUBJECT TITLE: Introduction to Forestry

SUBJECT CODE: AFOR 1201

SEMESTER: II

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	2	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to teach basics of Forestry.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
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 - from seed and vegetative parts, coppicing, pollarding, root suckers; Artificial regeneration – objectives, choice between natural and artificial regeneration, essential preliminary considerations.	5
UNIT-II	Crown classification. Tending operations. Forest mensuration – objectives, diameter measurement, instruments used in diameter measurement; Non instrumental methods of height measurement - shadow and single pole method; Instrumental methods of height measurement - geometric and trigonometric principles, instruments used in height measurement; measurement of volume of felled and standing trees, age determination.	5
UNIT-III	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.	5
PRACTICAL:		
	Identification of tree-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. Nursery lay out, seed sowing, vegetative propagation techniques. Forest plantations and their management. Visits of nearby forest based industries.	30

Course Outcomes:

After taking the course, students will be able to:

1. Students will understand recognize various harvesting, transportation, and processing systems used in the management of forest resources and production of forest products
2. Students will understand develop and evaluate management plans with multiple objectives and constraints.
3. Students will learn how to develop and apply silvicultural prescriptions appropriate to management objectives.
4. Students will learn to analyse forest inventory information.



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Recommended Books:

1. Donald L. Grebner, Jacek Siry and Pete Bettinger (2013) Introduction to Forestry and Natural Resources. Academic Press.
2. Mishra, R. (1968) Ecology Work Book. Oxford and IBH Publishing Co, Calcutta
3. Arvind Kumar. Biodiversity and environment. Published by A.P.M. Publishing Corporation, New Delhi.

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Fundamentals of Genetics

SUBJECT CODE: APBG 1201

SEMESTER: II

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	2	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objectives: The course objective is to introduce students with basics of Genetics.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	Pre- and Post-Mendelian concepts of heredity, Mendelian principles of heredity, Cell division – mitosis, meiosis, Probability and Chi-square. Dominance relationships, gene interaction. Multiple alleles, pleiotropism and pseudoalleles	9
UNIT-II	Sex determination and sex linkage, sex limited and sex influenced traits, Blood group genetics, Linkage and its estimation, crossing over mechanisms, chromosome mapping. Structural changes in chromosome, Mutation, classification, Methods of inducing mutation & CIB technique, mutagenic agents and induction of mutation.	10
UNIT-III	Qualitative & Quantitative traits, Polygenes and continuous variations, multiple factor hypothesis, Epistatic interactions with examples. 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.	11
PRACTICAL:		
	Study of microscope. Study of cell structure. 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 structure.	30

Course Outcomes:

After taking the course, students will be able to:

1. Comprehensive, detailed understanding of the chemical basis of heredity specially in crop plants to improve and develop the new varieties of plants.
2. Understanding of how genetic concepts affect broad societal issues including health and disease, food and natural resources, environmental sustainability, etc.
3. Knowledge required to design, execute, and analyse the results of genetic experimentation in plant systems.
4. Understanding the role of genetic technologies in industries related to biotechnology, pharmaceuticals, energy, and other fields.



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Recommended Books:

1. Singh, B.D.(2016) Fundamentals of Genetics. Kalyani Publishing House, New Delhi.
2. Singh, P.(2017) Genetics. Kalyani Publishing House, New Delhi Publishing House, New Delhi.
3. Gupta P. K. Genetics. Rastogi Publications
4. Gardner,E,J,; Simmons,M. J. and Snustad, D.P. Principles of Genetics. John Willey & Sons, New York.

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Fundamentals of Plant Pathology

SUBJECT CODE: APPT1201

SEMESTER: II

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	2	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to teach basics of Plant Pathology.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
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. Cause and classification of plant diseases. Important plant pathogenic organisms, different groups: fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasmas, viruses, viroids, algae, protozoa, phanerogamic parasites and nematodes with examples of diseases caused by them.	10
UNIT-II		
UNIT-III	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. Bacteria and mollicutes: general morphological characters	09
UNIT-IV	Basic methods of classification and reproduction. Viruses: nature, architecture, multiplication and transmission. Study of phanerogamic plant parasites. Nematodes: General morphology and reproduction, classification, symptoms and nature of damage caused by plant nematodes (Heterodera, Meloidogyne, <i>Anguina</i> etc.) Principles and methods of plant disease management. Nature, chemical combination, classification, mode of action and formulations of fungicides and antibiotics.	11
PRACTICAL:		
	Acquaintance with various laboratory equipments and microscopy. 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. Extraction of nematodes from soil. Study of fungicides and their formulations. Methods of pesticide application and their safe use. Calculation of fungicide sprays concentrations.	30



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Course Outcomes:

After taking the course, students will be able to:

1. Student will acquaint about concepts of plant pathogens, major disease causing organisms and their etiology.
2. To provide specific knowledge about host pathogen interactions.
3. Recognition of plant disease is the first step in doing something about them.
4. To give specific knowledge about environment and disease development.

Recommended Books:

1. Mehrotra, R.S. and Aggarawal (2007) A. Plant Pathology. Tata McGraw Hill Publishing Co. Ltd., New Delhi
2. Agrios, G.N.(1996) Plant Pathology, Academic Press, New Delhi.
3. Singh, R.S. (1996) An Introduction to Principles of Plant Pathology. Oxford & IBH, New Delhi.
4. Alexopolus, C.J., Mims, C.W. and Blackwell, M. (1996) Introductory Mycology, John Wiley Estern Private Limited, New York.

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Fundamentals of Agricultural Extension Education

SUBJECT CODE: AEXT 1202

SEMESTER: II

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	2	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course aims at acquainting the students with the basics of Agricultural Extension Education

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
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.).	09
UNIT-II	Various extension/ agriculture development programmes launched by ICAR/ Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND,NATP, NAIP, etc.). New trends in agriculture extension: privatization extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems, etc. Rural Development: concept, meaning, definition; various rural development programmes launched by Govt. of India. Community Dev.- meaning, definition, concept & principles, Physiology of C.D. Rural Leadership: concept and definition, types of leaders in rural context; extension administration: meaning and concept, principles and functions.	11
UNIT-III	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, media mix strategies; communication: meaning and definition; models and barriers to communication. Agriculture journalism; diffusion and adoption of innovation: concept and meaning, process and stages of adoption, adopter categories.	10
PRACTICAL:		
	To get acquainted with university extension system. Group discussion-exercise; handling and use of audio visual equipments and digital camera and LCD projector; preparation and use of AV aids, preparation of extension literature – leaflet, booklet, folder, pamphlet news stories and success stories; Presentation skills exercise; micro teaching exercise; A visit to village to understand the problems being encountered by the villagers/ farmers; to study organization and functioning of DRDA and other development departments at district level; visit to NGO and learning from their experience in rural development; understanding PRA techniques and their application in	30



	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.	
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Course Outcomes:

After taking the course, students will be able to:

1. To learn the definition of education, extension programme planning, principles.
2. To learn about the various extension systems in India: extension efforts in pre-independence era .
3. New trends in agriculture extension: privatization extension.
4. Monitoring and evaluation – concept and definition, monitoring, and evaluation of Extension programmes, Transfer of Technology- Concept and models

Recommended Books:

1. Dhama, O.P. & Bhatnagar, O.P. (1985) Education and Communication for Development, Oxford & IBH Publishing Co. New-Delhi.
2. Kelsey, L.D. & Hearne, C.C. (1963) Cooperative Extension Work: Cornell University Press, New York, USA.
3. Ray, G.L.(2003) Extension Communication and Management, Naya Prakash, 206 Bidhan Sarni, Calcutta
4. Reddy, A.A.(1993) Extension Education, Shri Laxmi Press, Bapatla.

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Farm Machinery and Power

SUBJECT CODE: AFMP 1201

SEMESTER: II

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	2	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to teach students about the machinery used at farm.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
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.	5
UNIT-II	Air cleaning, cooling, lubrication fuel supply and hydraulic control system of a tractor, Familiarization with Power transmission system : clutch, gear box, differential and final drive of a tractor , Tractor types, Cost analysis of tractor power and attached implement.	5
UNIT-III	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.	5
PRACTICAL:		
	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 inter-cultivation equipment, Familiarization with harvesting and threshing machinery.	30

Course Outcomes:

After taking the course, students will be able to:

1. To learn about various sources of farm power and their uses.
2. To learn about the working of IC Engines and their uses in modern equipments.
3. To learn about various parts of tractors and their mechanism.
4. To learn about the financial aspects of using farm power.



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Recommended Books

1. Michael, A.M. and T.P. Ojha.(1987) Principles of Agricultural Engineering. Vol. I. Jain Brothers, Jodhpur.
2. Rai and Jain (1989) Farm Tractors, Maintenance and Repair. Tata Mc Graw Hill Publ. New Delhi.
3. Srivastava, A.C. (1989) Elements of Farm Machinery. Oxford IBH Publ. Company, New Delhi.
4. Singhal, O.P.(1989) Elements of Agricultural Engineering, Vol. I & III. Suraj Prakashan, Allahabad.
5. Sahay and Jagdishwar,(1990) Element of Agricultural Engineering. Agro. Book Agency, New Chitragupta Nagar, Patna.

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Soil and Water Conservation Engineering

SUBJECT CODE: ASWE 1201

SEMESTER: II

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	2	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to teach about the soil and water conservation theory and practices

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
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.	5
UNIT-II	Soil loss estimation by universal Loss Soil Equation. Soil loss measurement techniques. Principles of erosion control: Introduction to contouring, strip cropping. Contour bund. Graded bund and bench terracing.	5
UNIT-III	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.	5
PRACTICAL:		
	General status of soil conservation in India. Calculation of erosion index. Estimation of soil loss. Measurement of soil loss. Preparation of contour maps. Design of grassed water ways. Design of contour bunds. Design of graded bunds. Design of bench terracing system. Problem on wind erosion.	30

Course Outcomes:

After taking the course, students will be able to:

1. To learn about various causes of soil erosion and forms of water erosion.
2. Students will learn about contour strip cropping designed to minimize soil erosion and contour bunds which can save soils from erosion.
3. Knowledge about grassed waterways designed to move surface water across farmland without causing soil erosion and various water harvesting techniques.
4. Students will be able to understand the wind erosion, centrifugal pumps and various pressurized irrigation methods.



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Recommended Books:

1. Majumdar, D.K.(2004) Irrigation Water Management- Principles and Practice. Prentice Hall of India , New-Delhi.
2. Reddy,S.R. (2000) Principles of Crop Production , Kalyani Publishers, New-Delhi.
3. Lenka, D. (1999) Irrigation and Drainage . Kalyani Publishers, New-Delhi. 1999
4. Sankara Reddy, G.H. and Yellamanda Reddi, T. (1995) Efficient use of Irrigation Water. Kalyani Publishers, New Delhi.
5. Parihar, S.S. and Sandhu, B.S. (1978) Irrigation of Field Crops- Principles and Practices,ICAR, NewDelhi.

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Fundamentals of Crop Physiology

SUBJECT CODE: ABOT 1201

SEMESTER: II

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	2	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to introduce the students with crop physiology.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
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.	4
UNIT-II	Mineral nutrition of Plants: Functions and deficiency symptoms of nutrients, nutrient uptake mechanisms. Photosynthesis: Light and Dark reactions, C ₃ , C ₄ and CAM plants. Respiration: Glycolysis, TCA cycle and electron transport chain.	5
UNIT-III	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.	6
PRACTICAL:		
	Study of plant cells, structure and distribution of stomata, imbibitions, osmosis, plasmolysis, measurement of root pressure, rate of transpiration, Separation of photosynthetic pigments through paper chromatography, Rate of transpiration, photosynthesis, respiration, tissue test for mineral nutrients, estimation of relative water content, Measurement of photosynthetic CO ₂ assimilation by Infra Red Gas Analyser (IRGA).	30

Course Outcomes:

After taking the course, students will be able to:

1. To learn about role of crop physiology in crop health.
2. Students will learn about identification of deficiency symptoms of nutrients.
3. To understand the metabolic and synthetic pathway of biomolecules.
4. To know the difference between C₃, C₄ and CAM plant.



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Recommended Books:

1. N.K. Gupta & Sunita Gupta, Plant Physiology. Oxford & IBH Publication, New Delhi 2004
R.L. Agarwal, Seed Technology, Oxford & IBH Publication, New Delhi 1995
2. J.B. Salisbury and C.W. Ross. Plant Physiology, Wadswar Publishing Company, Belmont, California 1992

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Fundamentals of Agricultural Economics
SUBJECT CODE: AECN 1201
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	0	2

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Course objective: The course objective is to teach basics of economics.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
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 behavior. Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare. Agricultural economics: meaning, definition, characteristics of agriculture, importance and its role in economic development. Agricultural planning and development in the country. <i>Demand:</i> meaning, law of demand, demand schedule and demand curve, determinants, utility theory; law of diminishing marginal utility, equi-marginal utility principle. Consumer's equilibrium and derivation of demand curve, concept of consumer surplus	10
UNIT-II	Elasticity of demand: concept and measurement of price elasticity, income elasticity and cross elasticity. Production: process, creation of utility, factors of production, input output relationship. <i>Laws of returns:</i> Law of variable proportions and law of returns to scale. <i>Cost:</i> Cost concepts, short run and long run cost curves. Supply: Stock v/s supply, law of supply, supply schedule, supply curve, determinants of supply, elasticity of supply. Market structure: meaning and types of market, basic features of perfectly competitive and imperfect markets. Price determination under perfect competition; short run and long run equilibrium of firm and industry, shut down and break even points. Distribution theory: meaning, factor market and pricing of factors of production. Concepts of rent, wage, interest and profit.	09
UNIT-III	National income: Meaning and importance, circular flow, concepts of national income accounting and approaches to measurement, difficulties in measurement. Population: Importance, Malthusian and Optimum population theories, natural and socio-economic determinants, current policies and programmes on population control. Money: Barter system of exchange and its problems, evolution, meaning and functions of money, classification of money, money supply, general price index, inflation and deflation. Banking: Role in modern economy, types of banks, functions of commercial and central bank, credit creation policy. Agricultural and public finance: meaning, micro v/s macro finance, need for agricultural finance, public revenue and public expenditure. <i>Tax:</i> meaning, direct and indirect taxes, agricultural taxation, VAT. <i>Economic systems:</i> Concepts of economy and its functions, important features of capitalistic, socialistic and mixed economies,	11



	elements of economic planning.	
PRACTICAL:		
	N.A.	

Course Outcomes:

After taking the course, students will be able to:

1. To identify elements of business success in agriculture and food-processing as well as elements that determine economic role of agriculture in national economy.
2. Propose methods of micro- and macroeconomic decision making in agriculture in different agro-ecological and agro-economic circumstances.
3. Describe and explain models of production, supply and demand of agricultural and food products on national and international markets
4. Understand the macroeconomics aspects of the economy as they affect the agricultural sector.

Recommended Books:

1. G.B. Jathar and S.G. Beri, (1996) Elementary Principles of Economics, Oxford University Press (10th Edition), Delhi.
2. S.K. Mishra and V.K. Puri (1996) Indian Economy, Himalaya Publishing House, New Delhi
3. P.A. Samuelson & W.D. Nordhaus (1987) Economics, McGraw-Hill, Singapore
4. K.K. Dewett and J.D. Verma (1986) Elementary Economic Theory, S.Chand & Company, New Delhi.

