TEACHING SCHEME & SYLLABI

B.Sc.

(Agriculture Technology)

w.e.f. 2018-19

Shobhit Institute of Engineering & Technology, Meerut
(Deemed to- be -University)

Approved and adopted in year 2018 (Board of Studies, August 10, 2018)
by 23rd Academic council (Agenda no-3.2 g)

Our Inspirer

Babu Vijendra Kumar Ji

*'To fulfill the vision of our **Inspirer***
We commit ourselves to empower
*the **Nation** through **Education**'*

B. Sc. Agriculture (Honours)

Overview

B.Sc. Agriculture program is a 4 year, Eight-semester Professional degree program whose curriculum, based on ICAR-recommended national curriculum. It includes courses in agriculture science along with production and protection of field and horticultural crops, biotechnology and farm engineering together with relevant laboratory programs to improve agriculture productivity, manage products and contribute to future development of the sector through research and development activities. Since India is an agriculture based country, this field will never run out of job opportunities. The students are specifically prepared for R&D, agri-business and industry. A multidisciplinary approach is the essence of the course which is achieved by offering open electives.

Objective:

The course was design to gain a market increase in the turnover of the organization by enhancing the agricultural output using student's energy, enthusiasm and expertise in the field of agricultural research and to the farmers directly.

A BSc in Agriculture equips students with all-round knowledge of sector and normally includes the following:

- Agronomy: Basics of Agronomy, Kharif and Rabi Crop, Crop Protection, Weed Management, Irrigation Techniques, Water Resource Management, Organic Farming, Sustainable Agriculture.
- Plant Genetics: Botany, Basics of Genetics, Plant Breeding, Seed Technology, Basics of Biotechnology.
- Soil Science: Introduction to Soil Science, Soil Fertility, Soil Chemistry, Fertilizers, Agricultural Chemistry.
- Entomology: Pest Management, Beneficial Insects, Grain Storage and Management.
- Agricultural Economics: Market prices, Trade prices, Marketing, Finance, Agribusiness Management, Farm Management.
- Agriculture Engineering: Agriculture Machinery, Power and Tools, Harvest Technology, Environment Science and Engineering, Renewable Energy.
- Plant Pathology: Crop Diseases, Nematology.
- Horticulture: Fruit Crops, Medicinal Plants, Aromatic Plants, Flower Production, Spices, Plantation Crops.
- Agricultural Meteorology: Climate patterns, Climatic hazards on Agriculture, Climatic Zones, Weather forecasting.
- Agricultural Extension: Dimensions of Agricultural Extension, Extension Methodologies, Entrepreneurship Development program.

In all the above areas of study, practical sessions related to theoretical knowledge are also built into the course. There are some elective courses, study tours, field trips, in some semesters. These vary from university to university.

Outcome:

Objective of this course is to train students for government as well as private sector jobs available for BSc Agriculture graduates. They can be appointed as Research Officer, Quality Assurance Officer, Agriculture Officer, Agriculture Loan Officer/ field officers (in Banks), Production Manager, Operations Manager and Farm Manager with State agriculture departments.

In the private sector, agriculture science graduates may find jobs as managers at plantations, as officers at fertilizer manufacturing firms, agriculture machinery industries, agricultural products marketing firms, food processing units etc. After doing BSc Agriculture, one may also go for MSc Agriculture and take up a teaching job, or even go for a PhD and build a career in Agricultural Research.

Eligibility Criteria:

- B.Sc. Hons. In Agriculture Sciences is a highest demanding program nowadays and Admission to B.Sc. Programs is open to candidates who have Passed (10+2)/ Intermediate / Higher Secondary from any approved Board with PCM/PCB/Agriculture.

Summary of Semester Credits

Semester	I	II	III	IV	V	VI	VII	VII	Total Credits
Credit	21+1**	24+2**	23	22	24+2**	24	20+02**	20	178 +7**

****NC: Non-gradial courses**

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26.	AGS-607	Principles of Organic Farming	84
27.	DAG-10	Weed Management	98

Scheme of Teaching

B.Sc. (Agriculture) 1st Year

SEMESTER-I				
Subject Code	**Subject Name**	**L**	**P**	**Cr**
AGS-101	Fundamentals of Horticulture	1	1	2
AGS-102	Fundamentals of Plant Biochemistry and Biotechnology	2	1	3
AGS-103	Fundamentals of Soil Science	2	1	3
AGS-104	Introduction to Forestry	1	1	2
AGS-105	Comprehension & Communication Skills in English	1	1	2
AGS-106	Fundamentals of Agronomy	3	1	4
AGB-107 AGM-107	Introductory Biology*/ Elementary Mathematics*	1 2	1 0	2 2
AGS-108	Agricultural Heritage*	1	0	1
AGS-109	Rural Sociology & Educational Psychology	2	0	2
NGC-	NSS/NCC/Physical Education & Yoga Practices**	0	1	--
Total		**15/16**	**7/6 +1****	**21+1****
SEMESTER-II				
Subject Code	**Subject Name**	**L**	**P**	**Cr**
AGS-201	Fundamentals of Genetics	2	1	3
AGS-202	Agricultural Microbiology	1	1	2
AGS-203	Soil and Water Conservation Engineering	1	1	2
AGS-204	Fundamentals of Crop Physiology	1	1	2
AGS-205	Fundamentals of Agricultural Economics	2	0	2
AGS-206	Fundamentals of Plant Pathology	3	1	4
AGS-207	Fundamentals of Entomology	3	1	4
AGS-208	Fundamentals of Agricultural Extension Education	2	1	3
AGS-209	Communication Skills and Personality Development	1	1	2
NGC -	Human Values & Ethics**	1	0	--
NGC-	NSS/NCC/Physical Education & Yoga Practices**	0	1	--
Total		**16+1****	**8+1****	**24+2****
***R: Remedial course; **NC: Non-gradial courses**				

Scheme of Teaching
B.Sc. (Agriculture) 2nd Year

SEMESTER-III				
Subject Code	**Subject Name**	**L**	**P**	**Cr**
AGS-301	Crop Production Technology – I (Kharif Crops)	1	1	2
AGS-302	Fundamentals of Plant Breeding	2	1	3
AGS-303	Agricultural Finance and Cooperation	2	1	3
AGS-304	Agri- Informatics	1	1	2
AGS-305	Farm Machinery and Power	1	1	2
AGS-306	Production Technology for Vegetables and Spices	1	1	2
AGS-307	Environmental Studies and Disaster Management	2	1	3
AGS-308	Statistical Methods	1	1	2
AGS-309	Livestock and Poultry Management	3	1	4
Total		**14**	**9**	**23**
SEMESTER-IV				
Subject Code	**Subject Name**	**L**	**P**	**Cr**
AGS-401	Crop Production Technology –II (Rabi Crops)	1	1	2
AGS-402	Production Technology for Ornamental Crops, MAP and Landscaping	1	1	2
AGS-403	Renewable Energy and Green Technology	1	1	2
AGS-404	Problematic Soils and their Management	2	0	2
AGS-405	Production Technology for Fruit and Plantation Crops	1	1	2
AGS-406	Principles of Seed Technology	1	2	3
AGS-407	Farming System & Sustainable Agriculture	1	0	1
AGS-408	Agricultural Marketing Trade & Prices	2	1	3
AGS-409	Introductory Agro-meteorology & Climate Change	1	1	2
DAG-	Elective Course	2	1	3
Total		**13**	**9**	**22**
Educational tour will be conducted in break between IV & V Semester				

Scheme of Teaching
B.Sc. (Agriculture) 3rd Year

SEMESTER-V				
Subject Code	**Subject Name**	**L**	**P**	**Cr**
AGS-501	Principles of Integrated Pest and Disease Management	2	1	3
AGS-502	Manures, Fertilizers and Soil Fertility Management	2	1	3
AGS-503	Pests of Crops and Stored Grain and their Management	2	1	3
AGS-504	Diseases of Field and Horticultural Crops and their Management –I	2	1	3
AGS-505	Crop Improvement-I (Kharif Crops)	1	1	2
AGS-506	Entrepreneurship Development and Business Communication	1	1	2
AGS-507	Geoinformatics and Nano-technology and Precision Farming	1	1	2
AGS-508	Intellectual Property Rights	1	0	1
DAG-	Elective Course	2	1	3
AGS-551	Practical Crop Production – I (Kharif crops)	0	2	2
NGC-	Educational tour**	0	2	--
Total		**14**	**10+2****	**24+2****
SEMESTER-VI				
Subject Code	**Subject Name**	**L**	**P**	**Cr**
AGS-601	Rainfed Agriculture & Watershed Management	1	1	2
AGS-602	Protected Cultivation and Secondary Agriculture	1	1	2
AGS-603	Diseases of Field and Horticultural Crops and their Management-II	2	1	3
AGS-604	Post-harvest Management and Value Addition of Fruits and Vegetables	1	1	2
AGS-605	Management of Beneficial Insects	1	1	2
AGS-606	Crop Improvement-II (Rabi crops)	1	1	2
AGS-607	Principles of Organic Farming	1	1	2
AGS-608	Farm Management, Production & Resource Economics	1	1	2
AGS-609	Principles of Food Science and Nutrition	2	0	2
AGS-651	Practical Crop Production –II (Rabi crops)	0	2	2
DAG-	Elective Course	2	1	3

Total	**13**	**11**	**24**
**NC: Non-gradial courses			
Educational tour will be conducted in break between IV & V Semester **Educational tour will be conducted in break between VI & VII Semester**			