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Agricultural Microbiology

SUBJECT CODE: AMIC1201

SEMESTER: II

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	2	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to teach about microbiology from agriculture point of view.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	Introduction. Microbial world: Prokaryotic and eukaryotic microbes. Bacteria: cell structure, chemoautotrophy, photo autotrophy, growth.	4
UNIT-II	Bacterial genetics: Genetic recombination- transformation, conjugation and transduction, plasmids, transposon. Role of microbes in soil fertility and crop production: Carbon, Nitrogen, Phosphorus and sulphur cycles.	5
UNIT-III	Biological nitrogen fixation-symbiotic, associative and aysmbiotic. Azolla, blue green algae and mycorrhiza. Rhizosphere and phyllosphere. Microbes in human welfare: silage production, biofertilizers, biopesticides, biofuel production and biodegradation.	6
PRACTICAL:		
	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 <i>Rhizobium</i> from legume root nodule. Isolation of <i>Azotobacter</i> from soil. Isolation of <i>Azospirillum</i> from roots. Staining and microscopic examination of microbes.	30

Course Outcomes:

After taking the course, students will be able to:

1. Student will understand the basic microbial structure.
2. Student will understand the function and study the comparative characteristics of prokaryotes and eukaryotes.
3. To know the various Physical and Chemical growth requirements of bacteria
4. Impart knowledge about production of beneficial bacteria.



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Recommended Books:

1. Mukherjee, N. and Ghosh T.(1998) Agricultural Microbiology. Kalyani Publishers, New Delhi.
2. Pelczar, Jr. Michel J. Chan, E.C.S. and Krieg, Noel R.(1997) Microbiology. Tata McGraw - Hill Edition, India.
3. Mukherjee, N. and Ghosh T. (1998) Agricultural Microbiology, Kalyani Publishers, New Delhi.
4. Rao, N.S.(2000) Soil Microbiology, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Basic Statistics

SUBJECT CODE: BMAT 2353

SEMESTER: II

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	2	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to teach basic statistics to the students.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
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	5
UNIT-II	Definition of Correlation, Scatter Diagram. Karl Pearson's Coefficient of Correlation. Linear Regression Equations. Introduction to Test of Significance, One sample & two sample test t for Means, Chi-Square Test of Independence of Attributes in 2 × 2 Contingency Table.	5
UNIT-III	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.	5
PRACTICAL:		
	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.	30



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Course Outcomes:

After taking the course, students will be able to:

1. Acquaintance with some basic concepts in statistics.
2. Making familiar with some elementary statistical *viz.* measures of central tendency, dispersion.
3. Interpretation of statistical methods. Skewness and Kurtosis.
4. Analysis of data pertaining to statistical methods.

Recommended Books:

1. C.H. Goulden, Method of Statistical Analysis.
2. G.W. Snedecor and W.G. Cochran, Statistical Methods.
3. R.G. Steel and J.H. Torrie, Principles and Procedures of Statistics (with special reference to Biological Sciences)
4. V.G. Panse and P.V. Sukhatme, Statistical Methods for Agricultural workers.
5. .Ram Singh Chandel, A Handbook of Agricultural Statistics.
6. R.Rangaswamy, A Text Book of Agricultural Statistics.

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



THIRD SEMESTER

Subject		Contact Hours/Week			Credit	Evaluation Scheme (% of Total Marks)					ETE Duration (Hours)
Code	Title	L	T	P		CWA	LWA	MTE	ETE	Total	
Core Courses											
AAGR 2102	Crop Production Technology-I (Kharif Crops)	1	---	---	1	16	---	24	60	100	3
	Lab	---	---	2	1	---	60	---	40	100	3
AASH 2101	Livestock and Poultry Management	2	---	---	2	16	---	24	60	100	3
	Lab	---	---	2	1	---	60	---	40	100	3
AENT 2101	Fundamentals of Entomology	3	---	---	3	16	---	24	60	100	3
	Lab	---	---	2	1	---	60	---	40	100	3
APBG 2102	Fundamentals of Plant Breeding	2	---	---	2	16	---	24	60	100	3
	Lab	---	---	2	1	---	60	---	40	100	3
AVEG 2101	Production Technology for Vegetable and Spices	1	---	---	1	16	---	24	60	100	3
	Lab	---	---	2	1	---	60	---	40	100	3
AENV 2101	Environmental Studies and Disaster Management	3	---	---	3	16	---	24	60	100	3
	Lab	---	---	---	---	---	60	---	40	100	3
AECN 2102	Agricultural Finance and Cooperation	2	---	---	2	16	---	24	60	100	3
	Lab	---	---	2	1	---	60	---	40	100	3
Ability Enhancement Compulsory Courses											
ACSE 2101	Agricultural Informatics	1	---	---	1	16	---	24	60	100	3
	Lab	---	---	2	1	---	60	---	40	100	3
Total		15	0	14	22						

L-- Lecture

T-- Tutorial

P---Practical

CWA Class work Assessment

LWA Lab work Assessment

MTE Mid Term Exam

ETE End Term Exam



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

SYLLABUS

SEMESTER-III



SUBJECT TITLE: Crop Production Technology-I (*Kharif* crops)

SUBJECT CODE: AAGR 2102

SEMESTER: III

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	2	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course aims to educate the students about the basic knowledge of crop production technology.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of <i>Kharif</i> crops: Cereals – rice, maize, sorghum, pearl millet and finger millet.	5
UNIT-II	Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of <i>Kharif</i> crops: pulses-pigeonpea, mungbean and urdbean; oilseeds- groundnut, sesame and soybean.	5
UNIT-III	Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of <i>Kharif</i> crops: fibre crops- cotton & Jute; forage crops-sorghum, maize, cowpea, cluster bean and napier grass.	6
PRACTICAL:		
	Rice nursery preparation, transplanting of rice, sowing of soybean, pigeonpea and mungbean. maize, groundnut and cotton, effect of seed size on germination and seedling vigour of kharif season crops, effect of sowing depth on germination of kharif crops, identification of weeds in kharif season crops, top dressing and foliar feeding of nutrients, study of yield contributing characters and yield calculation of kharif season crops, study of crop varieties and important agronomic experiments at experimental farm. study of forage experiments, morphological description of kharif season crops, visit to research centres of related crops.	30

Course Outcomes:

After taking the course, students will be able to:

1. In the course study the students will be able to know about origin, geographical distribution, and economic importance of Kharif crops
2. In the course study the students will be able to know about Soil and climatic requirements, varieties, cultural practices and yield of Kharif crops.
3. Analysis of comparative benefits of the different kharif crops
4. Constraints in production of oilseeds and pulses maybe identified through course content



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Recommended Books:

1. Rathore, P.S. 2000. Techniques and Management of Field Crop Production, Agrobios (India), Jodhpur.
2. Singh, Chhida, Singh, Prem and Singh, Rajbir. 2003. Modern Techniques of Raising Field Crops, Oxford & IBH Publishing Co., New Delhi.
3. Panda, S.C.2012. Modern Concepts and Advance Principles in Crop Production. Agrobios (India), Jodhpur
4. Singh, S.S.and Singh, Rajesh. 2013. Crop Management Under Irrigated and Rainfed Conditions. Kalyani Publishers, New Delhi.
5. Singh, S.S.and Singh, Rajesh. 2015. Principles and Practices of Agronomy (5th Re-set), Kalyani Publishers, New Delhi, Kalyani Publishers, Ludhiana.

****Instruction to Question Paper setter:** The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Livestock and Poultry Management

SUBJECT CODE: AASH 2101

SEMESTER: III

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	2	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to teach the students about the basic knowledge of Livestock and Poultry Management

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
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.	10
UNIT-II	Incubation, hatching and brooding. Management of growers and layers. Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry. Improvement of farm animals and poultry. Digestion in livestock and poultry.	10
UNIT-III	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.	10
PRACTICAL:		
	External body parts of cattle, buffalo, sheep, goat, swine and poultry. Handling and restraining of livestock. Identification methods of farm animals and poultry. Visit to IDF and IPF to study breeds of livestock and poultry and daily routine farm operations and farm records. Judging of cattle, buffalo and poultry. Culling of livestock and poultry. Planning and layout of housing for different types of livestock. Computation of rations for livestock. Formulation of concentrate mixtures. Clean milk production, milking methods. Hatchery operations, incubation and hatching equipments. Management of chicks, growers and layers. Debeaking, dusting and vaccination. Economics of cattle, buffalo, sheep, goat, swine and poultry production.	30



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Course Outcomes:

After taking the course, students will be able to:

1. Develop animal production and management systems by integrating knowledge of animal genetics, nutrition, reproduction, and other relevant disciplines and applying scientific and quantitative reasoning to solve real-world challenges.
2. Locate, critically evaluate, and apply information from scholarly animal science literature and other sources to expand personal understanding and knowledge of animal sciences
3. Communicate effectively about animal sciences to a range of audiences, both orally and in writing, using appropriate traditional and emerging media.
4. Engage actively and effectively in discussion of complex issues relevant to the animal sciences

Recommended Books:

1. Eigan, W.M., and Paul, R., 2005. Dairy cattle feed, Johan Willey & Sons, New York
2. Kumar, A., Animal Husbandry, 2006. Discovery Publishing House, New Delhi
3. Singh, H., 2011. Handbook of Animal Husbandry, I.C.A.R. Publications, New Delhi

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Fundamentals of Entomology

SUBJECT CODE: AENT 2101

SEMESTER: III

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	2	4

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to teach the students about the basic knowledge of Entomology.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	Entomology - definition , history, importance and scope. Insects - their importance, place and dominance in animal kingdom. Integument, moulting , body regions and segmentation. Morphology and Anatomy of an insect (Grasshopper/Blister beetle). Modifications and functions of mouth parts, antennae, legs and wings. Wing venation. Endoskeleton. Sense organs.. Metamorphosis. Types of larvae and pupae.	16
UNIT-II	Definition and biotype, sub-species, species, genus, family and order. Classification of insecta up to order, sub-orders and agriculturally important families. Insect morphology - introduction, environment, effect of biotic and abiotic factors. Biotic potential, environmental resistance and causes of pest outbreaks. Pest surveillance & forecasting. Categories of pests.	15
UNIT-III	Cultural, mechanical, physical, legislative, chemical and biological control. IPM, its tools and limitations. Insecticides - classification, toxicity and formulation. Novel insecticides. Insecticide Act. Application techniques of spray fluids. Symptoms of poisoning and antidotes.	15
PRACTICAL:		
	Collection and preservation of insects including immature stages. Morphology and anatomy of Grasshopper/Blister beetle. Different types of antennae, mouth parts, legs and wings. Types of larvae and pupae. Study of insect orders, suborders and families of agricultural importance. Study of ecosystems. Pest surveillance IPM practices. Insecticides and their formulations. and spraying techniques.	30

Course Outcomes:

After taking the course, students will be able to:

1. To be able to identify morphological characteristics, feeding habit and habitat of agriculturally important insect-pest.
2. To be able to apply concepts and analytical approaches in evolutionary biology, genetics and other areas of insect biology
3. To be able to categorize insects based on basic ecological, behavioural, morphological, physiological, or developmental attributes.



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

4. To be able to examine insects deeply within a biological level of analysis and make strategies for successful pest management strategy

Recommended Books:

1. Chapman .R.F.1981. Insect Structure and Function, ELBS Publishers New Delhi.
2. David B.V. and Ananthakrishnan .T.N. 2003. General and Applied Entomology, 2nd Ed. Mc graw Hill publishing Co. Ltd. New Delhi.
3. Mathur and Upadhyay, 2005. A Text Book of Entomology, Aman Publishing House, Meerut.
4. Richards O.W. and Davies R.G. 1977. Imm's General Text Book of Entomology, Vol. I & II. Chapman and Hall, London.
5. Snodgrass R.E .2001. Principles of Insect Morphology, CBS Publishers and Distributors, New Delhi.

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Fundamentals of Plant Breeding

SUBJECT CODE: APBG 2102

SEMESTER: III

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	2	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to teach the students about the basic knowledge of Plant Breeding.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
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, introduction; Centre of origin/diversity, component of Genetic variation.	10
UNIT-II	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; Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties.	10
UNIT-III	Breeding methods in asexually propagated crops, clonal selection and hybridization; Wide hybridization and pre-breeding; Polyploidy in relation to plant breeding, mutation breeding-methods and uses; 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.	10
PRACTICAL:		
	Plant Breeder's kit, Study of germplasm of various crops. Study of floral structure of self-pollinated and cross pollinated crops. Emasculation and hybridization techniques in self & cross pollinated crops. Consequences of inbreeding on genetic structure of resulting populations. Study of male sterility system. Handling of segregation populations. Methods of calculating mean, range, variance, standard deviation, heritability. Designs used in plant breeding experiment, 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.	30



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Course Outcomes:

After taking the course, students will be able to:

1. Establish the commercial plant breeding company to developed new superior crops varieties.
2. Serve the quality food in the market by developing high nutritive varieties
3. Increase the farm yield to get higher income on farm by developing higher yield crop varieties.
4. To start a consultant company to guide & supply the better varieties to the farmers.

Recommended Books:

1. Alard, R.W. (2000).Principles of Plant Breeding. John Willey & Sons, New York.
2. Chahal, G.S. and S.S. Gosal.(2002).Principles and Procedures of Plant Breeding: Biotechnological and Conventional Approaches. Narosa Publishing House, New Delhi.
3. Singh, B.D. (2005). Plant Breeding. Kalyani Publishing House, New Delhi.
4. Singh, P. (2001). Essentials of Plant Breeding-Principles and Methods. Kalyani Publishing House, New Delhi.
5. Jain,H.K. and M.C. Kharkwal. (2004). Plant Breeding- Mendelian to Molecular Approach. Narosa Publishing House, New Delhi.
6. Sharma, A.K. (2005). Breeding Technology of Crop Plants (Edt.). Yash Publishing House, Bikaner.

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Production Technology for Vegetables and Spices

SUBJECT CODE: AVEG 2101

SEMESTER: III

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	2	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to teach the students about the basic knowledge of production of Vegetables and Spices.

Sr. No	Contents	Contact Hours
THEORY		
UNIT-I	Importance of vegetables & spices in human nutrition and national economy, brief about origin, area, production.	5
UNIT-II	Improved varieties and cultivation practices such as time of sowing, sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting, storage.	6
UNIT-III	physiological disorders, disease and pest control and seed production of important vegetable and spices	5
PRACTICAL		
	Identification of vegetables & spices crops and their seeds. Nursery raising. Direct seed sowing and transplanting. Study of morphological characters of different vegetables & spices. Fertilizers applications. Raising of nursery of vegetables & spices. Vegetables & spices seed extraction. Harvesting & preparation for market. Economics of vegetables and spices cultivation.	30

Course Outcomes:

After taking the course, students will be able to:

1. Students will understand practical knowledge on specialized production techniques of vegetables and spices.
2. Students understand will Importance of vegetables & spices in human nutrition improved and national economy.
3. Students will knowledge about quality requirement and production and techniques
4. Managing skill for solving field problems

Recommended Books:

1. Dhaliwal M.S., (2008) Handbook of vegetable crops, Kalyani Publishers, Ludhiana
2. Das , P.C. (1993) Vegetable crops of India, Kalyani Publishers, Ludhiana
3. Chauhan, D.V. (1993) Vegetable production in India, S. Ram Prasad and Sons, Agra
4. Anonymous (2019) Package of Practices for Vegetable crops, P.A.U. Publications Ludhiana,
5. Purthy, J.S. (1996). Spices and Condiments. National Book Trust.