Scheme of Teaching

B.Sc. (Agriculture) 4th Year

SEMESTER-VII				
Subject Code	**Subject Name**	**L**	**P**	**Cr**
AGS-771	Rural Agricultural Work Experience and Agro-industrial Attachment(RAWE &AIA):			
	Activities	0	1	1
	General orientation & On campus training by different faculties	0	2	2
	Village attachment	0	4	4
	Unit attachment in Univ. / College. KVK/ Research Station Attachment	0	7	7
	Plant clinic	0	2	2
	Agro- Industrial Attachment: The students would be attached with the agro-industries for a period of 3 weeks to get an experience of the industrial environment and working.	0	3	3
	Project Report Preparation, Presentation and Evaluation	0	1	1
NGC-	Educational tour**	0	2	--
		0	20+02**	20+02**
SEMESTER-VIII				
Subject Code	**Subject Name**	**L**	**P**	**Cr**
AGS-851	Production Technology for Bio agents and Bio fertilizer	0	10	10
AGS-852	Seed Production and Technology	0	10	10
AGS-853	Mushroom Cultivation Technology	0	10	10
AGS-854	Soil, Plant, Water and Seed Testing	0	10	10
AGS-855	Commercial Beekeeping	0	10	10
AGS-856	Poultry Production Technology	0	10	10
AGS-857	Commercial Horticulture	0	10	10
AGS-858	Floriculture and Landscaping	0	10	10
AGS-859	Food Processing	0	10	10
AGS-860	Agriculture Waste Management	0	10	10
AGS-861	Organic Production Technology	0	10	10
AGS-862	Commercial Sericulture	0	10	10

- Educational tour will be conducted in break between VI & VII Semester
- Modules for Skill Development and Entrepreneurship: A student has to register 20 credits opting for

two modules of (0+10) credits each (total 20 credits) from the package of modules in the VIII semester

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

Subject Code	Subject Name	L	P	Cr
DAG- 01	Agribusiness Management	2	1	3
DAG- 02	Agrochemicals	2	1	3
DAG- 03	Commercial Plant Breeding	1	2	3
DAG- 04	Landscaping	2	1	3
DAG- 05	Food Safety and Standards	2	1	3
DAG- 06	Biopesticides & Biofertilizers	2	1	3
DAG- 07	Protected Cultivation	2	1	3
DAG- 08	Micro propagation Technologies	1	2	3
DAG- 09	Hi-tech. Horticulture	2	1	3
DAG- 10	Weed Management	2	1	3
DAG- 11	System Simulation and Agro-advisory	2	1	3
DAG- 12	Agricultural Journalism	2	1	3

Non Gradial Courses:

Subject Code	Subject Name	L	P	Cr
NGC-01	Physical Education & Yoga Practices	0	1	--
NGC-02	NSS	0	1	--
NGC-03	NCC	0	1	--
NGC-04	Human Values & Ethics	0	1	--
NGC-05	Educational tour	0	2	--

I SEMESTER

Course code	**AGS-101**			
Category	Core			
Course title	**Fundamentals of Horticulture**			
Scheme and Credits	**Credit**	**L**	**P**	
	2	1	1	
Objectives	In this course the students will prepare for successful employment through classroom and practical experiences while encouraging them to take pride in their work and establish a high standard of professionalism. In addition, this course will encourage students to be responsible stewards of the environment by demonstrating and valuing sustainable practices.			
Outcomes	After completion of this course, the student will be able to: CO 1: Identify and research career opportunities in the horticulture industry as well as emerging trends CO 2: Demonstrate an understanding of the composition, fertility and biology of soil and how they relate to good plant growth CO 3: Propagate, grow, and maintain plants in horticulture production systems CO 4: Demonstrate a fundamental understanding of plant identification, selection, use and maintenance of plant material best suited for conventional and sustainable landscapes CO 5: Identify and prescribe sustainable options in horticulture which benefit the environment while maintaining productivity and economic viability CO 6: Identify common biotic and abiotic plant pests and disorders and develop strategies to manage them in an environmentally safe and sustainable manner			
Course Content				
Unit	**Content**			**Hours**
Unit I	Horticulture - Its definition and branches, importance and scope; History of horticulture, and botanical classification; climate and soil for horticultural crops.			05
Unit II	Importance and role of different soil and environment in horticulture Plant propagation-methods and propagating structures; Seed dormancy, Seed germination, principles of orchard establishment			05
Unit III	Importance of organic manures in horticulture crops, Principles and methods of training and pruning, juvenility and flower bud differentiation; unfruitfulness; pollination, pollinizers and pollinators; fertilization and parthenocarpy; medicinal and aromatic plants.			05
Unit IV	Role of PGR (Plant Growth Regulator) in horticulture. Irrigation – methods, Fertilizer application in horticultural crops.			05
Practical	1. Identification of garden tools. Identification of horticultural crops 2. Preparation of seed bed/ nursery bed. 3. Practice of sexual and asexual methods of propagation including micro-			

	propagation. 4. Layout and planting of orchard. Training and pruning of fruit trees. 5. Preparation of potting mixture. 6. Fertilizer application in different crops. 7. Visits to commercial nurseries/orchard.
References	1. Chadha K L 2006 Handbook of Horticulture 6th Ed ICAR Indian Council of Agricultural Research Crop Production Science in Horticulture 7

Course code	**AGS-102**			
Category	Core			
Course title	**Fundamentals of Plant Biochemistry and Biotechnology**			
Scheme and Credits	**Credit**	**L**	**P**	
	3	2	1	
Objectives	The objective of this course is to introduce biotechnology methods in plants. This course explores the use of biotechnology to both generate genetic variation in plants and to understand how factors at the cellular level contribute to the expression of genotypes and hence to phenotypic variation. There is an emphasis on the molecular mechanisms directing plant gene expression under diverse environmental and developmental stimuli. This knowledge is central to our ability to modify plant responses and properties for global food security and commercial gains in biotechnology and agriculture.			
Outcomes	After completion of this course, the student will be able to: CO 1: Understand the significance of Biochemistry CO 2: Describe the chemistry of carbohydrates, lipids, proteins and amino acids CO 3: Describe the classification and structural organization of proteins CO 4: Describe the mechanism of enzyme action and identify the classes of enzymes and factors affecting action CO 5: Describe the catabolic reactions of carbohydrates, lipids and amino acids CO 6: Understand the advanced tools of biotechnology.			
Course Content				
Unit	**Content**			**Hours**
Unit I	History of biochemistry, Scope and Importance of Biochemistry. Properties of Water, pH and Buffer. Carbohydrate: Importance and classification. Structures of Monosaccharides, Reducing and oxidizing properties of Monosaccharides, Mutarotation; Structure of Disaccharides and Poly saccharides.			06
Unit II	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 Amino acid: Importance and its Type, Protein: Importance and its Type.			06
Unit III	Enzymes: General properties; Classification; Mechanism of action; Michaelis & Menten and Line Weaver Burk equation & plots; Introduction to allosteric enzymes. Nucleic acids: Importance and classification; Structure of Nucleotides, A, B & Z DNA; RNA: Types			06

	and Secondary & Tertiary structure. Metabolism of carbohydrates: Glycolysis, TCA cycle, Glyoxylate cycle, Electron transport chain. Metabolism of lipids: Beta oxidation, Biosynthesis of fatty acids.	
Unit IV	Concepts and applications of plant biotechnology: Scope, organ culture, embryo culture, cell suspension culture, callus culture, anther culture, pollen culture and ovule culture and their applications; Micro-propagation methods; organogenesis and embryogenesis, Synthetic seeds and their significance; Embryo rescue and its significance; somatic hybridization and cybrids; Somaclonal variation and its use in crop improvement; cryo-preservation; Introduction to recombinant DNA methods: physical (Gene gun method).	06
Unit V	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.	06
Practical	1. Preparation of solution, pH & buffers, Qualitative tests of carbohydrates and amino acids. 2. Quantitative estimation of glucose/ proteins. Titration methods for estimation of amino acids/lipids. 3. Effect of pH, temperature and substrate concentration on enzyme action. 4. Paper chromatography/ TLC demonstration for separation of amino acids/ Monosaccharides. 5. Sterilization techniques. Composition of various tissue culture media and preparation of stock solutions for MS nutrient medium. 6. Callus induction from various explants. 7. Micro-propagation, hardening and acclimatization. 8. Demonstration on isolation of DNA. Demonstration of gel electrophoresis techniques and DNA finger printing.	
References	1. BIOS Instant Notes in Biochemistry by David Hames and Nigel Hooper. 2. Principles of Biochemistry by Lehninger. 3. Plant biotechnology by B.D. Singh	

Course code	**AGS-103**			
Category	Core			
Course title	**Fundamentals of Soil Science**			
Scheme and Credits	**Credit**	**L**	**P**	
	3	2	1	
Objectives	The objective of the course is to provide the student with a formalized way to build their fundamental knowledge and skills within the different areas of soil science to enhance their professional skills.			

Outcomes	After completion of this course, the student will be able to: CO 1: Understand how and why different soils behave and perform differently. CO 2: Apply understanding of soil processes to predict soil behavior and performance. CO 3: Able to make environmentally and economically sound soil management decisions. CO 4: Able to predict soil behavior and field performance.