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Instruction to Question Paper setter The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Agricultural Informatics
SUBJECT CODE: ACSE 2101
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	2	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course aims at introducing the students to learning of the Agricultural Informatics for used in the agricultural technology

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	Introduction to Computers, Anatomy of Computers, Memory Concepts, Units of Memory, Operating System, definition and types, Applications of MS-Office for creating, Editing and Formatting a document, Data presentation, tabulation and graph creation, statistical analysis, mathematical expressions, Database, concepts and types, creating database, uses of DBMS in Agriculture, Internet and World Wide Web (WWW), Concepts and components. Computer Programming, General Concepts, Introduction to Visual Basic, Java, Fortran, C/ C++, etc	5
UNIT-II	Concepts and standard input/output operations. e-Agriculture, concepts, design and development. Application of innovative ways to use information and communication technologies (IT) in Agriculture. Computer Models in Agriculture: statistical, weather analysis and crop simulation models, concepts, structure, inputs-outputs files, limitation, advantages and application of models for understanding plant processes, sensitivity, verification, calibration and validation.	5
UNIT-III	IT application for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management, Smartphone mobile apps in Agriculture for farm advises, market price, postharvest management etc; Geospatial technology, concepts, techniques, components and uses 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 and crop calendars using IT tools.	6
PRACTICAL:		
	Study of Computer Components, accessories, practice of important DOS Commands. Introduction of different operating systems such as windows, Unix/ Linux, Creating, Files & Folders, File Management. Use of MS-WORD and MS Power-point for creating, editing and presenting a scientific document. MS-EXCEL - Creating a spreadsheet, use of statistical tools, writing expressions, creating graphs, analysis of scientific data, handling macros. MS-ACCESS: Creating Database, preparing queries and reports, demonstration of Agri-information system. Introduction to World Wide Web (WWW) and its components. Introduction of programming languages such as Visual Basic, Java, Fortran, C, C++. Hands on practice on Crop Simulation	30



	Models (CSM), DSSAT/Crop-Info/CropSyst/ Wofost. Preparation of Inputs file for CSM and study of model outputs, computation of water and nutrient requirements of crop using CSM and IT tools. Use of smart phones and other devices in agro-advisory and dissemination of market information. Introduction of Geospatial Technology, for generating information important for Agriculture. Hands on practice on preparation of Decision Support System. Preparation of contingent crop planning.	
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Course Outcomes:

After taking the course, students will be able to:

1. Understand analogy of computer
2. Basic knowledge of MS Office
3. Use of IT application and different IT tools in Agriculture
4. Use of Decision support systems, Agriculture Expert System and Soil Information Systems in Agriculture

Recommended Books:

1. Vanitha, G. (2011). Agri informatics. New India Publishing Agency
2. Chakravarthy, R. (2006). Agri Informatics: An Introduction (Industry Series) ICFAI University Press

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Agricultural Finance and Cooperation

SUBJECT CODE: AECN 2102

SEMESTER: III

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	2	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to introduce students with the basics of finance and management in agriculture.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	Agricultural Finance- meaning, scope and significance, credit needs and its role in Indian agriculture. Agricultural credit: meaning, definition, need, classification. Credit analysis: 4 R's, and 3C's of credits. Sources of agricultural finance: institutional and non-institutional sources, commercial banks, social control and nationalization of commercial banks, Micro financing including KCC.	10
UNIT-II	Lead bank scheme, RRBs, Scale of finance and unit cost. An introduction to higher financing institutions – RBI, NABARD, ADB, IMF, world bank, Insurance and Credit Guarantee Corporation of India. Cost of credit. Recent development in agricultural credit. Preparation and analysis of financial statements – Balance Sheet and Income Statement. Basic guidelines for preparation of project reports- Bank norms – SWOT analysis.	10
UNIT-III	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.	10
PRACTICAL:		
	Determination of most profitable level of capital use. Optimum allocation of limited amount of capital among different enterprise. Analysis of progress and performance of cooperatives using published data. Analysis of progress and performance of commercial banks and RRBs using published data. Visit to a commercial bank, cooperative bank and cooperative society to acquire firsthand knowledge of their management, schemes and procedures. Estimation of credit requirement of farm business – A case study. Preparation and analysis of balance sheet – A case study. Preparation and analysis of income statement – A case study. Appraisal of a loan proposal – A case study. Techno-economic parameters for preparation of projects. Preparation of Bankable projects for various agricultural products and its value added products. Seminar on selected topics.	30



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Course Outcomes:

After taking the course, students will be able to:

1. Explain the broad feature of Indian financial institutions with instruments to control credit in the country.
2. Effectively narrate the kinds and components of money with its regulatory system and be aware of the functions, objectives and limitations of commercial bank.
3. Understand the conditions of financial markets and its impact in the economy.
4. Apply economics principles to understand the conduct and performance of the agricultural industry.

Recommended Books:

1. S.Subba Reddy.(1996). Agricultural Finance and management.1996 Vijay Nicole
2. Black. J.D. (1955). Introduction of Economics for Agriculture, Fromount Pierre National Press
3. Bond H. and Cunnighum (1921). Farm Management, John Wiley and Sons Inc, New York

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Environmental Studies and Disaster Management

SUBJECT CODE: AENV 2101

SEMESTER: III

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to introduce students with basic knowledge of related environmental issues and disaster and its consequences.

Contents of Syllabus

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	Environment- basic concepts and issues. Natural Resources - renewable and non-renewable resources and their sustainable utilization. Ecosystem concepts - types, structure and functions of ecosystem. Pollution of water and air - types, causes, methods of measurement, standards and management. Solid and liquid waste management-treatment and disposal. Vulnerability, adaptability, sustainable development. International conventions and treaties.	10
UNIT-II	Biodiversity and conservation - value, utilization and threats. Threatened/endangered species and hotspots. Human population and environment - environment and human health, Environment management laws and conservation projects of Government of India. Climate change - history and future projections, greenhouse gases, effects and mitigation strategies.	10
UNIT-III	Natural Disasters - causes, phenomenon and impacts; Global and national events of disaster management; Agricultural Disaster phenomenon, events and their management; Acts and policies in India. Man Made Disasters - Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste, road accidents, rail accidents and sea accidents.	10
PRACTICAL:		
	N.A.	

Course Outcomes:

After taking the course, students will be able to:

1. Appreciate concepts and methods from ecological and physical sciences and their application in environmental problem solving. Interdisciplinary branches of environment and their scopes.
2. Concepts of natural resources, Food resources, mineral resources, Concept of non Conventional energy resources, types and various applications of renewable resources and current potentials of energy resources.



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

3. Ecosystem Links between environmental components and their role and types of ecosystems.
4. Meaning and nature of natural disasters, their types and effects and management.

Recommended Books:

1. Agrawal K.C. (2001). Fundamentals of Environmental Biology Nidhi Publishers (India)
2. Sharma P.D. (2015). Ecology and Environment Rastogi Publications
3. Dhaliwal, G.S. and Kukal, S.S. (2005). Essentials of Environmental Science Kalyani Publishers
4. Sharma P.D.(2005). Environmental Biology and Toxicology. Rastogi Publications

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



FOURTH SEMESTER

Subject		Contact Hours/Week			Credit	Evaluation Scheme (% of Total Marks)					ETE Duration (Hours)
Code	Title	L	T	P		CWA	LWA	MTE	ETE	Total	
Core Courses											
AAGR 2203	Crop Production Technology-II (Rabi Crops)	1	---	---	1	16	---	24	60	100	3
	Lab	---	---	2	1	---	60	---	40	100	3
AAGR 2204	Farming Systems and Sustainable Agriculture	2	---	---	2	16	---	24	60	100	3
	Lab	---	---	---	---	---	---	---	---	---	---
AAMT 2201	Introductory Agrometeorology and Climate Change	1	---	---	1	16	---	24	60	100	3
	Lab	---	---	2	1	---	60	---	40	100	3
AFLS 2201	Production Technology for Ornamental Crops, MAP and Landscaping	1	---	---	1	16	---	24	60	100	3
	Lab	---	---	2	1	---	60	---	40	100	3
AHRT 2202	Production Technology for Fruit and Plantation Crops	1	---	---	1	16	---	24	60	100	3
	Lab	---	---	2	1	---	60	---	40	100	3
APBG 2203	Principles of Seed Technology	1	---	---	1	16	---	24	60	100	3
	Lab	---	---	4	2	---	60	---	40	100	3
ASOL 2202	Problematic Soils and their Management	2	---	---	2	16	---	24	60	100	3
	Lab	---	---	---	---	---	---	---	---	---	---
AEST 2201	Renewable Energy and Green Technology	1	---	---	1	16	---	24	60	100	3
	Lab	---	---	2	1	---	---	---	---	100	---
APBT 2201	Fundamentals of Plant Biotechnology	2	---	---	2	16	---	24	60	100	3
	Lab	---	---	2	1	---	---	---	---	100	---
Elective Courses											
AHRT-2203 AENT-2202 APPT-2202 AAGR-2205	Introduction to Protected Cultivation/ Introduction to Beekeeping/ Introduction to mushroom cultivation/ Introduction to Non-conventional Farming	2	---	---	2	16	---	24	60	100	3



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

	Lab	---	---	2	1	---	----	----	----	100	----
Total		14	0	18	23						

L-- Lecture

T-- Tutorial

P---Practical

CWA Class work Assessment

LWA Lab work Assessment

MTE Mid Term Exam

ETE End Term Exam



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

SYLLABUS

SEMESTER-IV



SUBJECT TITLE: Crop Production Technology-II (Rabi crops)

SUBJECT CODE: AAGR 2203

SEMESTER: IV

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	2	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: Teaching of the course aims at familiarizing the students with both theory and raising of various *rabi* crops in the field

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of <i>Rabi</i> crops; cereals –wheat and barley, pulses-chickpea, lentil, peas.	5
UNIT-II	Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of <i>Rabi</i> crops; oilseeds-rapeseed, mustard and sunflower and linseed.	5
UNIT-III	Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of <i>Rabi</i> crops; sugar crops-sugarcane; other crops- potato, Forage crops-berseem, lucerne and oat.	6
PRACTICAL:		
	Sowing methods of wheat and sugarcane, identification of weeds in rabi season crops, study of morphological characteristics of rabi crops, study of yield contributing characters of rabi season crops, yield and juice quality analysis of sugarcane, study of important agronomic experiments of <i>rabi</i> crops at experimental farms. Study of <i>rabi</i> forage experiments, oil extraction of medicinal crops, visit to research stations of related crops.	60

Course Outcomes:

After taking the course, students will be able to:

1. To know the Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of rabi crops
2. Identify weeds in rabi season crops, Pulses-chickpea, lentil, peas; oilseeds-rapeseed, mustard and sunflower; sugar crops-sugarcane,
3. Through proper knowledge of irrigation scheduling in rabi crops, additional area can be increased of low water requiring crops.
4. It will be helpful to know about basic morphological characteristics of *rabi* crops.



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Recommended Books:

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

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

SUBJECT TITLE: Farming Systems and Sustainable Agriculture

SUBJECT CODE: AAGR 2204

SEMESTER: IV

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	0	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to introduce students with basics of farming system and sustainable agriculture.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
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.	5
UNIT-II	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.	5
UNIT-III	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.	6

Course Outcomes:

After taking the course, students will be able to:

1. The student will be able to explain the major aspects of agricultural practices and traditions through time and throughout the world.
2. The student will be able to explain in general the relationships among culture, economics, politics, science, and agricultural development.
3. The student will study and analyze the refereed-journal articles, texts, and practices that represent the perspectives of different societies and agricultural traditions
4. To show how agricultural scientists are attempting to minimize agricultural pollution and sustain food production adequate for the world's population.



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Recommended Books:

1. Walia, U.S., Walia, S.S., Kler, D.S. and Singh Dalip, 2011. Science of Agronomy, Scientific Publishers
2. Reddy, S.R. 2012. Agronomy of Field Crops. Kalyani Books, New Delhi
3. ICAR. 2010. Handbook of Agriculture (6th edition), Indian Council of Agricultural Research, New Delhi.
4. Reddy, S.R. 2012. Agronomy of Field Crops. Kalyani Books, New Delhi

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Introductory Agrometeorology and Climate Change

SUBJECT CODE: AAMT 2201

SEMESTER: IV

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	2	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to teach basics of agrometeorology and climate change.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	Agrometeorology - definition, practical utility and scope. General climatology. Structure and composition of earth's atmosphere. Elements and factors of weather and climate - temperature, pressure, wind, solar radiation and moisture. Impact of climate on crops and livestock distribution and production.	5
UNIT-II	Agroclimatic indices - definitions and applications in agriculture. Effect of environmental factors on crop growth. Weather hazards in agriculture. Climatic classifications. Agroclimatic regions of Punjab and India. Basics of field microclimate modification.	5
UNIT-III	Introduction to monsoons. Elementary aspects of weather forecasting. Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture.	6
PRACTICAL:		
	Site selection for Agrometeorological Observatory. Project on setting up, recording and maintenance of instruments in a meteorological observatory. Measurement of temperature, rainfall, evaporation, atmospheric pressure, sunshine duration, solar radiation, wind direction, wind speed and relative humidity. Study of weather forecasting and synoptic charts. Processing, presentation and interpretation of climatic data in relation to crops.	30

Course Outcomes:

After taking the course, students will be able to:

1. To understand roles of agrometeorology in agriculture and its relation to other areas of agriculture to acquaint with recent developments in agrometeorology with historical development of climate change.
2. Agrometeorology or Agricultural meteorology studies meteorological and hydrological factors in relation to agriculture.
3. Weather and climate are the factors determining the success or failure of agriculture.
4. To develop weather based agro advisories.



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Recommended Books:

1. Sacheti, A.K. (1985). Agricultural Meteorological Instructional–cum-Practical Manual (Ed.) NCERT Publication, New Delhi.
2. Lal, D.S. (2005) Climatology, Sharda Pustak Bhawan, Allahabad..
3. Varshneya, M.C. and Balakrishna, Pillai. (2003). Text book of Agricultural Meteorology. ICAR, New-Delhi.
4. Sahu, D.D. (2007). Agrometeorology and Remote sensing: Principles and Practices , Agrobios (India) , Jodhpur.
5. Murithy, K, and Radha, V. (1995). Practical Manual on Agricultural Meteorology , Kalyani Publishers, New-Delhi
6. Panda, S.C. (2012). Modern Concepts and Advance Principles in Crop Production. Agrobios (India), Jodhpur
7. Balasubramaniyan, P. and Palaniappan, S.P. (2016). Principles and Practices of Agronomy, Agrobios (India), Jodhpur

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Production Technology for Ornamental Crops, MAP and Landscaping

SUBJECT CODE: AFLS 2201

SEMESTER: IV

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	2	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to introduce students with basics of production of ornamental crops, medicinal and aromatic plants and landscaping

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	Importance and scope of ornamental crops, medicinal and aromatic plants and landscaping. Principles of landscaping. Landscape uses of trees, shrubs and climbers.	5
UNIT-II	Production technology of important cut flowers like rose, gerbera, carnation, liliun and orchids under protected conditions and gladiolus, tuberose, chrysanthemum under open conditions. Package of practices for loose flowers like marigold and jasmine under open conditions.	5
UNIT-III	Production technology of important medicinal plants like asparagus, aloe, costus, Cinnamomum, periwinkle, isabgol and aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, rose, geranium, vetiver. Processing and value addition in ornamental crops and MAPs produce.	6
PRACTICAL:		
	Identification of Ornamental plants. Identification of Medicinal and Aromatic Plants. Nursery bed preparation and seed sowing. Training and pruning of Ornamental plants. Planning and layout of garden. Bed preparation and planting of MAP. Protected structures – care and maintenance. Intercultural operations in flowers and MAP. Harvesting and post harvest handling of cut and loose flowers. Processing of MAP. Visit to commercial flower/MAP unit.	30

Course Outcomes:

After taking the course, students will be able to:

1. To evaluate natural herbal products from an economic perspective.
2. To use medicinal and aromatic herbs sustainably.
3. To set up business related to medicinal, aromatic and landscaping.
4. To develop effective ideas related to collecting, processing and marketing herbal natural sources.



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Recommended Books:

1. Arora, J.S.(2010). Introductory Ornamental Horticulture. Kalyani Publishers
2. Swarup Vishnu, (1997) Ornamental Horticulture. MacMillan India Ltd.
3. Raj Desh, (2011). Floriculture at Glance. Kalyani Publishers

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Production Technology for Fruit and Plantation Crops

SUBJECT CODE: AHRT 2202

SEMESTER: IV

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	2	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: To introduce students with the basics of production of ornamental crops, maps and landscaping

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
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,	5
UNIT-II	Production technologies for the cultivation of major fruits- litchi, papaya, sapota, apple, pear, peach, walnut, almond.	5
UNIT-III	Production technologies for the cultivation of minor fruits- date, ber, pineapple, pomegranate, jackfruit, strawberry, plantation crops-coconut, arecanut, cashew, tea, coffee & rubber.	6
PRACTICAL:		
	Seed propagation. Scarification and stratification of seeds. Propagation methods for fruit and plantation crops. Description and identification of fruit. Preparation of plant bio regulators and their uses, Important pests, diseases and physiological disorders of above fruit and plantation crops, Visit to commercial orchards.	30

Course Outcomes:

After taking the course, students will be able to:

1. To know importance of different fruit crops and plantation crops.
2. Students will understand canopy architecture
3. Students will understand package of practices for the major crops like mango, banana, guava, lemon, pineapple, coffee, coconut and rubber.
4. To understanding the concept of high density planting in different fruit crops.

Recommended Books:

1. J.S Bal, (2014). Fruit Growing. 3rd Revised ed. Kalyani Publishers
2. Ranjeet Singh (1992). Fruits. National Book Trust
3. T.K Chattopadhyay, A Text Book on Pomology. Kalyani Publishers (Vol I)
4. T.K Chattopadhyay. A Text Book on Pomology (Tropical Fruits). (Vol II) Kalyani Publishers
5. T.K Chattopadhyay. A Text Book on Pomology (Subtropical Fruits) (Vol III). Kalyani Publishers
6. T.K Chattopadhyay. A Text Book on Pomology (Temperate Fruits) (Vol IV). Kalyani Publishers
7. T.K Bose (2002). Tropical and Subtropical Fruits. Naya Udyog (Vol I and II)



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Principles of Seed Technology

SUBJECT CODE: APBG 2203

SEMESTER: IV

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	4	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: To acquaint students with the fundamentals and principles of seed technology.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
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.	5
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,	5
UNIT-III	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.	6
PRACTICAL:		
	Seed production in major cereals: Wheat, Rice, Maize, Sorghum and Bajra. Seed production in major pulses: Urd, Mung, Pigeonpea, Lentil, Gram, Fieldpea. Seed production in major oilseeds: Soybean, Rapeseed and Mustard. Seed production in vegetable crops. Seed sampling and testing: Physical purity, germination, viability, etc. Seed and seedling vigour test. Genetic purity test: Grow out test and electrophoresis. Seed certification: Procedure, Field inspection, Preparation of field inspection report. Visit to seed production farms, seed testing laboratories and seed processing plant.	30

Course Outcomes:

After taking the course, students will be able to:



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

1. Start a seed production program for fill full the requirement of quality seed in market and increase the income.
2. Storage the pure variety seed to avoid the availability crises of pure variety seed due to adverse environmental conditions
3. To increase the farm income by producing high yielding disease free quality seed and decrease the cost of cultivation also.
4. Production of hybrid seed of different crops to increase the farm income

Recommended Books

1. Agarwal, R.L.(1991).Seed Technology. Oxford & IBH Publishing Co. Delhi
2. Agarwal, P.K. (1999). Seed Technology. ICAR, New Delhi.
3. Sen, Subir and Ghosh, Nabinanda.(1999). Seed Science and Technology. Kalyani Publishers. New Delhi.
4. Khare, Dhirenra and Bhale, Mohan S.(2000). Seed Technology. Scientific Publishers (India), Jodhpur.
6. Joshi, A.K. and Singh, B.D.(2013). Seed Technology. Kalyani Publishers, New Delhi.
7. Basavraju,G. V., Ravishankar, P. and Gowdiperu, Sarika. (2014). A Text book of Seed Science and Technology. Kalyani Publishers.

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Problematic Soils and their Management

SUBJECT CODE: ASOL 2202

SEMESTER: IV

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	0	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course aims at teaching about different types of problematic soil and its management.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
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.	10
UNIT-II	Irrigation water – quality and standards, utilization of saline water in agriculture. Remote sensing and GIS in diagnosis and management of problem soils.	10
UNIT-III	Multipurpose tree species, bio remediation through MPTs of soils, land capability and classification, land suitability classification. Problematic soils under different Agroeco systems.	10
PRACTICAL:		
	N.A.	

Course Outcomes:

After taking the course, students will be able to:

1. To provide knowledge about waste land and problematic soils in India and management of the soils.
2. To provide knowledge about management of the soils.
3. Knowledge of different reclamation and management practices for the development of the soils.
4. To Understand different factors responsible for saline , sodic and acidic soils and their properties.

Recommended Books:

1. Bear F.E (1964). Chemistry of the Soil. Oxford & IBH.
2. Jurinak J.J. (1978). Salt-affected Soils. Department of Soil Science & Biometeorology. Utah State Univ.
3. USDA.(1954). Diagnosis and improvement of Saline and Alkali Soils. Oxford & IBH.
4. ISSS, 2009. Fundamentals of Soil Science. Divison of Soil Science, IARI, New Delhi
5. Cirsan Paul, J. (1985). Principles of remote sensing. Longman, New York.
6. Richards, L.A. (1954). Diagnosis and improvement of saline and alkali soils. USDA Hand book No. 60, Washington, DC USA.



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Renewable Energy and Green Technology

SUBJECT CODE: AEST 2201

SEMESTER: IV

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	2	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to introduce the students with renewable energy and green technology.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	Classification of energy sources, contribution of these of sources in agricultural sector, Familiarization with biomass utilization for biofuel production and their application,	5
UNIT-II	Familiarization with types of biogas plants and gasifiers, biogas, bioalcohol, biodiesel and biooil production and their utilization as bioenergy resource, introduction of solar energy, collection and their application.	5
UNIT-III	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.	6
PRACTICAL:		
	Familiarization with renewable energy gadgets. To study biogas plants, To study gasifier, To study the production process of biodiesel, To study briquetting machine, To study the production process of bio-fuels. Familiarization with different solar energy gadgets. To study solar photovoltaic system: solar light, solar pumping, solar fencing. To study solar cooker, To study solar drying system. To study solar distillation and solar pond.	30

Course Outcomes:

After taking the course, students will be able to:

1. To understand the role of renewable sources in agriculture sector.
2. To understand the bio fuel production
3. To understand the bio fuel production applications in today's world.
4. To understand and utilizing the solar energy in various aspects.

Recommended Books:

1. N. S. Rathore. A.K. Kurchania, N.L. Panwar. (2007). Non Conventional Energy Sources, Himanshu Publications.
2. N.S. Rathore. A. K. Kurchania, N.L. Panwar. (2007). Renewable Energy, Theory and Practice, Himanshu Publications.
3. Tiwari, G. N. and Mishra Rajeev Kumar (2012) Advanced Renewable Energy Sources. Royal Society of Chemistry



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Fundamentals of Plant Biotechnology

SUBJECT CODE: APBT 2201

SEMESTER: IV

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	2	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to teach basics of plant biotechnology.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	Concepts. History of Plant Tissue Culture and Plant Genetic Engineering. Scope and importance in crop improvement. Nutritional requirements of in-vitro cultures. Micro propagation. Anther culture. Pollen culture. Ovule culture. Embryo culture. Test tube fertilization. Endosperm culture.	10
UNIT-II	Somaclonal variation. Somatic embryogenesis and synthetic seed production technology. Protoplast isolation, culture, manipulation and fusion. Products of somatic hybrids and hybrids- applications in crop improvement.	10
UNIT-III	Genetic engineering. Restriction enzymes. Vectors for gene transfer. Gene cloning. Direct and indirect method of gene transfer. Transgenic plants and their applications. Blotting techniques. DNA finger printing. DNA based markers - RFLP, AFLP, RAPD, SSRs SNPs. DNA Probes. QTL Mapping.MAS and its application in crop improvement.	10
PRACTICAL:		
	Requirements for Plant Tissue Culture Laboratory. Techniques in Plant Tissue Culture. Media components and preparations. Sterilization techniques and Inoculation of various explants. Aseptic manipulation of various explants. Callus induction and Plant Regeneration. Micro propagation of important crops. Anther, Embryo and Endosperm culture. Hardening / Acclimatization of regenerated plants. Somatic embryogenesis and synthetic seed production. Isolation of protoplast. Demonstration of Culturing of protoplast. Demonstration of isolation of DNA. Demonstration of gene transfer techniques- direct methods. Demonstration of gene transfer techniques- indirect methods. Demonstration of confirmation of genetic transformation. Demonstration of gel-electrophoresis techniques.	30



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Course Outcomes:

After taking the course, students will be able to:

1. Role of cell organelles and their functions
2. Application of plant tissue culture in crop improvement
3. Tackle the problems in convention breeding
4. Plant tissue culture is a area of entrepreneurship

Recommended Books:

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

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Introduction to Protected Cultivation

SUBJECT CODE: AHRT-2203

SEMESTER: IV

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	2	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to teach about protected cultivation

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	Protected cultivation- importance and scope, Status of protected cultivation in India and world. Types of protected structures based on site and climate. Cladding material involved in greenhouse/ poly house. Greenhouse design, environment control, artificial lights, Automation.	10
UNIT-II	Soil preparation and management, Substrate management. Types of benches and containers. Irrigation and fertigation management. Propagation and production of quality planting material of horticultural crops.	10
UNIT-III	Greenhouse cultivation of important horticultural crops – rose, carnation, chrysanthemum, gerbera, orchid, anthurium, liliun, tulip, tomato, bell pepper, cucumber, strawberry, pot plants, etc. Cultivation of economically important medicinal and aromatic plants. Off-season production of flowers and vegetables. Insect pest and disease management.	10
PRACTICAL:		
	Raising of seedlings and saplings under protected conditions, use of protrays in quality planting material production, Bed preparation and planting of crop for production, Inter cultural operations, Soil EC and pH measurement, Regulation of irrigation and fertilizers through drip, fogging ad misting.	30

Course Outcomes:

After taking the course, students will be able to:

1. Learn about types of protected structures based on site and climate. Cladding material involved in greenhouse/ poly house.
2. Learn about Soil preparation and management, Substrate management. Types of benches and containers.
3. Learn about Greenhouse cultivation of important horticultural crops – rose, carnation, chrysanthemum, gerbera, orchid, anthurium, liliun, tulip, tomato, bell pepper, cucumber, strawberry, pot plants, etc.
4. Learn about Inter cultural operations, Soil EC and pH measurement, Regulation of irrigation and fertilizers through drip, fogging ad misting.



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Recommended Books

1. Singh D K and Peter V K (2013), Protected Cultivation of Horticultural Crops Seeds. NIPA
2. Swain S C (2014) Precision Farming in Horticulture: Approaches and Strategies. Narindrar Publishing House.
3. Henderson, S.M. and R.L. Perry (1955). Agricultural Process Engineering. John Willy Sons, New York.

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Introduction to Beekeeping

SUBJECT CODE: AENT-2202

SEMESTER: IV

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	2	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course aims to acquaint the students about fundamentals of beekeeping.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	History of beekeeping; classification of bees; honey bee species. Morphology, anatomy, life cycle, colony organization and division of labour in honey bees. Economic importance of honeybees.	5
UNIT-II	Honey bees as pollinators and study of various honeybee products such as Honey, royal jelly, pollens, wax, venom. Nutritional significance of various products of honey bees. Basic requirements to start beekeeping.	5
UNIT-III	Study of bee flora and its availability. Study of symptoms, nature of damage and management of bee diseases. Bee enemies: Life cycle, seasonal history, nature of damage and their management.	6
PRACTICAL:		
	Identification of different species and castes of honeybees. Study of morphology of Italian honeybee, <i>Apis mellifera</i> with respect to head, thorax and abdomen; fore-, middle- and hind legs; mouth parts; fore and hind wings; poison glands etc. Study of internal organs of honey bee, specifically the honey stomach as part of the alimentary canal and pharyngeal glands. Study of foraging behavior of honey bees. Acquaintance with nectar, pollen, apicultural equipment and machinery. Visit to apiaries and industrial set up to familiarize students with the process of beekeeping and products of honey bees.	30

Course Outcomes:

After taking the course, students will be able to:

1. Learn about history of beekeeping; classification of bees; honey bee species. Morphology, anatomy, life cycle, colony organization and division of labour in honey bees.
2. Learn about Economic importance of honeybees.
3. Learn about Soil preparation and management, Substrate management. Types of benches and containers.
4. Study of bee flora and its availability.

Recommended Books:

- 1) Singh, S., 1975. Bee keeping in India – ICAR, New Delhi., 214p.
- 2) Sunita, N.D, Guled, M.B, Mulla, S.R and Jagginavar, 2003, Beekeeping, UAS Dharwad
- 3) Mishra, R.C. and Rajesh Gar. 2002. Prospective in Indian Apiculture. Agrobios, Jodhpur.
- 4) Singh, D. and Singh, D.P. 2006. A Hand Book of Beekeeping, Agrobios (India). 98
- 5) Paul DeBach and Devid Rosen 1991. Biological control by natural enemies. Cambridge University Press; 2 edition (27 June 1991)



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Introduction to mushroom cultivation

SUBJECT CODE: APPT-2202

SEMESTER: IV

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	2	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to teach about micro propagation technologies.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	Taxonomic classification, nomenclature and important feature of edible fungi, distinction between edible and poisonous taxa and characters of poisonous varieties of mushrooms.	5
UNIT-II	Nutritional, physiological and ecological parameters for growing edible variety of mushroom. Cultivation technology of edible varieties of mushrooms including substrate pretreatment, its preparation, composting methodologies.	5
UNIT-III	Spawn types and preparation of spawn, growing methodologies of different varieties of mushrooms for small, medium and commercial scale and crop management practices.	6
PRACTICAL:		
	Methodology of substrate pretreatment, preparation and composting of substrate, Master culture and spawn preparation techniques, cultivation methodology for commonly cultivated varieties of mushrooms and post harvest shelf life of these mushrooms. Visit to mushroom industry.	30

Course Outcomes:

After taking the course, students will be able to:

1. Learn about Taxonomic classification, nomenclature and important feature of edible fungi, distinction between edible and poisonous taxa and characters of poisonous varieties of mushrooms.
2. Learn about Nutritional, physiological and ecological parameters for growing edible variety of mushroom.
3. Learn about Cultivation technology of edible varieties of mushrooms including substrate pretreatment, its preparation, composting methodologies.
4. Study about spawn types and preparation of spawn, growing methodologies of different varieties of mushrooms

Recommended Books:

1. B.C.Suman and V.P. Sharma. 2007. Mushroom cultivation in India, Daya Books, New Dehli
2. Agrios GN.2005. Plant Pathology. 5th edition. Academic Press, New York.
3. V.P. Sharma. 2011. Diseases and pest of mushrooms. Agribios, India

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Introduction to Non-conventional Farming

SUBJECT CODE: AAGR-2205

SEMESTER: IV

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	2	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Objective and outcome of course: The course objective is to teach the students about the basic knowledge of Entomology.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	Concept principles and different methods of non-conventional farming system. Organic Farming: Introduction, production requirements, introduction, recycling of organic residues. Use of biocontrol agents and biopesticides.	10
UNIT-II	Quality considerations - certification, labeling and accreditation, processors, marketing and exports. Hydroponics, aeroponics, aquaponics : Meaning, significance and basic methods of hydroponics.	10
UNIT-III	Importance, concepts and procedures for Trough Culture; Urban and Peri-urban Farming. Green House farming permaculture, vertical growing and aquaculture.	10
PRACTICAL:		
	Raising of vegetable and other crops through organic sources. Vermicomposting. Vegetable and ornamental nursery raising, under protected cultivation. Familiarization with the different types of Hydroponic system- NFT – Nutrient Film Technique, DFT – Deep Flow Technique, Ebb & Flow, Wick System, Drip method, Aeroponics and their pros and cons. Green house structure and functioning.	30

Course Outcomes:

After taking the course, students will be able to:

1. Learn about Organic Farming and recycling of organic residues.
2. Use of biocontrol agents and biopesticides.
3. Learn about Quality considerations - certification, labeling and accreditation, processors, marketing and exports.
4. Learn about Hydroponics, aeroponics, aquaponics : Meaning, significance and basic methods of hydroponics.