Course Content

Unit	Content	Hours
Unit I	Composition of earth's crust, soil as a natural body – major components. Eluviations and alleviations formation of various soils. Physical parameters; texture – definition, Structure of Soil, methods of textural analysis, stock's law, assumption, limitations, textural classes, use of textural triangle; absolute specific gravity/particle density, definition, apparent specific gravity/bulk density – factors influencing, field bulk density.	06
Unit II	Define bulk density & Relation between BD (bulk density), AD – practical problems. Pore space – definition, factors affecting capillary and non-capillary porosity, soil color – definition, its significance, factors influencing, parent material, soil moisture, organic matter, soil structure, definition, classification, clay prism like structure, factors influencing genesis of soil structure, soil consistency, plasticity, Atterberg's constants.	06
Unit III	Soil air, air capacity, composition, factors influencing, amount of air space, soil air renewal, soil temperature, sources and distribution of heat, factors influencing, measurement, chemical properties, soil colloids, organic, humus, inorganic, secondary silicate, clay, hydrous oxides. Importance of Organic & Inorganic matters for soil	06
Unit IV	Ion exchange Capacityof Soil, cations and anions, soil water, forms, hygroscopic, capillary and gravitational, soil moisture constants, hygroscopic coefficient, wilting point, field capacity, Soil Ec, moisture equivalent, maximum water holding capacity, energy concepts, PF scale, measurement, gravimetric – electric and tensiometer methods – pressure plate and pressure membrane apparatus – Neutron probe – soil water movement – classification – aerial photography – satellite of soil features – their interpretation; soil orders; land capability classification; soil of different eco-systems and their properties, Rock & Minerals classification, Pedogenic process	06
Unit V	Objectives of soil science research institute in India (NBSS & LUP, ISSS, LTFE & NSSTL). Management of Soil Crusting, Soil pH, Soil Compaction and Soil Compression. Soil Biology benefits and harmful effects. Methods and objective of soil survey, Remote sensing application in soil and plant Studies, Soil degradation.	06
Practical	1. Collection and preparation of soil samples, estimation of moisture, EC, pH and bulk density. 2. Textural analysis of soil by Robinson's pipette method. Description of soil profile in the field. 3. Quantification of minerals and their abundance. 4. Determination of Soil colour using Munsell Chart. 5. Estimation of water holding capacity and hydraulic conductivity of	

	soils. 6. Estimation of Infiltration rate using double ring infiltrometer method. 7. Estimation of soil moisture using gypsum block and neutron probe method. Soil compaction measurement with Pentrometer. 8. Determination of pore space of soil. Determination of filed capacity and permanent wilting point of soil. 9. Determination of soil water potential characteristic curves by tensiometer and pressure plate apparatus. 10. Aggregate size distribution analysis of soil. Air capacity of soil by field method.
References	1. Brady Nyle C and Ray R Well, 2014. Nature and properties of soils. Pearson Education Inc., New Delhi. 2. Indian Society of Soil Science, 2002. Fundamentals of Soil Science. IARI, New Delhi. 3. Sehgal J. A., 2005. Textbook of Pedology Concepts and Applications. Kalyani Publishers, New Delhi. 4. Dilip Kumar Das, 2015. Introductory Soil Science. Kalyani Publishers, Ludhiana. 5. Biswas, T.D. and Mukharjee, S.K., 2015. Text Book of Soil science. Tata Mc Graw Hill Publishing Co. Ltd., New Delhi. 6. Brady, N.C., 1995. The Nature and properties of Soils. Macmillan Publishing Co, New York. 7. Ghildyal, B.P. and Tripathi, R.P., 1987. Soil Physics. Acad. Press. New York. 8. Kolay, A.K., 1983. Basic concepts of Soil Science. Wiley Eastern Ltd., New Delhi 9. Brady, N. C. and Weil, R. R., 2010. Elements of the Nature and Properties of Soils (3rd Edition), Pearson Education, New Delhi. 10. Foth, H.D., 1991. Fundamentals of Soil Science (8th Edition), John Wiley & Sons, New Delhi. 11. Das, D.K., 2011. Introductory Soil Science (3rd Edition), Kalyani publisher, Ludhiana (India). 12. Khan, T. O. 2013 Forest Soils: Properties and Management. Springer International Publishing, Switzerland 13. Pritchett and Fisher RF, 1987. Properties and Management of Forest Soils. John Wiley, New York. 14. Gupta, P.K. 2009. Soil, Plant, Water and Fertilizer Analysis (2nd Edition), AGROBIOS, Jodhpur (India).

Course code	**AGS-104**			
Category	Core			
Course title	**Introduction to Forestry**			
Scheme and Credits	**Credit**	**L**	**P**	
	2	1	1	
Objectives	Students will develop concepts involved in managing forest ecosystems in regard to fire. It will enable students to think analytically and operationally about fire in forested landscapes, taking into account a complex of physical/biological factors, management objectives, and public interest.			
Outcomes	After completion of this course, the student will be able to: CO 1: Demonstrate skills of critical analysis and application of scientific methods in forest science and management. Make decisions and exercise informed judgement in relation to native forest, plantation and agroforestry science and management. CO 2: Demonstrate imagination, initiative and enterprise in problem-solving. CO 3: Evaluate issues with reference to sound ethical frameworks and sustainability. CO 4: Demonstrate well-developed judgement on principles of social justice and professional standards. CO 5: Demonstrate broad and coherent knowledge of forest science and management. CO 6: Apply disciplinary knowledge and skills in professional and community settings.			

Course Content

Unit	Content	Hours
Unit I	Definition of Forest and Forestry, importance, History, Forestry Education and Research in India, Important and scope, various branches in forestry. National Forest Policy of 1894, 1952, 1988: Indian Forest Act-1927: Karnataka Tree Preservation Act: Forest Conservation Act-1980: The Environment (Protection) Act-1986: Indian Wildlife Preservation Act-1972: Amendments to Environment (Protection) Act-1999. Importance of forestry in wildlife and environment management	05
Unit II	Forest wealth in India: Forest productivity. Deforestation: Various causes and implications, desertification, afforestation, reforestation. Indian wildlife and management losses by Deforestation.	05
Unit III	National parks and sanctuaries, endangered species; Forest ecosystem, natural forests and their formation, succession and zonation, limiting factors: climax vegetation, types of natural forests and their distribution. Food chain: importance of Food chain, natural forests, V/s man-made forest.	05
Unit IV	Social forestry and its branches: Extension forestry, urban forestry, recreation forestry. Farm-forestry: Agro-forestry methods, woodlot system etc., and their management, windbreaks and shelterbelts: different types of waste lands and their reclamation through afforestation and joint forest management.	05
Practical	1. Identification of important trees, seeds and seedlings: Study of nursery techniques- Trench and mound plantation, pit plantation	

	2. Study of different types of plantations 3. Visit to agro-forestry and farm forestry plots 4. Measurement of volume of standing trees: Study of wood formation: study of wood specimens and non-timber forest products. 5. Visit to a nearby National Park and forest.
References	1. Beazley, M. 1981. The International Book of Forest. London 2. Champion and Seth. 1968. Forest types of India. 3. Grebner, D.L., Bettinger, P. and Siry, J.P. 2012. Introduction to Forestry and Natural Resources. Academic Press. 508p (Google eBook). 4. Khanna, L.S. 1989. Principles and Practice of Silviculture. Khanna Bandhu, New Delhi. 5. Mitchell Beazly.1981. The International Book of the Forest. Mitchell Beazly Publishers, London. 6. Mather, A.S. 1990. Global Forest Resources. Belhaven, London 7. Persson, R. 1992. World Forest Resources. Periodical Experts, New Delhi. 8. Westoby, J. 1991. Introduction to World Forestry. Wiley, 240p

Course code	**AGS-105**			
Category	Core			
Course title	**Comprehension & Communication Skills in English**			
Scheme and Credits	**Credit**	**L**	**P**	
	2	1	1	
Objectives	This course will help to strengthen student's ability to write academic papers, essays and summaries using the process approach. Students will heighten their awareness of correct usage of English grammar in writing and speaking and they will improve their speaking ability in English both in terms of fluency and comprehensibility.			
Outcomes	After completion of this course, the student will be able to: CO 1: Review the grammatical forms of English and the use of these forms in specific communicative contexts, which include: class activities, homework assignments, reading of texts and writing CO 2: Develop and enhance competence in the four modes of literacy: writing, speaking, reading and listening CO 3: Develop their ability as critical readers and writers CO 4: Demonstrate a short research paper using the drafting process			
Course Content				
Unit	**Content**			**Hours**
Unit I	War Minus Shooting- The Sporting Spirit. A Dilemma- A layman looks at science Raymond B. Fosdick. You and Your English – Spoken English and broken English G.B. Shaw. Reading.			05
Unit II	Comprehension, Vocabulary- Antonym, Synonym, Homophones, Homonyms, often confused words. Exercises to Help the students in the enrichment of vocabulary based on TOEFL and other competitive examinations.			05
Unit III	Functional grammar: Parts of Speech, Articles, Prepositions, Verb,			05

	Subject verb Agreement, Transformation, Synthesis, Direct and Indirect Narration. Written Skills: Paragraph writing, Precise writing, Report writing and Proposal writing.	
Unit IV	The Style: Importance of professional writing. Preparation of Curriculum Vitae and Job applications. Synopsis Writing. Application and latter writing.	05
Practical	1. Listening Comprehension: Listening to short talks lectures, speeches (scientific, commercial and general in nature). 2. Oral Communication: Phonetics, stress and intonation, Conversation practice. 3. Conversation: rate of speech, clarity of voice, speaking and Listening, politeness &Reading skills: reading dialogues, rapid reading, intensive reading, improving reading skills. 4. Mock Interviews: testing initiative, team spirit, leadership, intellectual ability. 5. Group Discussions.	

Course code	**AGS-106**			
Category	Core			
Course title	**Fundamentals of Agronomy**			
Scheme and Credits	**Credit**	**L**	**P**	
	4	3	1	
Objectives	The objective of the course is to provide fundamental knowledge of soil and water, nutrient management, pest management, and crop management to students. The course is taught a variety of agricultural practical skills to maximize understanding and application in the field.			
Outcomes	After completion of this course, the student will be able to: CO 1: Identify new developments in agricultural production systems. CO 2: Describe the principles of sustainability in relation to agricultural practices. CO 3: Identify drought-tolerant crops and management practices. CO 4: Compare and contrast local and global agricultural systems. CO 5: Analyze the potential impacts of climate change on agriculture and food security.			

Course Content

Unit	Content	Hours
Unit I	Agronomy and its scope, seeds and sowing, tillage and tilth, crop density and geometry, Zero tillage, Crop nutrition, manures and fertilizers, nutrient use efficiency, Crop cultivation practices .	08
Unit II	Water resources, soil-plant-water relationship, crop water requirement, water use efficiency, irrigation- scheduling criteria, Types of irrigation, quality of irrigation water, logging.	08
Unit III	Weeds- importance, classification, crop weed competition, concepts of weed management principles and methods, Integrated weed management (IWM), herbicides- classification, selectivity and resistance, allelopathy.	08
Unit IV	Growth and development of crops, factors affecting growth and development, plant ideotypes, crop rotation and its principles.	08

Unit V	Adaptation and distribution of crops, crop management technologies in problematic areas, Method of harvesting and thrashing of crops, Storing (seed and straw).	08
Practical	1. Identification of crops, seeds, fertilizers, pesticides and tillage implements 2. Study of agroclimatic zones of India 3. Identification of weeds in crops 4. Study of yield contributing characters and yield estimation. 5. Seed germination and viability test 6. Methods of herbicide and fertilizer application. Numerical exercises on fertilizer requirement, plant population, herbicides and water requirement 7. Use of tillage implements-reversible plough, one-way plough, harrow, leveler, seed drill. 8. Study of soil moisture measuring devices, Measurement of field capacity, bulk density and infiltration rate 9. Measurement of irrigation water	

Course code	**AGB-107**			
Category	Core			
Course title	**Introductory Biology**			
Scheme and Credits	**Credit**	**L**	**P**	
	2	1	1	
Objectives	In this course students will appropriately apply quantitative concepts and formula to solve biological problems. This course will help students to identify the form and function of cellular structures in both Eukaryotic, prokaryotic, and viral systems, and how these structures interact to carry out important cell functions. Students will be able to read and dissect various biochemical pathways, identify the role of important cofactors (i.e. ATP, NADH), and describe the transfer of energy through the process.			
Outcomes	After completion of this course, the student will be able to: CO 1: Describe levels of organization and related functions in plants and animals. CO 2: Identify the characteristics and basic needs of living organisms and ecosystems. CO 3: Explain the processes of growth and development in individuals and populations. CO 4: Understand the scientific investigations. CO 5: Demonstrate cell division and cell cycle.			

Course Content

Unit	Content	Hours
Unit I	Introduction to the living world, diversity and characteristics of life, origin of life, Evolution and Eugenics.	05
Unit II	Binomial nomenclature and classification Cell and cell division.	05
Unit III	Morphology of flowing plants. Seed and seed germination.	05
Unit IV	Plant systematic- viz; Brassicaceae, Fabaceae and Poaceae. Role of animals in agriculture.	05

Practical	1. Morphology of flowering plants – root, stem and leaf and their modifications. 2. Inflorence, flower and fruits. 3. Cell, tissues & cell division. 4. Internal structure of root, stem and leaf. 5. Study of specimens and slides. 6. Description of plants - Brassicaceae, Fabaceae and Poaceae.

Course code	**AGM-107**			
Category	Core			
Course title	**Elementary Mathematics**			
Scheme and Credits	**Credit**	**L**	**P**	
	2	2	0	
Objectives	In this course students will students will be able to apply problem solving techniques to understand and solve general real-world problems as well as problems in the areas of probability, statistics, and finance.			
Outcomes	After completion of this course, the student will be able to: CO 1: Demonstrate algebraic facility with algebraic topics including linear, quadratic, exponential, logarithmic, and trigonometric functions, CO 2: Produce and interpret graphs of basic functions of these types, CO 3: Solve equations and inequalities, both algebraically and graphically, and CO 4: Solving and model applied problems CO 5: Apply the Fundamental Theorem of Calculus CO 6: Use appropriate modern technology to explore calculus concepts.			

Course Content

Unit	Content	Hours
Unit I	Introduction to the living world, diversity and characteristics of life, origin of life, Evolution and Eugenics. Theory Straight lines : Distance formula, section formula (internal and external division), Change of axes (only origin changed), Equation of co-ordinate axes, Equation of lines parallel to axes, Slope-intercept form of equation of line, Slope-point form of equation of line, Two point form of equation of line, Intercept form of equation of line, Normal form of equation of line, General form of equation of line, Point of intersection of two st. lines, Angles between two st. lines, Parallel lines, Perpendicular lines, Angle of bisectors between two lines, Area of triangle and quadrilateral.	05
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 (x1, y1) & (x2,y2), Tangent and Normal to a given circle at given point (Simple problems), Condition of tangency of a line y = mx + c to the given circle x2 + y2 = a2.	05
Unit III	Differential Calculus : Definition of function, limit and continuity, Simple problems on limit, Simple problems on continuity, Differentiation of xn , ex , sin x & cos x from first principle,	05

	Derivatives of sum, difference, product and quotient of two functions, Differentiation of functions of functions (Simple problem based on it), Logarithmic differentiation (Simple problem based on it), Differentiation by substitution method and simple problems based on it, Differentiation of Inverse Trigonometric functions. Maxima and Minima of the functions of the form y=f (x) (Simple problems based on it).	
Unit IV	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.	05

Course code	**AGS-108**			
Category	Core			
Course title	**Agricultural Heritage**			
Scheme and Credits	**Credit**	**L**	**P**	
	1	1	0	
Objectives	In this course the students will understand landscapes, maintenance and adaptation of globally significant agricultural biodiversity, indigenous knowledge systems and resilient ecosystems, but, above all, in the sustained provision of multiple goods and services, food and livelihood security for millions of local community members and indigenous peoples, well beyond their borders.			
Outcomes	After completion of this course, the student will be able to: CO 1: Understand the significance of landscaping. CO 2: Describe the agricultural biodiversity, indigenous knowledge systems and resilient ecosystems. CO 3: Describe the sustained provision of multiple goods and services. CO 4: Describe the maintenance and adaptation of globally significant agricultural biodiversity CO 5: Understand the agriculture heritage importance.			
Course Content				
Unit	**Content**			**Hours**
Unit I	Introduction of Indian agricultural heritage; Ancient agricultural practices, Relevance of heritage to present day agriculture; Past and present status of agriculture and farmers in society; Journey of Indian agriculture and its development from past to modern era.			03
Unit II	Plant production and protection through indigenous traditional knowledge; Crop voyage in India and world.			03
Unit III	Agriculture scope; Importance of agriculture and agricultural resources available in India; Crop significance and classifications.			02
Unit IV	National agriculture setup in India; Current scenario of Indian agriculture; Indian agricultural concerns and future prospects.			02

Course code	**AGS-109**			
Category	Core			
Course title	**Rural Sociology & Educational Psychology**			
Scheme and Credits	**Credit**	**L**	**P**	
	2	2	0	
Objectives	In this course the students will acquaint with characteristics of rural society, village institutions and social organizations. To impart knowledge to the students on sociological and psychological aspects of rural people and to acquaint with some important features of rural society.			
Outcomes	After completion of this course, the student will be able to: CO 1: Understand concept of rural sociology, its importance in agricultural extension, characteristics of Indian rural society CO 2: Understand social groups, social stratification, culture, social values, social control and attitudes, leadership and training CO 3: Understand concept of educational psychology, intelligence, personality, perceptions, emotions, frustration, motivation, teaching and learning			

Course Content

Unit	Content	Hours
Unit I	Sociology and Rural sociology: Definition and scope, its significance in agriculture extension	05
Unit II	Social Ecology, Rural society, Social Groups, Social Stratification, Culture concept, Social Institution, Social Change & Development.	05
Unit III	Education introduction of Educational psychology: Meaning & its importance in agriculture extension.	05
Unit IV	Behavior: Cognitive, affective, psychomotor domain, Personality, Learning, Motivation, Theories of Motivation, Intelligence.	05

Course code	**NGC -101**			
Category	Core			
Course title	**Human Values & Ethics**			
Scheme and Credits	**Credit**	**L**	**P**	
	1	0	0	
Objectives	This course will help students to develop a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of existence. It will help student's essential complementarity between 'VALUES' and 'ETHICS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.			
Outcomes	After completion of this course, the student will be able to: CO 1: Describe the meaning human value and ethics in life. CO 2: Develop of a Holistic perspective among students towards life, profession and happiness. CO 3: Understand the significance of fundamentals right. CO 4: Develop holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior and mutually enriching interaction with Nature.			

Course Content

Unit	Content	Hours
Unit I	Universal human aspirations: Happiness and prosperity; Human values and ethics: Concept, definition, significance and sources; Fundamental values: Right conduct, peace, truth, love and non-violence.	03

II SEMESTER

Course code	**AGS-201**			
Category	Core			
Course title	**Fundamentals of Genetics**			
Scheme and Credits	**Credit**	**L**	**P**	
	3	2	1	
Objectives	In this course the students will learn the basic terms, principles, and research methods used in the study of genetics. Students will learn about the transmission, distribution, arrangement, and alteration of genetic information and how it functions and is maintained in populations. genetics in plants, animals and humans.			
Outcomes	After completion of this course, the student will be able to: CO1: To state the basic principles, concepts and biological processes involved in genetics. CO2: To explain structure and function of the DNA molecule to its functional role in encoding genetic material, make deductions about gene regulation and DNA mutations. CO3: To plan experiments for the study of cell structure, cell division stages, chromosome structures and apply the Hardy-Weinberg Law in analyzing population genetics for gene frequency, sex linkage, equilibrium, and heterozygote frequency. CO4: To analyse chromosome variation, including rearrangements, aneuploidy and polyploidy as well as cell division in different plant growth stages. CO5: To interpret which is the appropriate growth stages of plant cell for different research purpose. CO6: To Construct pedigrees and analysis of pattern of inheritance in the families.			