Recommended Books:

1. Biswas R. K (2014) Organic Farming in India . [ND Publishers](#), New Delhi.
2. Bansal, M (2010). Basics of Organic Farming, [Cloudbtail India](#).
3. Mason J (2004). How to grow different plants in hydroponics. A Viacom Company
4. Hansen G (2019) Aeroponics Gardening: The perfect guide to small and large scale aeroponics

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.

FIFTH SEMESTER

Subject		Contact Hours/Week			Credit	Evaluation Scheme (% of Total Marks)					Exam Duration (Hours)
Code	Title	L	T	P		CWA	LWA	MTE	ETE	Total	
Core Courses											
AAGR 3104	Practical Crop Production-I (<i>Kharif</i> Crops)	---	---	---	---	----	---	----	----	----	---
	Lab	---	---	4	2	----	60	----	40	100	3
AAGR 3105	Rainfed Agriculture and Watershed Management	1	---	---	1	16	---	24	60	100	3
	Lab	---	---	2	1	----	60	----	40	100	3
AENT3102	Pests of Crops, Stored Grains and their Management	2	---	---	2	16	---	24	60	100	3
	Lab	---	---	2	1	----	60	----	40	100	3
APPT 3102	Diseases of Field and Horticultural Crops and their Management-I	1	---	---	1	16	----	24	60	100	3
	Lab	---	---	2	1	----	60	----	40	100	3
APBG3104	Crop Improvement-I (<i>Kharif</i> Crops)	1	---	---	1	16	----	24	60	100	3
	Lab	---	---	2	1	----	60	----	40	100	3
APBG3105	Intellectual Property Rights	1	---	---	1	16	----	24	60	100	3
	Lab	---	---	---	---	---	----	---	----	---	----
ASOL 3103	Manures, Fertilizers and Soil Fertility Management	2	---	---	2	16	----	24	60	100	3
	Lab	---	---	2	1	---	----	----	----	100	----
ASOL 3104	Geoinformatics, Nanotechnology and Precision Farming	1	---	---	1	16	----	24	60	100	3
	Lab	---	---	2	1	---	----	----	----	100	----
AECN3103	Agricultural Marketing, Trade and Prices	2	---	---	2	16	----	24	60	100	3
	Lab	---	---	2	1	---	----	----	----	---	----
Elective Courses											
AHRT-3104/ AENT-3103/ APPT- 3103/	Principles and Practices of Protected Cultivation Principles and Practices of Beekeeping Principles and practices of mushroom cultivation Principles and Practices of non-conventional farming	2	---	---	2	16	----	24	60	100	3



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

AAGR 3106											
	Lab	---	---	2	1	---	----	----	----	100	----
	Educational tour**	---	---	----	----	-----n	----	----	----	----	----
	Lab	---	---	4	2	---	---	----	----	----	----
Total		13	0	20	23						

L-- Lecture

T-- Tutorial

P---Practical

CWA Class work Assessment

LWA Lab work Assessment

MTE Mid Term Exam

ETE End Term Exam



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

SYLLABUS

SEMESTER-V



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

SUBJECT TITLE: Practical Crop Production-I (*Kharif Crops*)

SUBJECT CODE: AAGR 3104

SEMESTER: V

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	4	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course aims at educating the students about the basic knowledge of production of *kharif* crops

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
	N.A.	
PRACTICAL:		
	Crop planning, raising field crops in multiple cropping systems: Field preparation, seed treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.	60

Course Outcomes:

After taking the course, students will be able to:

1. In the course study the students will be able to know about origin, geographical distribution, and economic importance of Kharif crops
2. In the course study the students will be able to know about Soil and climatic requirements, varieties, cultural practices and yield of Kharif crops.
3. Analysis of comparative benefits of the different kharif crops
4. Constraints in production of oilseeds and pulses may be identified through course content.

Recommended Books:

1. Balasubramaniyan, P. and Palaniappan, S.P.(2016). Principles and Practices of Agronomy (2nd edition), Agrobios (India), Jodhpur.
2. Reddy, S. R. (2016). Principles of Agronomy (5th edition), Kalyani Publishers, Ludhiana.
3. Singh, S.S. and Singh, Rajesh. (2015). Principles and Practices of Agronomy (5th Re-set), Kalyani Publishers, New Delhi, Kalyani Publishers, Ludhiana.

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Rainfed Agriculture and Watershed Management

SUBJECT CODE: AAGR 3105

SEMESTER: V

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	2	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to teach the students about the basic knowledge of rainfed agriculture and watershed management

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	Rainfed agriculture: Introduction, types, History of rainfed agriculture & watershed in India; Problems and prospects of rainfed agriculture in India ; Soil and climatic conditions prevalent in rainfed areas.	5
UNIT-II	Drought: types, effect of water deficit on physio- morphological characteristics of the plants, Mechanism of crop adaptation under moisture deficit condition; Water harvesting: importance, its techniques, Efficient utilization of water through soil and crop management practices.	5
UNIT-III	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.	6
PRACTICAL:		
	Studies on climate classification, studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons. Studies on cropping pattern of different dry land areas in the country and demarcation of dry land 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 viz; mulching, plant density, depth of sowing, thinning and leaf removal 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.	30

Course Outcomes:

After taking the course, students will be able to:



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

1. Students will gain knowledge on the water use by agriculture, known as the Comprehensive Assessment of Water Management in Agriculture, coordinated by the International Water Management Institute, noted a close correlation between hunger, poverty and water. However, it concluded that there was much opportunity to raise productivity from rainfed farming. fundamentals of horticulture.
2. Rainfall water can be use for a larger area by suitable watershed management techniques
3. Student will study about rainfed agriculture which is predominant in all over India and develop watersheds to manage agricultural practices during off-season.
4. Conservation of soil by adopting latest soil conservation techniques will help in obtaining higher production of Rainfed crops.

Recommended Books:

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

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Pests of Crops and Stored Grains and their Management

SUBJECT CODE: AENT 3102

SEMESTER: V

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	2	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course aims at teaching students about the pests of crops and stored grains and their management.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	Distribution, biology, symptoms of damage and management strategies of insect pests of rice, sorghum, maize, cotton, groundnut, sugarcane, ragi (Eleusine coracana), wheat, sunhemp, pulses, castor, safflower, sunflower, mustard, brinjal, bhindi and tomato.	09
UNIT-II	Distribution, biology, symptoms of damage and management strategies of insect pests of cruciferous and cucurbitaceous vegetables, potato, sweet potato, chillies, mango, citrus, grapevine, banana, pomegranate, guava, sapota, ber, apple, coconut, tobacco, coffee, tea, turmeric, onion, coriander, garlic, ginger, ornamental plants.	10
UNIT-III	Factors responsible for Stored grain losses. Important pests namely insects, mites, rodents, birds and micro-organisms associated with stored grains and agricultural products. Systematic position, identification, distribution, host range, biology, nature and extent of damage of stored grain insect pests. Preventive and curative measures for the management of insect pests of stored grains.	11
PRACTICAL		
	Identification of insect pests, their damage symptoms and management of rice, sorghum, maize, wheat, sugarcane, cotton, pulses, solanaceous, malvaceous, cruciferous and cucurbitaceous vegetables, chilli, mango, citrus, sapota and stored grains. Assessment of damage by the stored grain insect pests. Determination of moisture content of grain. Methods of grain sampling under storage condition. Visit to Indian Storage Management and Research Institute at Ludhiana and nearest FCI godowns.	30

Course Outcomes:

After taking the course, students will be able to:

1. Familiarized with identification of different insect pest of field, horticulture, ornamentals, vegetables and stored grains at the field level.
2. Understand how insects affect animal and Plant health and agricultural production, and be able to safely manipulate populations of beneficial and destructive species in habitats and in production agro-ecosystems with minimal environmental impact.



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

3. To understand identification of nature of damage and symptoms caused by the pest so suitable technique of pest management can be apply for effective control.
4. Management of crop pest through Integrated Pest Management approach without side effect on plant, animal and environment health.

Recommended Books:

1. David, B.V. and Ramamurthy, V.V. (2016). Elements of Economic Entomology, 8th Ed. Popular Book Depot, Chennai.
2. Mathur and Upadhyay (2005). A Text Book of Entomology, Aman Publishing House, Meerut.
3. Pruthi H S (1950) Pests of Stored Graishn and their Products
4. Srivastava, K.P. (2004). A Text Book of Entomology, Vol.I & II, Kalyani Publishers, New Delhi.
5. Reddy, P. Parvatha (2010). Insect, Mite and Vertebrate Pests and their Management in Horticultural Crops. Scientific Publishers, Jodhpur.

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Diseases of Field and Horticultural Crops and their

SUBJECT CODE: APPT 3102

SEMESTER: V

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	2	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to teach the students about the diseases of field and horticultural crops and their management.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
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, khaira and tungro; Maize: stalk rots, downy mildew, leaf spots; Sorghum: smuts, grain mold and anthracnose, Bajra : downy mildew and ergot; Groundnut: early and late leaf spots, wilt Soybean: Rhizoctonia blight, bacterial spot, seed and seedling rot and mosaic;	5
UNIT-II	Symptoms, etiology, disease cycle and management of major diseases of following crops: Pigeonpea: Phytophthora blight, wilt and sterility mosaic; Finger millet: Blast and leaf spot; black & green gram: Cercospora leaf spot and anthracnose, web blight and yellow mosaic; Castor: Phytophthora blight; Tobacco: black shank, black root rot and mosaic. Horticultural Crops: Guava: wilt and anthracnose; Banana: Panama wilt, bacterial wilt, Sigatoka and bunchy top; Papaya: foot rot, leaf curl and mosaic, Pomegranate: bacterial blight;	5
UNIT-III	Symptoms, etiology, disease cycle and management of major diseases of following crops: 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.	6
PRACTICAL:		
	Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory. Field visit for the diagnosis of field problems. Collection and preservation of plant diseased specimens for Herbarium; Note: Students should submit 50 pressed and well-mounted specimens.	30

Course Outcomes:

After taking the course, students will be able to:



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

1. Student will know the common pathogens of different diseases.
2. Student acquire the knowledge about etiology, and symptoms of these diseases which helps in diagnosis of the diseases of field and horticultural crops
3. By knowing means of dispersal of these diseases suitable management methods can be applied.
4. Eco-friendly and economically suitable management practices may be adopted.

Recommended Books:

1. Rangaswami, G. and Madhwan, A, (1998). Diseases of crop plants in India PHI Learning Pvt. Ltd.
2. Thind, T.S.(2007). Diseases of field crops and their management. Daya Books.
3. Gupta VK and Sharma SK (2000). Diseases of Fruit Crops. Kalyani Publ., New Delhi.
4. Singh R.S., 2017. Diseases of Fruit Crops. Medtech Publishers
5. Gupta, S.K and Thind, T.S. Disease problems in vegetable production, Scientific Publishers India

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Crop Improvement – I (*Kharif* crops)

SUBJECT CODE: APBG 3104

SEMESTER: V

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	2	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to teach the students about the basic knowledge of crop improvement in *kharif* crops.

Sr. No	Contents	Contact Hours
THEORY		
UNIT-I	Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fibres; fodders and cash crops; vegetable and horticultural crops; Plant genetic resources, its utilization and conservation Floral biology, study of genetics of qualitative and quantitative characters;. Ideotype, concept and climate resilient crop varieties for future.	5
UNIT-II	Important concepts of breeding self pollinated, cross pollinated and vegetatively propagated crops; Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional).	6
UNIT-III	Seed production technology in self pollinated, cross pollinated and vegetatively propagated crops. Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeon pea, etc	5
PRACTICAL		
	Emasculation and hybridization techniques in different crop species; viz., Rice, Maize, Sorghum, Pearl Millet, Ragi, Pigeon pea, Urdbean, Mungbean, Soybean, Groundnut, Sesame, Caster, Cotton, Cowpea, Pearl millet and Tobacco. Maintenance breeding of different <i>kharif</i> 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 <i>Kharif</i> 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.	30

Course Outcomes:

After taking the course, students will be able to:



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

1. In this course Students learn importance of wild relative to produce new varieties of kharif crop.
2. Learner learns Gene preservation method for further use to improve kharif crops.
3. Learner learns to applies breeding method to improve kharif crops
4. Learner learns new genetic approaches to achieve a definite ideotype of kharif crop.

Recommended Books

1. Chopra, V.L. (2000). Breeding of Field Crops. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Manjit S. Kang (2004). Crop Improvement: Challenges in the Twenty-First Century (Edt). International Book Distributing Co. Lucknow.
3. Poehlman, J.M. (1987). Breeding of Field Crops. AVI Publishing Co. INC, East Port, Connecticut, USA.
4. Ram, H.H. and H.G. Singh. (1994). Crop Breeding and Genetics. Kalyani Publishers, New Delhi.
5. Sharma, A.K. (2005). Breeding Technology of Crop Plants (Edt.). Yash Publishing House, Bikaner.
6. Poehlman, J. M. and Sleper, D. A. (2006). Breeding Field Crops. Blackwell Publishing

Instruction to Question Paper setter The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Intellectual Property Rights

SUBJECT CODE: APBG 3105

SEMESTER: V

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	0	1

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to learning of the Agricultural Informatics for use in the agricultural technology

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY		
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.	5
UNIT-II	Patents Act 1970 and Patent system in India, patentability, process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement, compulsory licensing, Patent Cooperation Treaty, Patent search and patent database. Origin and history including a brief introduction to UPOV for protection of plant varieties, Protection of plant varieties under UPOV and PPV&FR Act of India, Plant breeders rights, Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights.	5
UNIT-III	Traditional knowledge-meaning and rights of TK holders. Convention on Biological Diversity, International treaty on plant genetic resources for food and agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing.	6
PRACTICAL:		
	N.A.	

Course Outcomes:

After taking the course, students will be able to:

1. Skill to understand the concept of intellectual property rights.
2. Develops procedural knowledge to Legal System and solving the problem relating to intellectual property rights.
3. Skill to pursue the professional programs in Company Secretaryship, Law, Business, Agriculture, International Affairs, Public Administration and Other fields.
4. Establishment of Legal Consultancy and service provider.



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Recommended Books:

1. Ganguli P.(2001). Intellectual Property Rights: Unleashing Knowledge Economy. McGrawHill.
2. Saha R. (Ed.). (2006). Intellectual Property Rights in NAM and Other Developing Countries: A Compendium on Law and Policies. Daya Publ. House.