Course Content

Unit	**Content**	**Hours**
Unit I	Genetic: introduction, Pre and Post Mendelian concepts of heredity, Laws of Mendel, principles of heredity. Architecture of chromosome; chromonemata, chromosome matrix, chromomeres, centromere, secondary constriction and telomere; special types of chromosomes.	**06**
Unit II	Chromosomal theory of inheritance –cell cycle and cell division – mitosis and meiosis. Probability and Chi-square. Dominance relationship, Epistatic interactions with example.	**06**
Unit III	Multiple alleles, pleiotropism and pseudoalleles, Linkage and it`s estimation, crossing over mechanisms, chromosome mapping. Structural and numerical variations in chromosome and their implications.	**06**

Unit IV	Use of haploids, dihaploids and doubled haploids in Genetics. Mutation classification, Methods of inducing mutations & CIB technique, mutagenic agents and induction of mutation. Qualitative and Quantitative traits, Polygenes and continuous variations, multiple factor hypothesis, Cytoplasmic inheritance.	**06**
Unit V	Nature, structure and replication of genetic material. Protein synthesis, transcription and translational mechanism of genetic material. Gene concept :Gene structure, function and regulation, Lac and Trp operons	**06**
Practical	1. Study of microscope, Study of cell structure. 2. Mitosis and Meiosis cell division. 3. Experiments on monohybrid, dihybrid, trihybrid, testcross and back cross, 4. Experiments on epistatic interactions including test cross and back cross, 5. Practice on mitotic and meiotic cell division, 6. Experiments on probability and Chi-square test. 7. Determination of linkage and cross over analysis (through two point test cross and three point test cross data. 8. Study of models on DNA and RNA structures	
References	1. B. D. Singh. 2015. Plant Breeding – Principles and methods. Kalyani Publishers New Delhi. 2. Phunadan Singh. 2011. Essentials of Plant Breeding. Kalyani publisher new Delhi. 3. V.L. Chopra, 2005. Plant breeding theory and practice. Oxford and IBH Publishing Co. PVT. Ltd. 4. Allard, R. 2004. Principles of plant breeding. John Wiley and Sons , New Delhi. 5. J. R. Sharma. 2002. Principles and Practices of Plant Breeding. Tata McGraw-Hill publishing Co., New Delhi	

Course code	**AGS-202**			
Category	Core			
Course title	**Agricultural Microbiology**			
Scheme and Credits	**Credit**	**L**	**P**	
	2	1	1	
Objectives	In this course, the students will be introduced to diverse world of microbiology and the roles that microorganisms play in all aspects of agriculture, including animal, plant and soil science. The basic structure and biology of microorganisms will be covered, with a focus on bacteria, viruses and fungi. Aspects of molecular biology and genetics will also be introduced. The role that microorganisms play within the environment, in particular relating to plant, animal and soil health, will also be considered. The use of microorganisms in agricultural biotechnology is also discussed, including examples such as genetic			

	modification of plants and the use of microorganisms in the expression of recombinant proteins.	
Outcomes	After completion of this course, the student will be able to: CO1: Memorize the basic principles and concepts of agricultural microbiology. CO2: Explain the basic microbial structure and function and study the comparative characteristics of prokaryotes and eukaryotes and microbiology concepts as applicable to diverse areas such as medical, industrial, environment, genetics, agriculture, food and others. CO3: Develop key practical skills/competencies in working with microbes for study and use in the laboratory as well as outside, including the use of good microbiological practices. CO4: Analyze problems involving microbes, articulate these with peers/ team members/ other stake holders, and undertake remedial measures/ studies etc. CO5: Assess various relationships microorganisms have with their environments, including pathogenic, symbiotic and commensal lifestyles. In addition, also assess how microorganisms can be utilised in agricultural biotechnology, including specific techniques such as cloning and expression of genes using microorganisms. CO6: Develop a model microbial system to explain the catabolic and anabolic pathways of energy production and their growth kinetics.	
Course Content		
Unit	**Content**	**Hours**
Unit I	Need and importance of agricultural microbiology, Introduction. Microbial world: Prokaryotic and eukaryotic microbes. Bacteria: cell structure, chemoautotrophy, photo autotrophy, growth.	**04**
Unit II	Bacterial genetics: Genetic recombination-transformation, conjugation and transduction, plasmids, transposon.	**05**
Unit III	Role of microbes in soil fertility and crop production: Carbon, Nitrogen, Phosphorus and Sulphur cycles. Biological nitrogen fixation- symbiotic, associative and a symbiotic.	**05**
Unit IV	Azolla, blue green algae and Mycorrhiza, Rhizosphere and phyllosphere. Microbes in human welfare: silage production, biofertilizers, biopesticides, biofuel production and biodegradation of agro-waste.	**06**
Pratical	1. Introduction to microbiology laboratory and its equipments; 2. Microscope- parts, principles of microscopy, resolving power and numerical aperture. Methods of sterilization. 3. Nutritional media and their preparations. 4. Enumeration of microbial population in soil- bacteria, fungi, actinomycetes. 5. Methods of isolation and purification of microbial cultures. 6. Isolation of Rhizobium from legume root nodule. 7. Isolation of Azotobacter from soil. 8. Isolation of Azospirillum from roots.	

	9. Isolation of BGA. 10. Staining and microscopic examination of microbes.
References	1. Pelczar, J.r.,M.J.E.C.S. Chan and Krieg, N.R., 2015. Microbiology. 5th Ed. McGraw Hill Publishers, New York. 2. Madigan, M.,Martinko, J.M. and Parker, J., 2015. Brock Biology of Microorganisms. 14 Ed. Prentice Hall of India Pvt. Ltd., New Delhi 3. Prescott, L.M., Harley, J.P. and Klein, D.A. 2014. Microbiology. 9th Ed. McGraw Hill Publishers, New York. 4. Aneja, K.R. , 2017. Fundamental Agricultural Microbiology. New Age International Private Limited 5. Rangaswami, G. 1992. Agricultural Microbiology. Prentice Hall India Learning Private Limited;

Course code	**AGS-203**			
Category	Core			
Course title	**Soil and Water Conservation Engineering**			
Scheme and Credits	**Credit**	**L**	**P**	
	2	1	1	
Objectives	In this course the students will learn and equip with the process of soil degradation, soil and water conservation and their remedial measures for economic and recreational purposes.			
Outcomes	After completion of this course, the student will be able to: CO1: Memorize the concepts and techniques of agricultural study and research of modern techniques aimed at improving soil quality and water- related management. CO2: Explain the degradation of productive soil globally and its effect thereon, also to know about the causes about water scarcity and their solution to fight against the evil effects through soil and water conservation technologies. CO3: Apply knowledge of mathematics, agriculture, and engineering to solve real world problems. CO4: Compare the different agronomical and engineering measures adopted for erosion control. CO5: Evaluate the best possible soil and water conservation practices according to the available resources and topographic conditions of given land area. CO6: Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, and sustainability.			
Course Content				
Unit	**Content**			**Hours**
Unit I	Introduction to Soil and Water Conservation causes of soil erosion, losses due to soil erosion, Definition and agents of soil erosion, water erosion: Forms of water erosion. Gully classification and control			**04**

	measures.	
Unit II	Soil loss estimation by universal Loss Soil Equation. Soil loss measurement techniques. Principles of erosion control: Introduction to contouring, strip cropping, relay cropping and contour bund.	**06**
Unit III	Graded bund and bench terracing. Grassed water ways and their design. Water harvesting and its techniques.	**04**
Unit IV	Wind erosion: mechanics of wind erosion, types of soil erosion, Principles of wind erosion control and its control measures.	**06**
Practical	1. General status of soil conservation in India. 2. Calculation of erosion index. 3. Estimation of soil loss. Measurement of soil loss. 4. Preparation of contour maps. 5. Design of grassed water ways. 6. Design of contour bunds. Design of graded bunds. 7. Design of bench terracing system. 8. Problem on wind erosion.	
References	1. Ghanashyam Das, 2012. Hydrology and soil conservation Engineering, including watershed management. Second edition, PHI Learning Pvt. Ltd., New Delhi 2. Murthy, V.V.N. 2004. Land and Water Management Engineering, Kalyani Publishers, New Delhi. 3. Micheal, A.M. 2007.Irrigation Theory and Practice. Second edition. Vikas Publishing House, Pvt. Ltd.	

Course code	**AGS-204**			
Category	Core			
Course title	**Fundamentals of Crop Physiology**			
Scheme and Credits	**Credit**	**L**	**P**	
	2	1	1	
Objectives	In this course the students will understand crop growth, development and yield from a perspective of whole plant physiology. The students will gain an overview of crop physiological processes that are necessary to understand how plants operate, and interact with their environment. The course is useful to understand and interpret agronomic phenomena contributing to crop yield.			
Outcomes	After completion of this course, the student will be able to: CO1: Recall the basic terminologies, concepts, principles and different mechanisms in plants CO2: Explain the various physiological processes that occur in plants required for its growth and development. CO3: Apply their knowledge of crop physiology for analytical thinking and solving practical problems experienced in agricultural systems. CO4: Examine the physiology of crop adaptation to their environment and			

	phenological development. CO5: Evaluate the different strategies used by plants to acquire and utilize resources, and formulate a logical argument of their impact on crop productivity. CO6: Equip students with skills and techniques related to plant physiology so that they can design either their own experiments for farmers etc.	
Course Content		
Unit	**Content**	**Hours**
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	**05**
Unit II	Mineral nutrition of Plants: Functions and deficiency symptoms of nutrients, nutrient uptake mechanisms; Photosynthesis: Light and Dark reactions, C3, C4 and CAM plants, difference between C3, C4 and CAM Plants.	**05**
Unit III	Respiration: Glycolysis, TCA cycle and electron transport chain; Fat Metabolism: Fatty acid synthesis and Breakdown.	**05**
Unit IV	Plant growth regulators: its types and physiological roles and agricultural uses, Physiological aspects of growth and development of major crops: Growth analysis, Role of Physiological growth parameters in crop productivity.	**05**
Practical	1. Study of plant cells, structure and distribution of stomata. 2. Study of imbibitions, osmosis, plasmolysis, 3. Measurement of root pressure, rate of transpiration 4. Separation of photosynthetic pigments through paper chromatography, 5. Rate of transpiration, photosynthesis, respiration, 6. Tissue test for mineral nutrients, 7. Estimation of relative water content, 8. Measurement of photosynthetic CO2 assimilation by Infra Red Gas Analyser (IRGA).	
References	1. Taiz L and Zeiger E., 2010. Plant Physiology. 5th ed. Sinauer Associates, Inc. Publishers, Sunderland, MA 2. Hopkins W.G. and Huner, N.P.A. 2008. Introduction to Plant Physiology. John Wiley & Sons. 3. Jain, V.K. Fundamentals of Plant Physiology. S Chand Publishing. 4. Hay R and Porter J (2006) The Physiology of Crop Yield. 2nd ed. Blackwell Publishing Ltd, Oxford, UK.	

Course code	**AGS-205**			
Category	Core			
Course title	**Fundamentals of Agricultural Economics**			
Scheme and Credits	**Credit**	**L**	**P**	
	2	2	0	
Objectives	In this course the students will understand the area of economics of agricultural production, industry of agricultural inputs and food industry, services in rural areas and agricultural and rural policy. The study of Agricultural Economics trains students for the work on agricultural farms and cooperatives, extension services, and other public services			
Outcomes	After completion of this course, the student will be able to: CO1: Memorize the basic principles and concepts of economics in the agricultural field. CO2: Describe and explain models of production, supply and demand of agricultural and food products on national and international markets. CO3: Select, apply and interpret indicators of farm business success (family farms, crafts, co-operatives, companies) by standard mathematical, statistical and economic analysis methods. CO4: Analyse elements of business success in agriculture and food-processing as well as elements that determine economic role of agriculture in national economy CO5: Assess the various business elements which are involved in different sectors of agriculture. CO6: Propose methods of micro- and macroeconomic decision making in agriculture in different agro-ecological and agro-economic circumstances.			

Course Content

Unit	**Content**	**Hours**
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.	**04**
Unit II	Agricultural economics: Concept and definition, characteristics of agriculture, importance and its role in economic development. Agricultural planning and development in the country. Demand: meaning, law of demand, schedule and demand curve, determinants, utility theory; law of diminishing marginal utility, equi-marginal utility principle. Consumer's equilibrium and derivation of demand curve, concept of consumer surplus.	**04**
Unit III	Elasticity of demand: concept and measurement of price elasticity, income elasticity and cross elasticity. Production: process, creation of utility, factors of production, input output relationship. Laws of returns: Law of variable proportions and law of returns to scale.	**04**

	Cost: concepts, short run and long run cost curves. Supply: Stock v/s supply, law of supply, schedule, supply curve, determinants of supply, elasticity of supply. Market structure: meaning and types of market, basic features of perfectly competitive and imperfect markets.	
Unit IV	Price determination under perfect competition; short run and long run equilibrium of firm and industry, shut down and break even points. Distribution theory: meaning, factor market and pricing of factors of production. Concepts of rent, wage, interest and profit. National income: Meaning and importance, circular flow, concepts of national income accounting and approaches to measurement, difficulties in measurement. Population: Importance, Malthusian and Optimum population theories, natural and socio-economic determinants, current policies and programmes on population control.	**04**
Unit V	Money: Barter system of exchange and its problems, evolution, meaning and functions of money, classification of money, supply, general price index, inflation and deflation. Banking: Role in modern economy, types of banks, functions of commercial and central bank, credit creation policy. Agricultural and public finance: meaning, micro v/s macro finance, need for agricultural finance, public revenue and public expenditure. Tax: meaning, direct and indirect taxes, agricultural taxation, VAT. Economic systems: Concepts of economy and its functions, important features of capitalistic, socialistic and mixed economies, elements of economic planning.	**04**
References	1. Dewett,K.K. and Varma, J.D.2003.Elementory Economic Theory. S.Chand and Co, New Delhi 2. Dewett,K.K. and Chand,A.2009. Modern Economic Theory. S.Chand and Co, New Delhi 3. Paul A. Samuelson and Nordhus.2010. Economics. 19th Edition, Tata-Mac Graw Hill Education, New Delhi 4. Jhingan,M.L. 1990. Advanced Economic Theory. Vikas Publishing House, New Delhi	

Course code	**AGS-206**			
Category	Core			
Course title	**Fundamentals of Plant Pathology**			
Scheme and Credits	**Credit**	**L**	**P**	
	4	3	1	
Objectives	In this course the students will learn the basic concepts of plant pathology and living, non-living and environmental causes of diseases or disorders of the plants. The students will study the mechanism of plant disease development,			

	its diagnosis and various disease management systems in plants.	
Outcomes	After completion of this course, the student will be able to: CO1: Recall the objectives, concepts, disease diagnosis and its management in plant pathology. CO2: Explain the roles of microorganism to cause disease in plants, their pathogenesis and epidemiology. CO3: Plan/ Apply management strategies for the control of plant disease according to the crop grown. CO4: Compare the different disease management methods under various crop production systems. CO5: Assess the best possible disease management by keeping in mind the concept of Integrated Disease Management. CO6: Develop various hypothetical/ real-time models for plant disease detection and its management which will be farmers/ user friendly, economically viable and ecologically sustainable.	
Course Content		
Unit	**Content**	**Hours**
Unit I	Introduction: Importance of plant diseases, scope and objectives of Plant Pathology. History of Plant Pathology with special reference to Indian work. Terms and concepts in Plant Pathology. Pathogenesis. Causes/ factors affecting disease development: disease triangle and tetrahedron and classification of plant diseases.	**07**
Unit II	Important plant pathogenic organisms, different groups: fungi, bacteria, fastidious vesicular bacteria, phyto-plasmas, spiro-plasmas, viruses, viroids, algae, protozoa, phanerogamic parasites and nematodes with examples of diseases caused by them. Diseases and symptoms due to abiotic causes.	**08**
Unit III	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.	**08**
Unit IV	Bacteria and mollicutes: general morphological characters. Basic methods of classification and reproduction. Viruses: nature, structure, replication and transmission. Study of phanerogamic plant parasites. Nematodes: General morphology and reproduction, classification, symptoms and nature of damage caused by plant nematodes (Heterodera, Meloidogyne, Anguina, Radopholusetc.)	**08**
Unit V	Growth and reproduction of plant pathogens. Liberation / dispersal and survival of plant pathogens. Types of parasitism and variability in plant pathogens. Pathogenesis. Role of enzymes, toxins and growth regulators in disease development. Defense mechanism in plants. Epidemiology: Factors affecting disease development. Principles and	**09**

	methods of plant disease management. Nature, chemical combination, classification, mode of action and formulations of fungicides and antibiotics.	
Practical	1. Acquaintance with various laboratory equipments and microscopy. 2. Collection and preservation of disease specimen. 3. Preparation of media, isolation and Koch's postulates. 4. General study of different structures of fungi. Study of symptoms of various plant diseases. Study of representative fungal genera. 5. Staining and identification of plant pathogenic bacteria. 6. Transmission of plant viruses. Study of phanerogamic plant parasites. 7. Study of morphological features and identification of plant parasitic nematodes. 8. Sampling and extraction of nematodes from soil and plant material, preparation of nematode mounting. 9. Study of fungicides and their formulations. Methods of pesticide application and their safe use. 10. Calculation of fungicide sprays concentrations	
References	1. Singh R.P. 2013. Plant Pathology. 5th Ed. Kalyani Publishers. 2. Sharma P.D. 2016. Plant Patholoy. 2nd Ed. Rastogi Publications, Meerut. 3. Agrios, G. N. 2006. Plant Pathology. Elsevier Publishers, New Delhi. 4. Dube, H. C. 2013. An Introduction to Fungi.4th (Edition).Scientific Publishers, Jodhpur, India. (major text book) 5. Singh, R.S. 2002. Introduction to Principles of Plant Pathology. Oxford & IBH Publ. Co.Pvt. Ltd., New Delhi. 6. Chaube, H.S. and Singh, R. 2015.Introductory Plant Pathology. CBS Publishers.	

Course code	**AGS-207**			
Category	Core			
Course title	**Fundamentals of Entomology**			
Scheme and Credits	**Credit**	**L**	**P**	
	4	3	1	
Objectives	In this course the students will be familiarize with the insects and arachnids, their identification a harmful ones and their management. To study the way beneficial insects contribute to the well-being of humans, animals, and plants and To acquire working skills for collecting, mounting, and preserving insects.			
Outcomes	After completion of this course, the student will be able to: CO1: Memorize the basic information of entomology (i.e. insect identification, morphology, physiology and behaviour) acquired during the course program. CO2: Classify the harmful pests of crops, vegetables, fruits, stored grains and household pests as well as insects of economic importance. CO3: Demonstrate different control methods of pest according to the nature of			

	damage in crops and use of pesticide application equipment's as per the need. CO4: Examine the methods of managing beneficial and pest insect populations adopted. Prepare mounted specimens and label according to discipline protocol CO5: Select the methods which show evolutionary and ecological relationships of insects with other life forms and the impact of insects relative to human health and well-being and animal and plant health. CO6: Develop various hypothetical/ real-time models for pest detection and its management which will be farmers/ user friendly, economically viable and ecologically sustainable and models which will be helpful in generating employment for small and medium scale industries utilizing the virtues of beneficial insects	
Course Content		
Unit	**Content**	**Hours**
Unit I	History of Entomology in India. Major points related to dominance of Insecta in Animal kingdom. Classification of phylum Arthropod up to classes. Relationship of class Insecta with other classes of Arthropoda. Morphology: Structure and functions of insect cuticle and molting. Body segmentation. Structure of Head, thorax and abdomen. Structure and modifications of insect antennae, mouthparts, legs, Wing venation, modifications and wing coupling apparatus.	**09**
Unit II	Structure of male and female genital organ. Metamorphosis and diapauses in insects. Types of larvae and pupae. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretary (Endocrine) and reproductive system, in insects. Types of reproduction in insects. Major sensory organs like simple and compound eyes, chemoreceptor	**09**
Unit III	Insect Ecology: Introduction, Environment and its components. Effect of abiotic factors– temperature, moisture, humidity, rainfall, light, atmospheric pressure and air currents.	**05**
Unit IV	Categories of pests. Concept of IPM, Practices, scope and limitations of IPM. Classification of insecticides, toxicity of insecticides and formulations of insecticides. Chemical control- importance, hazards and limitations. Recent methods of pest control, repellents, anti feed ants, hormones, attractants, gamma radiation. Insecticides Act 1968- Important provisions. Application techniques of spray fluids. Symptoms of poisoning, first aid and antidotes.	**08**
Unit V	Systematic: Taxonomy –importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order. Classification of class Insecta up to Orders, basic groups of present day insects with special emphasis to orders and families of Agricultural importance like Orthoptera: Acrididae, Tettigonidae, Gryllidae, Gryllotalpidae; Dictyoptera: Mantidae,	**09**