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Manures, Fertilizers and Soil Fertility Management

SUBJECT CODE: ASOL 3103

SEMESTER: V

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	2	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to introduce students with different manures, fertilizers and soil fertility management practices.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY		
UNIT-I	Introduction and importance of organic manures, properties and methods of preparation of bulky and concentrated manures. Green/leaf manuring. Integrated nutrient management. Chemical fertilizers: classification, composition and properties of major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, Complex fertilizers, nano fertilizers.	10
UNIT-II	Soil amendments, Fertilizer Storage, Fertilizer Control Order. History of soil fertility and plant nutrition. criteria of essentiality. role, deficiency and toxicity symptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants. Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients.	10
UNIT-III	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.	10
PRACTICAL:		
	Introduction of analytical instruments and their principles, calibration and applications, Colorimetry and flame photometry. Estimation of available N in soils. Estimation of available P in soils. Estimation of available K. Estimation of available S in soils. Estimation of available Ca and Mg in soils. Estimation of available Zn in soils. Estimation of N in plants. Estimation of P in plants. Estimation of K in plants. Estimation of S in plants.	30



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Course Outcomes:

After taking the course, students will be able to:

1. Knowledge of different manure and fertilizers used in different crops according to soil condition
2. To understand essentiality of plant nutrients
3. To understand essentiality mechanism of nutrient transport to plant and factor affecting nutrient availability.
4. To be able to know about procedure of soil testing and establish soil testing laboratory in future as a entrepreneur.

Recommended Books:

1. Basak, R.K.(2000). Fertilizers, Kalyani Publishers, Ludhiana
2. Mehra R.K. (2004). Text book of Soil Science, ICAR New Delhi
3. Tisdale, S.L. Nelson, W.L. Beaton, J.D. and Havlin, J.L. (1991). Soil fertility and fertilizers. Prentice Hall of India, Pvt .Ltd, New Delhi.
4. Yawalkar, K.S. and Agarwal. J.P. (1992). Manure and fertilizers. Agriculture- Horticulture Publishing House, Nagpur.
5. Chopra, S.L. and Kanwar, J.S. (1991). Analytical Agriculture, Chemistry, Kalyani Publishers, New Delhi.

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Geo informatics, Nano-technology and Precision Farming

SUBJECT CODE: ASOL-3104

SEMESTER: V

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	2	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to introduce students with basic knowledge of geo informatics and nano-technology for precision farming.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture; Geo-informatics- definition, concepts, tool and techniques; their use in Precision Agriculture. Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies.	5
UNIT-II	Spatial data and their management in GIS; Geodesy and its basic principles; Remote sensing concepts and application in agriculture; Image processing and interpretation; Global positioning system (GPS), components and its functions; System Simulation- Concepts and principles, Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs.	5
UNIT-III	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 tillage, seed, water, fertilizer, plant protection for scaling-up farm productivity.	6
PRACTICAL:		
	Introduction to GIS software, spatial data creation and editing. Introduction to image processing software. Visual and digital interpretation of remote sensing images. Generation of spectral profiles of different objects. Supervised and unsupervised classification and acreage estimation. Multispectral remote sensing for soil mapping. Creation of thematic layers of soil fertility based on GIS. Creation of productivity and management zones. Fertilizers recommendations based of VRT and STCR techniques. Crop stress (biotic/abiotic) monitoring using geospatial technology. Use of GPS for agricultural survey. Formulation, characterization and applications of nanoparticles in agriculture. Projects formulation and execution related to precision farming.	

Course Outcomes:

After taking the course, students will be able to:



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

1. The concept of "doing the right thing in the right place at the right time" has a strong intuitive appeal which gives farmers the ability to use all operations and crop inputs more effectively.
2. Precision agriculture can address both economic and environmental issues that surround production agriculture today.
3. More effective use of inputs results in greater crop yield and/or quality, without polluting the environment.
4. Creating awareness amongst farmers about consequences of applying imbalanced doses of farm inputs like irrigation, fertilizers, insecticides and pesticides.

Recommended Books:

1. Krishna, K.K. 2013. Precision Farming: Soil Fertility and Productivity Aspects. Apple Academic Press
2. Srivastava, G.S. 2014. An Introduction to Geoinformatics. McGraw Hill Education (India) Pvt. Ltd. New Delhi
3. Gupta, R.K. and Subhash Chander. 2008. Principles of Geoinformatics. Jain Brothers, New Delhi.
4. Choudhary, S., 2011. Applied Nanotechnology in Agriculture. Arise Publishers & Distributors

****Instruction to Question Paper setter:** The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Agricultural Marketing, Trade and Prices

SUBJECT CODE: AECN 3103

SEMESTER: V

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	2	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to teach students about agricultural marketing, trade and prices.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
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;	10
UNIT-II	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. marketing channels: Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel; number of channel levels; marketing channels for different farm products; Integration, efficiency, costs and price spread: Meaning, definition and types of market integration; marketing efficiency; marketing costs, margins and price spread;	10
UNIT-III	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.	10
PRACTICAL:		



	Plotting and study of demand and supply curves and calculation of elasticities; Study of relationship between market arrivals and prices of some selected commodities; Computation of marketable and marketed surplus of important commodities; Study of price behaviour over time for some selected commodities; Construction of index numbers; Visit to a local market to study various marketing functions performed by different agencies, identification of marketing channels for selected commodity, collection of data regarding marketing costs, margins and price spread and presentation of report in the class; Visit to market institutions – NAFED, SWC, CWC, cooperative marketing society, etc. to study their organization and functioning; Application of principles of comparative advantage of international trade.	30
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Course Outcomes:

After taking the course, students will be able to:

1. The aim of the course is to give exposure on market concepts, marketing of agricultural commodities, intermediaries involved, domestic and export trade, risk in agricultural marketing, price dynamics and the role of Government in regulation of markets.
2. Know about marketing of agricultural commodities
3. To know the market promotion – advertising, personal selling, sales promotion and publicity
4. Role of Govt. in agricultural marketing

Recommended Books:

1. Acharya, S. S., 2011. Agricultural Marketing in India. N L Agarwal, Oxford & IBH Publishing Company.
2. Panda, S. C., 2007. Farm Management and Agricultural marketing Kalyani Publishers
3. Richard L Kohls, Joseph N., 2011 Marketing of Agricultural Products. Uhl. Prentice Hall India Learning Private Limited

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



Elective Courses

SUBJECT TITLE: Principles and Practices of Protected Cultivation

SUBJECT CODE: AHRT-3104

SEMESTER: V

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	2	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course aims to acquaint the students with the principle and practices of protected cultivation with special emphasis on automated green house.

Contents of syllabus:

Sr. No.	Contents	Contact hours
Theory:		
UNIT-I	Principles of constructing various protected structures. Green house effect.Components of green house and detailed specification. Basic concepts to construct protected structures i.e. automated green house,poly houses,poly tunneles,shady net house and trebches.	10
UNIT-II	Cooling and heating system.Ventilation system and humidity management in green house.Arrangement of pots,benches,portrays etc. Irrigation systems and fertigation management for protected cultivation.	10
UNIT-III	Preparation of artificial growing media and its sterilisation for protected cultivation.Arrangement and preparation of growing beds for various protected structures. Selection of various cladding materials for protected structures.	10
PRACTICAL:		
	Identification and application of various cladding materials for protected structures. Construction and management of low-cost poly house. Installment and maintenance of cooling and heating system under	30



C o u r s e O	greenhouse. Construction and cost estimation of polyhouse and tunnels. Care and maintenance of irrigation and fertigation system under polyhouse. Visits to protected cultivation structures at farmers' and industry levels.	
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Course outcomes:

After taking the course, students will be able to:

1. The aim of the course is to give exposure on market concepts, marketing of agricultural commodities, intermediaries involved, domestic and export trade, risk in agricultural marketing, price dynamics and the role of Government in regulation of markets.
2. The know about marketing of agricultural commodities
3. To know the market promotion – advertising, personal selling, sales promotion and publicity
4. Role of Govt. in agricultural marketing.

Recommended Books:

1. Anonymous,2011.Technical standards for naturally ventilated,fan and pad green house and shade net house,NHB, Gurgaon-Haryana (E-Book).
2. <http://www.fao.org/3/a-i3284e.pdf>(E-book)
3. http://horticulture.ap.nic.in/Section%20wise/MIDH/Documents/P_C_Guidelines.pdf(F-Book)
4. Michael,A.M. and T.P. Ojha.1993. Priciples of agricultural engineering, Voll. Jain Brothers, New Delhi.

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Principles and Practices of Beekeeping

SUBJECT CODE: AENT-3103

SEMESTER: V

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	2	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course aims to acquaint the students with the principles and practices of beekeeping with special; emphasis on Italian honey bees.

Content of syllabus:

Sr. No.	Contents	Contact hours
Theory:		
UNIT-I	Life cycle of <i>Apis mellifera</i> , its colony organisation and division of labour in honey bees. Colony multiplication and seasonal management of honey bee colonies. Swarming, absconding, robbing and drifting management.	10
UNIT-II	Physical and chemical properties of honey; its production, extraction, processing, packaging, transportation and uses. Collection, processing and storage of pollen, propolis, bees wax, bee venom, bee brood and royal jelly.	10
UNIT-III	Mass queen rearing technology. Stationary and migratory beekeeping. Management of bee diseases and bee enemies. Use of honey bee colonies for pollination.	10
PRACTICAL:		
	Requirements for starting beekeeping. Management of <i>Apis mellifera</i> colonies in different seasons. Collection, extraction and processing of honey. Study of bee behaviour while visiting the apiaries. Visits to the beekeeping industry to study hive manufacturing, bee equipment manufacturing, bee equipment manufacturing, honey processing, packaging and its commercial export.	30

Course Outcomes:

After taking the course, students will be able to:

1. Understand life cycle of *Apis mellifera*, its colony organisation and division of labour in honey bees.
2. Know Colony multiplication and seasonal management of honey bee colonies.
3. Get an insight swarming, absconding, robbing and drifting management.
4. Learn collection, processing and storage of pollen, propolis, bees wax, bee venom, bee brood and royal jelly.



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Recommended Books:

1. Singh,S.1975.Bee keeping in India-ICAR,New Delhi.,214p.
2. [Sinha,N.D.](#),[Guled,M.B.](#),[Mulla,S.R](#) and Jagginavar,2003, Beekeeping,UAS Dharwad.
3. Mishra,R.C and Rajesh Gar.2002.Prospective in Indian Apiculture.Agrobios.Jodhpur.
4. Singh,D and Singh,D.P.2006. A handbook of beekeeping,Agrobios (India).98.

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Principles and Practices of Mushroom Cultivation

SUBJECT CODE: APPT-3103 -

SEMESTER: V

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	2	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to teach about the principles, practice and cultivation of mushroom production.

Content of syllabus:

Sr. No.	Contents	Contact hours
Theory:		
UNIT-I	Preparation and pasteurization of the compost necessary to cultivate mushrooms. Selection of appropriate materials to prepare the compost-base materials from various agricultural by-products.	10
UNIT-II	Identify different types of compost-natural and synthetic, formulation of difrent compost. Composting in mushroom cultivation-short and long methods,casing and spawn preparation for mushroom cultivation.Disease control and pest management in cultivation.	10
UNIT-III	Harvesting of mushroom:Assessment of the maturity of mushroom and harvest periods,application of good harvesting practices cut, clean and dry harvested mushroom using approved procedures sort and grade the harvests as per required quality specifications.	10
PRACTICAL:		
	Composting in mushroom cultivation(button and oyster)-preparation and pasteurization,selection of commercially important types of mushroom's spawn,package of practices of white button mushroom and oyster	30



C o u r	mushroom,inspection of mushroom bags or beds for early detection of pests and diseases,methods of harvesting of mushrooms.	
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Course Outcomes:

After taking the course, students will be able to:

1. Understand about preparation and pasteurization of the compost necessary to cultivate mushrooms.
2. Know about selection of appropriate materials to prepare the compost-base materials from various agricultural by-products.
3. Learn composting in mushroom cultivation-short and long methods, casing and spawn preparation for mushroom cultivation.
4. Understand disease control and pest management strategies of mushroom cultivation.

Recommended Books:

1. Singh,S.1975.Bee keeping in India-ICAR,New Delhi.,214p.
2. [Sinha,N.D.](#),[Guled,M.B.](#),[Mulla,S.R](#) and Jagginavar,2003, Beekeeping,UAS Dharwad.
3. Mishra,R.C and Rajesh Gar.2002.Prospective in Indian Apiculture.Agrobios.Jodhpur.
4. Singh,D and Singh,D.P.2006. A handbook of beekeeping,Agrobios (India).98.

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.



SUBJECT TITLE: Principles and Practices of non-conventional farming

SUBJECT CODE: AAGR 3106

SEMESTER: V

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	2	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam: 3 Hrs

Course objective: The objective is to provide the knowledge about various principles and practices of non-conventional farming.

Contents of syllabus

Sr. No.	Contents	Contact hr
Theory		
Unit I	Non-conventional farming- importance, classification and scope; Organic farming – status, strategies to promote, often debated issues; Organic manures - definition, advantages and disadvantages, characteristics of a good organic manure; FYM, compost, vermicompost – principles, resources available, essential requirements, different stages occurring during the process of organic manures and chemical compostion;	10
Unit II	Organic crop production requirements – nutrient management, limiting nutrient losses; Green manuring – classification, crops, advantages and disadvantages; Mulching - role, scope, advantages and disadvantages, different types of mulches, soil solarisation effect of mulching; Bio-fertilizer – classification, benefits, use in agriculture crops and future scope. Organic methods of weed control – cultural, mechanical.	10
Unit III	Soilless Cultivation – definition, importance, scope, classification; Hydroponics - nutrient solutions, growing medium, nutritional disorders, diseases and pest control; Hydroponic production practices of tomatoes, cucumber, capsicum, Chrysanthemum and rose.	10
Practical		
	A field visit to the University organic farming fields; Preparation and maintenance of different organic manures; Comparisons of different organic manures in terms of chemical composition (N) and response to crops; Comparison between organic and conventional farming in relation to yield, quality and soil fertility; Grow green manure crop and compare the nutrients requirement of crops with and without green manuring; Use of mulches and its effect on weeds, yield and quality; Organic produce processing, storage, and transportation; Weed management in organic farm; Growing of vegetable crops such as tomato, cucumber, capsicum etc. in soilless culture; Visit to progressive farmers fields practicing non-conventional and organic farming.	30



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

Course Outcomes:

After taking the course, students will be able to:

1. Learn about importance, classification and scope of non-conventional farming and organic farming.
2. Know about principles of FYM, compost, vermicompost .
3. Learn about classification, advantages and disadvantages of green manuring and mulching.
3. Know about soil-less cultivation –Hydroponics and weed management in organic farm.

Books:

1. Anand, B. Masthihole and Nalina, L. (2020) Organic Farming. *www.Agrimoon.Com* .
2. Biswas, Rajendra Kumar (2014) Organic Farming in India, ND Publishers, New Delhi
3. George F. Van Patton (2004) Hydroponics Basics. Van Patton Publishing, USA.
4. Mishra, Sanjay and Mishra, R. L. (2017) Soilless Production. Daya Publishing House, New Delhi.