	Blattidae; Odonata; Isoptera: Termitidae; Thysanoptera: Thripidae; Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidae, Aleurodidae, Pseudococcidae; Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papiloinidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera: Tenthridinidae, Apidae. Trichogrammatidae, lchneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae, Muscidae, Tephritidae	
Practical	1. Methods of collection and preservation of insects including immature stages; 2. External features of Grasshopper/Blister beetle; 3. Types of insect antennae, mouthparts and legs; 4. Wing venation, types of wings and wing coupling apparatus. 5. Types of insect larvae and pupae; 6. Dissection of digestive system in insects (Grasshopper); 7. Dissection of male and female reproductive systems in insects (Grasshopper); 8. Study of characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance. 9. Insecticides and their formulations. Pesticide appliance	
References	1. Sehgal, P.K. (2017). Fundamentals of Agricultural Entomology. 3rd Ed. Kalyani Publisher 2. Bhattacharya, D. (2017). Textbook of Entomology. Arjun Publishing House 3. Vasantharaj David, B and Aanathakrishnan, T.N. 2006. General and Applied Entomology. Tata McGraw-Hill Publishing House, New Delhi. 4. Yazdani,S.S. and Agarwal,M.L.1979. Elements of Insect Ecology. Narosa Publishing House, New Delhi. 5. Dhaliwal, G.S. and Ramesh Arora 2001. Integrated Pest Management: Concepts and Approaches, Kalyani Publishers Ludhiana	

Course code	**AGS-208**			
Category	Core			
Course title	**Fundamentals of Agricultural Extension Education**			
Scheme and Credits	**Credit**	**L**	**P**	
	3	2	1	
Objectives	In this course the students will learn the concept of extension education and its importance in agriculture development and also to expose the students with various rural development programmes aimed at poverty alleviation and to			

	increase employment opportunities and their analysis. Besides, the students will be learning about the extension system worldwide and new dimensions of Agricultural Extension in India.	
Outcomes	After completion of this course, the student will be able to: CO1: Recall the basic concepts, objectives, principles and process of Extension Education. CO2: Explain the extension system in India, various programmes extension / agriculture development programmes launched by ICAR/ Govt. of India, new trends in agriculture extension. CO3: Organize meetings, fairs, choupal in rural areas and demonstrations of new agricultural research/ practices in field by adopting the best possible medium of communication. To ensure the dissemination of current best practices, organize cooperatives, and implement secondary programs. CO4: Examine the behavior of the rural people towards the schemes/ programmes conducted in the rural area. CO5: Assess the response of the people is either positive or negative towards a particular activity and to rectify it by improvising or modifying the programmes according to the need of the audience. CO6: Develop strategies for more quick and easy understandable way of communicating with the rural masses in order to bridge the gap between scientists and farmers i.e. lab to land approach which will be helpful in income generation and engaging more people in agricultural practices by adopting new technologies.	
Course Content		
Unit	**Content**	**Hours**
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.	**05**
Unit II	Extension systems in India: extension efforts in pre-independence era (Sriniketan, Marthandam, Firka Development Scheme, Gurgaon Experiment, etc.) and postindependence era (Etawah Pilot Project, Nilokheri Experiment, etc.); various extension/ agriculture development programmes launched by ICAR/ Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND,NATP, NAIP, etc.).	**06**
Unit III	New trends in agriculture extension: privatization extension, cyber extension/ eextension, market-led extension, farmer-led extension, expert systems, etc. Rural Development: concept, meaning, definition; various rural development programmes launched by Govt. of India	**06**
Unit IV	Community Dev.-meaning, definition, concept & principles, Philosophy of C.D. Rural Leadership: concept and definition, types of leaders in rural context; extension administration: meaning and concept, principles and functions. Monitoring and evaluation: concept and definition, monitoring and evaluation of extension	**06**

	programmes;	
Unit V	Transfer of technology: concept and models, capacity building of extension personnel; extension teaching methods: meaning, classification, individual, group and mass contact methods, ICT Applications in TOT (New and Social Media), media mix strategies; communication: meaning and definition; Principles and Functions of Communication, models and barriers to communication. Agriculture journalism; diffusion and adoption of innovation: concept and meaning, process and stages of adoption, adopter categories.	**07**
Practical	1. To get acquainted with university extension system. 2. Group discussion- exercise; handling and use of audio visual equipments and digital camera and LCD projector; 3. 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; 4. A visit to village to understand the problems being encountered by the villagers/ farmers; 5. To study organization and functioning of DRDA and other development departments at district level; 6. A visit to NGO and learning from their experience in rural development; understanding PRA techniques and their application in village development planning; exposure to mass media: 7. 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.	
References	1. Adivi Reddy, A. 2006. Extension Education. Sree Lakshmi Press, Bapatla 2. Ray, G. L. 2006. Extension Communication and Management. Naya Prokash/ Kalyani Publishers, Ludhiana. 3. Dubey, V.K. and Bishnoi, I. 2008. Extension Education and Communication. New Age International (P) Limited, Publishers. 4. Mondal, S. and Ray. G.L.2007. Text book of Rural Development. Kalyani Publishers, Kolkata/Ludhiana. 5. Van Den Ban, A.W. and Hawkins, H.S. 1998. *Agricultural Extension*. 2nd Ed. CBS. 6. Ganesan, R., Iqbal, I.M. and Anandaraja, N. 2003. *Reaching the Unreached: Basics of Extension Education*. Associated Publishing Co. 7. Jalihal KA & Veerabhadraiah V. 2007. Fundamentals of Extension Education and Management in Extension. Concept Publ. Khan	

Course code	**AGS-209**
Category	Core
Course title	**Communication Skills and Personality Development**

Scheme and Credits	**Credit**	**L**	**P**	
	2	1	1	
Objectives	In this course the students will learn basic knowledge of communication skills			
Outcomes	After completion of this course, the student will be able to: CO1: Students will analyze basic communication skills. CO2: Students will analyze intercultural communication skills. CO3: Students will analyze interpersonal communication skills. CO4: Students will analyze public speaking communication skills.			
Course Content				
Unit	**Content**			**Hours**
Unit I	Communication Skills: Structural and functional grammar; meaning and process of communication, verbal and nonverbal communication;			**04**
Unit II	Listening and note taking, writing skills, oral presentation skills;			**03**
Unit III	Field diary and lab record; indexing, footnote and bibliographic procedures.			**03**
Unit IV	Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting;			**05**
Unit V	Individual and group presentations, impromptu presentation, public speaking; Group discussion. Organizing seminars and conferences.			**05**
Practical	1. Listening and note taking, writing skills, oral presentation skills; 2. Field diary and lab record; indexing, footnote and bibliographic procedures. 3. Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting; individual and group presentations.			
References	1. Dr. S. S. Narula, 2011. Personality Development and Communication Skills. Taxmann Publications Private Limited. 2. Sanjay Kumar and Pushp lata, 2015. Communication Skills. Oxford Publications. 3. Krishna Mohan and Meera Banerjee. 1990. Developing Communication Skills. McMillanIndia Ltd., NewDelhi.			

III SEMESTER

Course code	**AGS-301**

Category	Core			
Course title	**Crop Production Technology – I *(Kharif Crops)***			
Credits	**Credit**	**L**	**P**	
	2	1	1	
Objectives	The objective of this course is to help students to understand the basic aspects of crop production techniques of Kharif crops. This course designed to teach students crops growing regions, varieties, quality control, and insect and pest management.			
Outcomes	After completion of this course, the student will be able to: CO1: Describe the principles of sustainability in relation to agricultural practices. CO 2: Identify drought-tolerant crops and management practices. CO 3: Compare and contrast local and global agricultural systems. CO 4: Identify new developments in agricultural productionsystems. CO 5: Analyze the potential impacts of climate change on agriculture and food security.			

Course Content

Unit	Content	Hours
Unit I	Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Kharif crops. Cereals – rice, maize, sorghum, pearl millet and finger millet	05
Unit II	Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Kharif crops. Cereals – pulses-pigeonpea, mungbean and urdbean; oilseeds- groundnut, and soybean.	05
Unit III	Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Kharif crops. Forage crops-sorghum, cowpea, cluster bean and napier.	05
Unit IV	Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Kharif crops. Fibre crops- cotton & jute.	05

Practical	1. 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 ofnutrients 2. Study of yield contributing characters and yield calculation of kharif season crops, study of crop varieties and important agronomic experiments at experimental farm. 3. study of forage experiments, morphological description of kharif seasoncrops, visit to research centres of related crops.
References	1. Rajendra Prasad. 2006. Text book of field crops production. ICAR, New Delhi. 2. Reddy, S.R. and Reddi Ramu. 5th edition. 2016. Agronomy of field crops. Kalyani publishers, Ludhiana. 3. Gururaj hunsigi and Krishna, K.R. 2007. Scientific field crop production. Oxford &IBH Publishing Co. Pvt. LTD. 4. 4. De Datta, S.K.1981. Principles and practices of rice Production. John Wiley and Sons, New York

Course code	**AGS-302**			
Category	Core			
Course title	**Fundamentals of Plant Breeding**			
Credits	**Credit**	**L**	**P**	
	3	2	1	
Objectives	The objective of this course is to help students to understand the breeding methods of self and cross pollinated crops, and seed germination, vigour, deterioration, seed conditioning and enhancement, seed pathology, seed production and certification.			
Outcomes	After completion of this course, the student will be able to: CO1: Memorize the basic concepts and principles of breedingandmethods used for testing the seedsample. CO2: Describe how the basic concepts, principles, tools andtechniquesof seed testing can be utilized in production of healthyseed. CO3: Apply different tools and techniques involved in analysis of seed viability, germination status as well as physical and geneticimpurities. CO4: Evaluate the requirement of seed production techniques ofselfand cross pollinatedcrops. CO5: Prescribe the breeding methods ofcrops.			