SIXTH SEMESTER

Subject		Contact Hours/Week			Credit	Evaluation Scheme (% of Total Marks)					Exam Duration (Hours)
Code	Title	L	T	P		CWA	LWA	MTE	ETE	Total	
Core Courses											
AAGR 3206	Practical Crop Production-II(<i>Rabi</i> Crops)	---	---	---	---	---	---	---	---	---	---
	Lab	---	---	4	2	---	60	---	40	100	3
AAGR 3207	Principles of Organic Farming, protected cultivation and secondary agriculture	2	---	---	2	16	---	24	60	100	3
	Lab	---	---	2	1	---	60	---	40	100	3
AENT3203	Management of Beneficial Insects	1	---	---	1	16	---	24	60	100	3
	Lab	---	---	2	1	---	60	---	40	100	3
AENT 3204	Principles of Integrated Pest and Disease Management	1	---	---	1	16	---	24	60	100	3
	Lab	---	---	2	1	---	60	---	40	100	3
AHRT3203	Post-harvest Management and Value Addition of Fruits and Vegetables	1	---	---	1	16	---	24	60	100	3
	Lab	---	---	2	1	---	60	---	40	100	3
APBG 3206	Crop Improvement-II (<i>Rabi</i> Crops)	1	---	---	1	16	---	24	60	100	3
	Lab	---	---	2	1	---	60	---	40	100	3
APPT 3203	Diseases of Field and Horticultural Crops and their Management-II	1	---	---	1	16	---	24	60	100	3
	Lab	---	---	2	1	---	---	---	---	100	---
APFT 3201	Principles of Food Science and Nutrition	2	---	---	2	16	---	24	60	100	3
	Lab	---	---	---	---	---	---	---	---	---	---
AECN 3204	Farm Management, Production and Resource Economics	1	---	---	1	16	---	24	60	100	3
	Lab	---	---	2	1	---	---	---	---	100	---
Elective Courses											
AHRT-3205 AENT-3205 APPT-3204 AAGR-3207	Commercial Protected Cultivation Commercial Beekeeping Commercial Mushroom Cultivation Commercial Non-conventional Farming	1	---	---	1	16	---	24	60	100	3
	Lab	---	---	4	2	---	---	---	---	100	---



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

	Educational Tour**	---	---	---	---	---	---	---	---	---
	Lab	---	---	4	2	---	---	---	---	---
	Total	12	0	24	22+ 2(NC)					

**** Non-gradual course**

L-- Lecture

T-- Tutorial

P---Practical

CWA Class work Assessment

LWA Lab work Assessment

MTE Mid Term Exam

ETE End Term Exam



Program Name: B.Sc (Hons.) Agriculture
Program Code: AG 311

SYLLABUS

SEMESTER-VI

SUBJECT TITLE: Practical Crop Production-II (*Rabi Crops*)

SUBJECT CODE: AAGR 3206

SEMESTER: VI

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	4	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to introduce students with basic knowledge of practical crop production in *Rabi Crops*.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
	N.A.	
PRACTICAL:		
	Crop planning, raising field crops in multiple cropping systems: Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students	60

Course Outcomes:

After taking the course, students will be able to:

1. In the course study students will be acquainted with the knowledge of profitable crop production technology.
2. It helps to adopt diversified farming system according to available farming situation
3. It will assist to encourage the sustainable agriculture system.
4. Profitable based farming system can we adopted with the help of course content

Recommended Books:

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

SUBJECT TITLE: Principles of Organic Farming, Protected Cultivation & Secondary Agriculture

SUBJECT CODE: AAGR 3207

SEMESTER: VI

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	2	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to learn principles of organic farming, protected cultivation & secondary agriculture

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
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; Choice of crops and varieties; Fundamentals of insect, pest, disease and weed management under organic production; Operational structure of NPOP; Certification process and standards of organic farming;	10
UNIT-II	Processing, leveling, economic considerations and viability, marketing and export potential of organic products. Green house technology: Introduction, Types of Green Houses; Plant response to Greenhouse environment, Planning and design of greenhouses 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 greenhouse heating systems, green house drying.	10
UNIT-III	Cost estimation and economic analysis. 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 dryers. Material handling equipment.	10
PRACTICAL:		
	Visit of organic farms to study the various components and their utilization; Preparation of enrich compost, vermicompost, bio-fertilizers/bio-inoculants and their quality analysis; Indigenous technology knowledge (ITK) for nutrient, insect, pest disease and weed management; Cost of organic production system; Post harvest management; Quality aspect, grading, packaging and handling. Study of different type of green houses based on shape. Determine the rate of air exchange in an active summer winter cooling system. Determination of drying rate of agricultural products inside green house. Study of green house equipments. Visit to various Post Harvest Laboratories. Determination of engineering properties (shape and size, bulk density and porosity of biomaterials).	30

Course Outcomes:

After taking the course, students will be able to:

1. Initiative from Government for organic produce
2. Students get to know about the organic farming practices and procedure for obtaining organic certificates
3. Role of NGOs in producing organic products.
4. To have hands on experience of the selection of crops and varieties for organic produce

Recommended Books:

1. Sharma, A.K., 2002. Biofertilizers for Sustainable Agriculture. Agrobios (India), Jodhpur.
2. Kannaiyan, S. Kumar, K & Govindarajan K. 2004, Biofertilizers Technology. Scientific Publ.
3. Gaur, A.C., 2006. Biofertilizers in Sustainable Agriculture. ICAR, New Delhi.
4. Palaniappan, S.P. and Annadurai, K. 2012. Organic farming theory and practice. Scientific Publishers

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.

SUBJECT TITLE: Management of Beneficial Insects

SUBJECT CODE: AENT 3203

SEMESTER: VI

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	2	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course aims at imparting knowledge to the students relating to beneficial insects with special; focus on their management

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	Importance of beneficial Insects, Beekeeping, pollinating plant and their cycle, 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.	5
UNIT-II	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 pollinator, weed killers and scavengers with their importance.	5
UNIT-III	Species of lac insect, morphology, biology, host plant, lac production – seed lac, button lac, shellac, lac- products. Identification of major parasitoids and predators commonly being used in biological control. Insect orders bearing predators and parasitoids used in pest control and their mass multiplication techniques.	5
PRACTICAL:		
	Honey bee species, castes of bees. Beekeeping appliances and seasonal management, bee enemies and disease. Bee pasturage, bee foraging and communication. Types of silkworm, voltinism and biology of silkworm. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Species of lac insect, host plant identification. Identification of other important pollinators, weed killers and scavengers. Visit to research and training institutions devoted to beekeeping, sericulture, lac culture and natural enemies.	30

Course Outcomes:

After taking the course, students will be able to:

1. Students can adopt apiculture, sericulture and lac culture as an entrepreneur according to agro climatic zone.
2. To understand commercial methods of rearing, equipment, seasonal management, insect pest and disease and important species for commercial use of honey bee, silkworm and lac insect.
3. Identification of different bio control agents (Predator, Parasite and Parasitoids) and their use for sustainable pest management.
4. Learn about mass multiplication technique of biological control agents and established a bio control lab in future as an entrepreneur

Recommended Books:

1. Abrol, D.P. 2013. Beekeeping: A Comprehensive Guide to Bee and Beekeeping, Scientific Publishers, Jodhpur.
2. Anonymous (2012) Sericulture and Silk Industry Statistics. Central Silk Board, India
3. Ghorai, N. (1995) Lac Culture in India

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.

SUBJECT TITLE: Principles of Integrated Pest and Disease Management

SUBJECT CODE: AENT 3204

SEMESTER: VI

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	2	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course will introduce the students to an integrated approach for the control of noxious insect pests of crops and diseases.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
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.	5
UNIT-II	Methods of control of insect pests and diseases: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control. Ecological management of crop environment. Introduction to conventional pesticides for the insect pests and disease management.	5
UNIT-III	Surveillance and forecasting of Insect pests and diseases. Development and validation of IPM module. Implementation and impact of IPM (IPM module for Insect pests and diseases). Safety issues in pesticide uses. Political, social and legal implication of IPM. Case histories of important IPM programmes.	6
PRACTICAL:		
	Identification and nature of damage of important insect pests and diseases. Assessment of crop yield losses, calculations based on economics of IPM, Identification of biocontrol agents, different predators and natural enemies. Mass multiplication of <i>Trichoderma</i> , <i>Pseudomonas</i> , <i>Trichogramma</i> , NPV etc. Plan and assess preventive strategies (IPM module) and decision making. Crop monitoring attacked by insect pests and diseases . Awareness campaign at farmers fields.	30

Course Outcomes:

After taking the course, students will be able to:

1. Students knowledgeable about the effects of biotic and abiotic factors on insect development, population growth, species interactions, physiological requirements and insect behaviour.
2. Students are skilled in determining pest levels and impact on plant and animal hosts and the management of these pests by Integrated Pest Management approach.
3. Learn about biological and chemicals in disease management.
4. Gain the knowledge about IDM modules.

Recommended Books

1. Ciancio, A. and Mukerji, K.G. eds. (2007). General Concepts in Integrated Pest and Disease Management. Springer.
2. Abrol, D.P. and Shankar, U. eds. (2012). Integrated Pest Management: Principles and Practices. CABI
- 3 Dhaliwal GS and Arora R. (2001). Integrated Pest Management: Concepts and approaches. Kalyani Publ., New Delhi
4. Chattopadhyay, S.B. (1980). Principles and Procedures of Plant Protection. Oxford & IBH Publishing Company.

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.

SUBJECT TITLE: Post-harvest Management and Value Addition of Fruits and Vegetables

SUBJECT CODE: AHRT 3203

SEMESTER: VI

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	2	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course aims at teaching about the post-harvest management and value addition of fruits and vegetables

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	Importance 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;	5
UNIT-II	Role of ethylene; Post harvest disease and disorders; Heat, chilling and freezing injury; Harvesting and field handling; Storage (ZECC, cold storage, CA, MA, and hypobaric); Value addition concept; Principles and methods of preservation.	5
UNIT-III	Intermediate moisture food- Jam, jelly, marmalade, preserve, candy – Concepts and Standards; Fermented and non-fermented beverages. Tomato products- Concepts and Standards; Drying/ Dehydration of fruits and vegetables – Concept and methods, osmotic drying. Canning -- Concepts and Standards, packaging of products.	6
PRACTICAL:		
	Applications of different types of packaging containers for shelf life extension. Effect of temperature on shelf life and quality of produce. Demonstration of chilling and freezing injury in vegetables and fruits. Extraction and preservation of pulps and juices. Preparation of jam, jelly, RTS, nectar, squash, osmotically dried products, fruit bar and candy and tomato products, canned products. Quality evaluation of products -- physico-chemical and sensory. Visit to processing unit/ industry and porosity of biomaterials).	30

Course Outcomes:

After taking the course, students will be able to:

1. Understand the post harvest technology of horticultural crops
2. Understand the value addition of horticulture crops.
3. Understand the work space, tool and equipment design for PHT and value addition.
4. To study the various certification and accreditation i.e. FPO, ISO and other labelling.

Recommended Books:

1. Panday P.H. (2015). Principles and Practices of Post-Harvest Technology . Kalyani Publishers
2. Verma L.R. and Joshi V.K. (2000). Post-Harvest Technology of Fruits and Vegetables Indus Publishing
3. Sudheer K.P. (2007). Post-Harvest Technology of Horticultural Crops New India Publishing Agency
4. Mir M.A. (2007). Post-Harvest Management of Horticultural Crops Agrotech Publishing Academy
5. Girdharilal, Sidhappa G.S. and Tondan, G.L.(1967). Fruits and Vegetable preservation Indian Council of Agricultural Research

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.

SUBJECT TITLE: Crop Improvement – II (*Rabi* crops)

SUBJECT CODE: AAGR 3207

SEMESTER: VI

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	2	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course aims at teaching about crop improvement in *Rabi* crops

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
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; Floral biology, study of genetics of qualitative and quantitative characters;	5
UNIT-II	Important concepts of breeding self pollinated, cross pollinated and vegetatively propagated crops; Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional);	5
UNIT-III	Seed production technology in self pollinated, cross pollinated and vegetatively propagated crops. Hybrid seed production technology of rabi crops. Ideotype concept and climate resilient crop varieties for future.	6
PRACTICAL:		
	Emasculation and hybridization techniques in different crop species namely Wheat, Oat, Barley, Chickpea, Lentil, Field pea, Rapeseed Mustard, Sunflower, Potato, Berseem. Sugarcane, Cowpea; 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 <i>Rabi</i> crops; Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments; Study of quality characters, study of donor parents for different characters; Visit to seed production plots; Visit to AICRP plots of different field crops.	30

Course Outcomes:

After taking the course, students will be able to:

1. In this course Students learn importance of wild relative to produce new varieties of *Rabi* crop.
2. Learner learns Gene preservation method for further use to improve *Rabi* varieties.
3. Learner learns identification of resistance gene relate to *Rabi* crop with high yield potential against Pest and pathogen and utilization genes.
4. Learner learns new genetic approaches to achieve a definite ideotype of *Rabi* crop.

Recommended Books

1. Poehlman, J.M. (1987). Breeding of Field Crops. AVI Publishing Co.. INC, East Port, Connecticut, USA.
2. Mandal, AK., P.K. Ganguli and S.P. Banerjee (1991). Advances in Plant Breeding Vol. I and II. CBS Publishers and Distributors, New Delhi.
3. Ram, H.H. and H.G. Singh, (1994). Crop Breeding and Genetics. Kalyani Publishers, New Delhi.
4. Chopra, V.L.(2000). Breeding of Field Crops. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
5. Kang, Manjit S.(2004). Crop Improvement: Challenges in the Twenty-First Century (Edt). International Book Distributing Co. Lucknow.
6. Poehlman, J. M. and Sleper, D. A. (2006). Breeding Field Crops. Blackwell Publishing

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.

SUBJECT TITLE: Diseases of Field and Horticultural Crops and their Management-II**SUBJECT CODE:** APPT 3203**SEMESTER:** VI**CONTACT HOURS/WEEK:**

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	2	2

Internal Assessment: 40**End Term Exam: 60****Duration of Exam; 3 Hrs**

Course objective: The course objective is to teach about diseases of field & horticultural crops and their management.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
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;	5
UNIT-II	Symptoms, etiology, disease cycle and management of following diseases: Gram: wilt, grey mould and Ascochyta blight; Lentil: rust and wilt; Cotton: anthracnose, vascular wilt, and black arm; Pea: downy mildew, powdery mildew and rust Horticultural Crops: Mango: anthracnose, malformation, bacterial blight and powdery mildew; Citrus: canker and gummosis; Grape vine: downy mildew, Powdery mildew and anthracnose; Apple: scab, powdery mildew, fire blight and crown gall; Peach: leaf curl Strawberry: leaf spot.	5
UNIT-III	Symptoms, etiology, disease cycle and management of following diseases: 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.	6
PRACTICAL:		
	Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory. Field visit for the diagnosis of field problems. Collection and preservation of plant diseased specimens for herbarium.	30

Course Outcomes:

After taking the course, students will be able to:

1. Student will know the common pathogens of different diseases.
2. Student acquire the knowledge about etiology, and symptoms of these diseases which helps in diagnosis of the diseases of field and horticultural crops.
3. By knowing means of dispersal of these diseases suitable management methods can be applied.
4. Eco-friendly and economically suitable management practices may be adopted.

Recommended Books

1. Rangaswami, G. and Madhwan, A(1998). Diseases of crop plants in India PHI Learning Pvt. Ltd.
2. Thind, T.S., (2007). Diseases of field crops and their Management. Daya Books.
3. Gupta VK &.Sharma SK.(2000). Diseases of Fruit Crops. Kalyani Publ., New Delhi.
4. Verma, L.R. and Sharma, R.C.(1999). Diseases of horticultural crops: vegetables, ornamentals, and mushrooms. Indus Publishing.
5. Singh R.S. (2017). Diseases of Fruit Crops. Medtech Publishers
6. Walker J.C.(1952). Diseases of Vegetable Crops. TTPP, India.

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.

SUBJECT TITLE: Principles of Food Science and Nutrition

SUBJECT CODE: APFT 3201

SEMESTER: VI

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	0	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course will acquaint students with the principles of food science and nutrition

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
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);	10
UNIT-II	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.).	10
UNIT-III	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.	10
PRACTICAL:		
	N.A.	

Course Outcomes:

After taking the course, students will be able to:

1. Critically evaluates information on food science and nutrition issues appearing in the popular press.
2. Discuss the important pathogen and spoilage microorganism in foods.
3. Discuss basic principles and practices of cleaning and sanitation in food preparation operation.
4. Identify and explain nutrients in foods and the specific functions in maintaining health.

Recommended Books:

1. Srilakshmi, B. (2010). Text Book of Food Science. New age international (P) limited, publisher, New Delhi
2. Sehgal, S. and Raghuvanshi, R.S. (2007). Text Book of Community Nutrition, ICAR Publication.
3. Khaddar V. (1999). Text Book of Food. Storage and Preservation. Kalyani Publishers, New Delhi.
4. Srilakshmi, B. (2010). Text Book of Nutrition Science. New age international (P) limited, publisher, New Delhi.
5. Swaminathan. M. (1993). Advanced Textbook on Food and Nutrition. Volume I, Bappco, the Bangalore Press and Publishing Co. Ltd. Bangalore.

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.

SUBJECT TITLE: Farm Management, Production and Resource Economics

SUBJECT CODE: AECN 3204

SEMESTER: VI

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	2	2

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to teach about the farm management, production and resources in economics

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
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 product-product relationship, law of equi-marginal/or principles of opportunity cost and law of comparative advantage. Meaning and concept of cost, types of costs and their interrelationship, importance of cost in managing farm business and estimation of gross farm income, net farm income, family labor income and farm business income.	5
UNIT-II	Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises. Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain on farm, farm inventory, balance sheet, profit and loss accounts. Meaning and importance of farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting-linear programming, appraisal of farm resources, selection of crops and livestock's enterprises.	5
UNIT-III	Concept of risk and uncertainty occurs in agriculture production, nature and sources of risks and its management strategies, Crop/livestock/machinery insurance – weather based crop insurance, features, determinants of compensation. Concepts of resource economics, differences between NRE and agricultural economics, unique properties of natural resources. Positive and negative externalities in agriculture, Inefficiency and welfare loss, solutions, Important issues in economics and management of common property resources of land, water, pasture and forest resources etc.	6
PRACTICAL:		
	Preparation of farm layout. Determination of cost of fencing of a farm. Computation of depreciation cost of farm assets. Application of equi-marginal returns/opportunity cost principle in allocation of farm resources. Determination of most profitable level of inputs use in a farm production process. Determination of least cost combination of inputs. Selection of most	30

profitable enterprise combination. Application of cost principles including CACP concepts in the estimation of cost of crop and livestock enterprises. Preparation of farm plan and budget, farm records and accounts and profit & loss accounts. Collection and analysis of data on various resources in India.	
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Course Outcomes:

After taking the course, students will be able to:

1. The course contains a comprehensive treatment of the traditional agricultural production economics topics employing both detailed graphics and differential calculus.
2. Focus on the neoclassical factor-product, factor-factor and product- product models, and is suitable for an advanced undergraduate or a beginning graduate –level course in static production economics.
3. Understand limited resources available in the economy. Realize the need to exploit and utilize through development and improvement of production techniques.
4. Gain knowledge of the causes of regional variations in productivity and production, social and economic inequality, size of land holdings and lack of quality inputs etc. And suggest appropriate measures for the whole economy.

Recommended Books

1. Lekhi, R.K. and Singh, J. (2007). Agricultural Economics. Kalyani publishers, Ludhiana
2. Black, J.D. (1955). Introduction of Economics for Agriculture, Fromont Pierre National Press
3. Memoria, C.B. and B.B. (2007). Agricultural Problems in India, Kitab Mahal, Allahabad
4. Kerr, John M. (1997). Natural Resource Economics: Theory and Applications in India, Oxford & U3H, New Delhi.
5. Tisdell C. (1993). Environmental Economics: Policies for Environmental Management & Sustainable Development, Edward Elgar Pub. Ltd., USA.

Instruction to Question Paper setter: The question paper will comprise 12 multiple choice questions, each of one mark; six short answer type questions, each of four marks and three explanatory questions each of eight marks.

Elective Courses

SUBJECT TITLE: Commercial Protected Cultivation

SUBJECT CODE: AHRT-3204

SEMESTER: VI

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	4	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to teach about the commercial Protected cultivation

Contents of syllabus

Sr. No.	Contents	Contact Hours
Theory:		
UNIT I	Commercial nursery raising and transplanting of horticultural crops and techniques of seed production.	3
UNIT II	Hi-tech cultivation of horticultural crops and their management (Tomato, capsicum, cucumber, parsley, broccoli, chinese cabbage, lettuce, melons, strawberry, roses, chrysanthemum, carnation, gerbera, and orchids).	9
UNIT III	Commercial production of hydroponics and aeroponics; constraints and solution. Post-harvest management of horticultural produce.	3
PRACTICAL:		
	Nursery management of horticultural crops: Propagation techniques, lifting and packaging of nursery plants. Preparation of media and mixtures, and raising nursery in poly bags. Intercultural operations in horticultural crops under protected condition. Seed production techniques of important vegetable and flower crops under protected condition. Irrigation and fertigation under protected condition. Integrated insect-pest and disease management of commercially important horticultural crops. Raising hydroponics and aeroponics under protected cultivation. Post-harvest handling and marketing of commercially important horticultural crops. Visit to hi-tech green-/polyhouses..	60

Course outcome:

After taking the course, students will be able to:

1. Understand commercial nursery raising and transplanting of horticultural crops and techniques of seed production.
2. Student will understand the hi-tech cultivation of horticultural crops and their management (Tomato, capsicum, cucumber, parsley, broccoli, chinese cabbage, lettuce, melons, strawberry, roses, chrysanthemum, carnation, gerbera, and orchids).
3. To know about commercial production of hydroponics and aeroponics; constraints and solution.
4. To know about post-harvest handling and marketing of commercially important horticultural crops. Visit to hi-tech green-/polyhouses.

Recommended Books:

- 1) Warade, S. D. 2003. Protected cultivation of Horticulture crops. MPKV, Rahuri.
- 2) Singh, B. 2005. Protected cultivation of vegetable crops. Kalyani publishers, New Delhi.
- 3) Prasad, S. and Kumar, U. 2003. Commercial Floriculture, Agrobios India.
- 4) Patil, M.T and Patil, P.V. 2004. Commercial Protected Floriculture, MPKV, Rahuri.
- 5) Singh, B. 2020. New Age Protected Cultivation, Bramha Sungh Horticulture Foundation, form New Delhi.
- 6) Tiwari, G.N. 2003. Green House Technology for Controlled Environment, Narosa Publication House.

SUBJECT TITLE: Commercial Beekeeping

SUBJECT CODE: AENT-3205

SEMESTER: VI

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	4	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course aims at to acquaint the students with the Commercial beekeeping with special emphasis on Italian honey bees

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	Apiary site selection; establishment of beehive; handling of bee colonies. Migration of bees, factors affecting migration of bees.	6
UNIT-II	Honeybee nutrition. Bee pheromones. Artificial queen bee rearing techniques. Communication in bees.	6
UNIT-III	Protection from pesticidal hazards. Maximising honey production. Economics of beekeeping.	3
PRACTICAL:		
	Step by step learning for starting beekeeping. Calendar of availability and utility of flora for the bees. Colony examination, feeding, shifting /migration of colonies, multiplication and mass queen bee rearing techniques. Collection and post-harvest handling of honey: Honey heating, processing, packaging, storage, quality testing. Collection, processing and storage of royal jelly, pollen, propolis, bee venom, beeswax and bee brood. Production of comb foundation sheets. Acquaintance with the various components of Honey Processing Plant and their working. Acquaintance with bottle washing, drying, packing and bottle sealing units for commercial beekeeping .Visits to the beekeeping industry to study hive manufacturing, bee equipment manufacturing, honey processing, packaging, and its commercial export.	60

Course outcome:

After taking the course, students will be able to:

1. Handle bee colonies, get knowledge about migration of bees, factors affecting migration of bees.
2. Understand about honeybee nutrition and bee pheromones.
3. To know about bee rearing techniques and communication in bees.
4. Impart knowledge about protection from pesticidal hazards and maximising honey production.

Recommended Books:

- 1) Sammataro, D. and Avitabile, A. (2011) *The Beekeepers' Handbook*. Cornell university Press, Ithaca, London.
- 2) Singh, S. (1975) *Bee keeping in India* – ICAR, New Delhi., 214p.
- 3) Sunita, N.D, Guled, M.B, Mulla, S.R and Jagginavar (2003) *Beekeeping*. UAS Dharwad
- 4) Mishra, R.C. and Rajesh G (2002). *Prospective in Indian Apiculture*. Agrobios, Jodhpur.
- 5) Singh, D. and Singh, D.P. 2006. *A Hand Book of Beekeeping*, Agrobios (India). 98
- 6) Paul DeBach and Devid Rosen 1991. *Biological control by natural enemies*. Cambridge University Press; 2 edition.

SUBJECT TITLE: Commercial Mushroom Cultivation

SUBJECT CODE: APPT-3204

SEMESTER: VI

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	4	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course objective is to teach about the commercial cultivation of mushroom production

Contents of syllabus

Sr. No.	Contents	Contact Hours
Theory:		
UNIT I	Preparation of culture, mother spawn production, multiplication of spawn, cultivation techniques	6
UNIT II	Basic requirement of cultivation of edible white button and oyster mushroom. Preparation of compost, casing and crop care, Substrate selection, Substrate soaking, pasteurization, bagging, spawning, Incubation	6
UNIT III	Harvesting, packing and storage, mushroom pest and pathology and their management strategies, processing of mushroom	3
PRACTICAL:		
	Preparation of media for mushroom culture. Preparation and maintenance of pure culture of mushroom. Spawn preparation. Long and short method of composting. Cultivation of mushroom: Bagging, spawning, casing, growing, harvesting of mushrooms, post-harvest practices of mushroom.	60

Course Outcomes:

After taking the course, students will be able to:

1. Understand about the preparation of culture, mother spawn production, multiplication of spawn, cultivation techniques.
2. Student will understand the basic requirement of cultivation of edible white button and oyster mushroom.
3. To know the various preparation of compost, casing and crop care, substrate selection, substrate soaking, pasteurization, bagging, spawning and incubation .
4. Impart knowledge about harvesting, packing and storage, mushroom pest and pathology and their management strategies, processing of mushroom.

Recommended Books:

1. Dr.Ravindra Singh Rana. 2020. Mushroom Cultivation and its Diseases, Daya Books, New Dehli.
2. R. Gogoi and Y. Rathaiah. 2006.Mushroom Cultivation Technology, Scientific Publishers, New Dehli.
3. B.C. Suman and V.P. Sharma. 2007. Mushroom cultivation in India, Daya Books, New Delhi
4. V. P. Sharma. 2011. Diseases and pest of mushrooms, Agribios, India.

SUBJECT TITLE: Commercial Non-conventional Farming

SUBJECT CODE: AAGR-3208

SEMESTER: VI

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	0	4	3

Internal Assessment: 40

End Term Exam: 60

Duration of Exam; 3 Hrs

Course objective: The course aims at to acquaint the students with the Commercial non conventional farming

Contents of Syllabus:

Sr. No	Contents	Contact Hours
THEORY:		
UNIT-I	Organic farming: Commercial importance; pre-requisites for starting organic farming at commercial level; crop-wise methods and practices; constraints in organic farming and solution.	6
UNIT-II	Biological intensive nutrient management; techniques of recycling of organic residue to sustain soil fertility. Intercropping for maintenance of good soil health.	6
UNIT-III	High tech protected cultivation: Feasibility of raising crops for commercial purpose under green-/ polyhouses; constraints and solution. Management of pests and diseases and marketability of the produce	3
PRACTICAL		
	Raising crops as per the concept of organic farming utilizing various techniques /.methods. Method demonstrations for intensive nutrient management to conserve soil fertility. Hi-tech cultivation of crops in green-/polyhouses and marketability of the produce. Visits to the fields of progressive farmers involved in non-conventional farming.	60

Course Outcomes:

After taking the course, students will be able to:

1. Student will learn about commercial importance of Organic farming.
2. Student will understand the function and biological intensive nutrient management; techniques of recycling of organic residue to sustain soil fertility.
3. Impart knowledge on intercropping for maintenance of good soil health.
4. To know the various high tech protected cultivation, their feasibility , constraints and solution.

Recommended Books

1. Biswas, R. K. (2014) Organic Farming in India, ND Publishers, New Delhi
2. Walia S S (2021) Organic Crop production. Scientific publishers Jodhpur
3. Yawalkar KS, JP Agarwal and S Bokde (2016) Manures and Fertilizers, Agri-horticultural Publishing house, Nagpur
4. Singh Brahma (2015) Advances in protected cultivation. New India Publishing Agency, New Delhi

SEVENTH SEMESTER
Skill Enhancement Compulsory Courses
Agro-Industrial Attachment / In-Plant Training/ Rural Agricultural Work Experience Total Credit Hours =20
EIGHTH SEMESTER
Skill Enhancement Compulsory Courses
Experiential Learning Modules AENT 4206 Experiential Learning Programme (Entomology) APPT 4205 Experiential Learning Programme (Plant Pathology) AHRT 4206 Experiential Learning Programme (Horticulture) AAGR 4209 Experiential Learning Programme (Agronomy) Total Credit Hours =20

Total credit hours for the degree programme = 180

Semester Wise Summary of the program

SYLLABUS

SEMESTER-VII & VIII

SEVENTH SEMESTER

SUBJECT TITLE: Agro-Industrial Attachment / In-Plant Training/ Rural Agricultural Work Experience

SUBJECT CODE: RAWE-4101

CONTACT HOURS: 20

Course objective: The course objective is to teach about the farm management, production and resources in economics

- (i) Provides opportunity to the students to understand the rural setting in relation to agriculture and allied activities.
- (ii) Make the students familiar with socio-economic conditions of the farmers and their problems.
- (iii) Imparts diagnostic and remedial knowledge to the students relevant to real field situations through practical training.
- (iv) Develop communication skills in students using extension teaching methods in transfer of technology.
- (v) Develops confidence and competence to solve agricultural problems.
- (vi) Acquaint students with on-going extension and rural development programmes.

Course Outcomes:

After taking the course, students will be able to:

1. Develops confidence and competence to solve agricultural problems.
2. Acquaint students with on-going extension and rural development programmes.
3. Provides opportunity to the students to understand the rural setting in relation to agriculture and allied activities.
4. Imparts diagnostic and remedial knowledge to the students relevant to real field situations through practical training.

EIGHTH SEMESTER

SUBJECT TITLE: Agro-Industrial Attachment / In-Plant Training/ Rural Agricultural Work Experience

SUBJECT CODE: Experiential Learning Programme (Entomology)/

Experiential Learning Programme (Plant Pathology)/

Experiential Learning Programme (Horticulture)/

Experiential Learning Programme (Agronomy)

CONTACT HOURS:20

Course objective: The course objective is to teach about the farm management, production and resources in economics

(i) To promote professional skills and knowledge through meaningful hands on experience.

(ii) To build confidence and to work in project mode.

(iii) To acquire enterprise management capabilities.

Course Outcomes:

After taking the course, students will be able to:

1. To build confidence and to work in project mode.

2. To promote professional skills and knowledge through meaningful hands on experience on included Mushroom Cultivation Technology, Food processing, Bee keeping, floriculture and landscaping, seed production technologies etc.

3. To acquire enterprise management capabilities.

4. To integrate the knowledge accomplished during hands on training including extended marketing facilities for economic benefit.

SEVENTH SEMESTER
Agro-Industrial Attachment / In-Plant Training/ Rural Agricultural Work Experience
Total Credit Hours =20
EIGHTH SEMESTER
Experiential Learning Modules
Total Credit Hours =20

Total credit hours for the degree programme = 180