Course Content

Unit	Content	Hours
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.	06
Unit II	Domestication, Acclimatization and Introduction; Centre of origin/diversity,componentsofGeneticvariation;Heritabilityandgenetic advance	06
Unit III	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.	06
Unit IV	Population improvement Schemes- Ear to row method, Modified Ear to Row, recurrent selection schemes; Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties; Breeding methods in asexually propagated crops, clonal selection and hybridization; Maintenance of breeding records and data collection; Wide hybridization and prebreeding; Polyploidy in relation to plant breeding, mutation breeding-methods and uses.	06
Unit V	Breeding for important biotic and abiotic stresses; Biotechnological tools-DNA markers and marker assisted selection. Participatory plant breeding; IntellectualPropertyRights,Patenting,PlantBreedersand&Farmer's Rights.	06
Practical	1. PlantBreeder'skit,Studyofgermplasmofvariouscrops. 2. Study of floral structure of self-pollinated and cross pollinatedcrops. 3. Emasculation and hybridization techniques in self & cross pollinatedcrops.	

	7. Consequences of inbreeding on genetic structure of resultingpopulations. 8. Study of male sterilitysystem. 9. Handling of segregationpopulations. 10. Methods of calculating mean, range, variance, standard deviation,heritability. 11. Designs used in plant breeding experiments, analysis of Randomized Block Design. 12. To work out the mode of pollination in a given crop and extent of naturalout-crossing.
Reference	1. Phundan Singh, 2014. Essentials of Plant Breeding. Kalyani Publishers, NewDelhi. 2. Singh, B.D. 2015. Plant Breeding: Principles and Methods. Kalyani Publishers, NewDelhi. 3. Gupta, S.K. 2010. Plant Breeding Theory and Techniques.Wiley India Pvt. Ltd. NewDelhi. 4. Allard, R.W. 2010. Principles of Plant Breeding. John Wiley and Sons, NewYork. 5. Poehlman, J.M. and Borthakur, D. 1995. Breeding of Asian Field Crops. Oxford and IBH Publishing Co., NewDelhi. 6. Sharma,J.R.1994.PrinciplesandPracticeofPlantBreeding.TataMcGrawHill, Publishing Company Ltd., New Delhi.

Course code	**AGS-303**			
Category	Core			
Course title	**Agricultural Finance and Cooperation**			
Credits	**Credit**	**L**	**P**	
	3	2	1	
Objectives	The objective of this course is to understand the financial theories and utilization of problem solving skills within the finance setting. This course designed to teach students about application of financial analysis tools and techniques on decision making.			
Outcomes	After completion of this course, the student will be able to: CO 1: Present, discuss, and defend financial decisions by using appropriate terminology. CO 2: Prepare reports containing appropriate terminology; CO 3: Develop interpersonal and teamwork skills. CO 4: Identify ethical dilemmas within the finance setting. CO 5: Identify, evaluate and select alternative courses of action for addressing the ethical dilemma			
Course Content				
Unit	**Content**			**Hours**
Unit I	Agricultural Finance- meaning, scope and significance, credit needs and its role in Indian agriculture. Agricultural credit: meaning, definition, need, classification. Credit analysis: 4R's and 3C's of credits.			06
Unit II	Sources of agricultural finance: institutional and non-institutional sources, commercial banks, social control and nationalization of commercial banks, Micro financing including KCC. Lead bank scheme, RRBs, Scale of finance and unit cost.			06

Unit III	An introduction to higher financing institutions – RBI, NABARD, ADB, IMF, world bank, Insurance and Credit Guarantee Corporation of India. Cost of credit.	06
Unit IV	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.	06
Unit V	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.	06
Practical	1. Determination of most profitable level of capitaluse. 2. Optimum allocation of limited amount of capital among different enterprise. 3. Analysis of progress and performance of cooperatives using published data. Analysis of progress and performance of commercial banks and RRBs using publisheddata. 4. Visit to a commercial bank, cooperative bank and cooperative society to acquire first and knowledge of their management, schemes and procedures. 5. Estimation of credit requirement of farm business – A casestudy. 6. Preparation and analysis of balance sheet – A casestudy. 7. Preparation and analysis of income statement – A casestudy. 8. Appraisal of a loan proposal – A casestudy. 9. Techno-economic parameters for preparation of projects. Preparation of Bankable projects for various agricultural products and its value added products. Seminar on selectedtopics.	
Reference	1. Johil S.S. and C.V. Moore. 1970. Essentials of Farm Financial Management. Today and Tomorrow Printers and Publishers, New Delhi. 2. John, J. Hamptron.1983. Financial Decision Making: Concepts, Problems and Cases, of India. New Delhi. 3. Mamoria, C.B. and R.D. Saksena. 1973. Co-operatives in India. Kitab Mahal, Allahabad, 4. Mamoria, C.B. and Saxena. Agricultural Problems in India. Kitab Mahal, Allahabad 5. Mukhi, H R. 1983. Cooperation in India and Abroad. New Heights Publishers, New Delhi. 6. Muniraj, R. 1987. Farm Finance for Development, Oxford & IBH Publishing Company Ltd., New Delhi, 7. Subba Reddy, S. and P. Raghuram. Agricultural Finance and Management. Oxford & Publishing Company Private Ltd., New Delhi, 2005 8. Subba Reddy, S., Raghu Ram., P., Sastry, T.V.N and Bhavani Devi, I. 2016. Agricultural Economics. Oxford & IBH Publishing Company Private Ltd., 9. New Delhi	

Course code	**AGS-304**			
Category	Core			
Course title	**Agri- Informatics**			
Credits	**Credit**	**L**	**P**	
	2	1	1	
Objectives	The objective of this course is to understand the basic concepts of Agro-informatics, and its application in agriculture with innovative ideas, techniques and scientific knowledge to expand the horizons of the Computer Science. It is information technology applied to management and analysis of agricultural data. It covers the diverse areas ranging from artificial intelligence, artificial neural networks, decision support system, expert system, , genetic algorithm, programming language with backend tool to develop softwares.			
Outcomes	After completion of this course, the student will be able to: CO 1: Identify appropriate information technology to analyze agriculture data. CO 2: Define geographic information system, information system related to agriculture. CO 3: Discuss software related to the collection of crop data. CO 4: Identify the agro climatic zones.			
Course Content				
Unit	**Content**			**Hours**
Unit I	Introduction to Computers, Operating Systems, definition and types, Applications of MSOffice for document creation & Editing, Data presentation, interpretation and graph creation, statistical analysis, mathematical expressions, Database, concepts and types, uses of DBMS in Agriculture, World Wide Web (WWW):			05
Unit II	Concepts and components. Introduction to computer programming languages, concepts and standard input/output operations. e-Agriculture, concepts and applications, Use of ICT in Agriculture. Computer Models for understanding plant processes.			05
Unit III	IT application for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management, Smartphone Apps in Agriculture for farm advises, market price, postharvest management etc;			05
Unit IV	Geospatial technology for generating valuable agri-information. Decision support systems, concepts, components and applications in Agriculture, Agriculture Expert System, Soil Information Systems etc for supporting Farm decisions. Preparation of contingent crop-planning using IT tools.			05
Practical	1. Study of Computer Components, accessories, practice of important DOS Commands. 2. Introduction of different operating systems such as windows, Unix/ Linux, Creating, Files & Folders, FileManagement. 3. Use of MS-WORD and MS Power-point for creating, editing andpresenting a scientific Document. MS-EXCEL - Creating a spreadsheet, use of statistical			

	tools, writing expressions, creating graphs, analysis of scientificdata. 4. MS-ACCESS: Creating Database, preparing queries and reports, demonstration of Agri-information system. Introduction to World Wide Web (WWW). Introduction of programminglanguages. 5. Hands on Crop Simulation Models (CSM) such as DSSAT/Crop-Info/CropSyst/ Wofost; Computation of water and nutrient requirements of crop using CSM and ITtools. 6. Introduction of Geospatial Technology for generating valuable information for Agriculture. Hands on Decision SupportSystem. 7. Preparation of contingent cropplanning.
Reference	**Reference books** 1. John Walkenbach, Herb Tyson, Michael R. Groh, Faithe Wempen, Microsoft Office2010. 2. Bangia,Learning Ms Office2010 3. Prof. Satish Jain and M. Geetha, MS-Office 2010 Training Guide. Johnson, Microsoft Office2010.

Course code	**AGS-305**				
Category	Core				
Course title	**Farm Machinery and Power**				
Credits	**Credit**	**L**	**P**		
	2	1	1		
Objectives	The objective of this course is to understand the applications and principles of farm machinery. This course is designed to teach students about combustion engines, tractor safety, pre-inspection of your equipment and, functions and working principles of equipment's used in agriculture.				
Outcomes	After completion of this course, the student will be able to: CO1: Know differences between conventional vs. reduced vs. conservation tillage. CO2: Differentiate primary and secondary tillage; identify tillage implements associated with either the primary or secondary tillagecategory. CO3: Understand why a producer might do conservation vs. conventional tillage. CO4: Describe strip tillage, ridge tillage, no-tillage, mulch tillage, and vertical tillage. CO5: Perform all pre-inspection and operations of at least two different types of farmmachinery				
Course Content					
Unit	**Content**				**Hours**
Unit I	Status of Farm Power in India, Sources of Farm Power, Engines: types, and their work, 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.				05

Unit II	Familiarization with different systems of I.C. engines: Air cleaning, cooling, lubrication ,fuel supply and hydraulic control system of a tractor, Familiarization with Power transmission system : clutch, gear box, differential and final drive of a tractor.	05
Unit III	Tractor: types of Tractor, Cost analysis of tractor power and attached implement, Familiarization with Primary and Secondary Tillage implement, Implement for hill agriculture, implement for intercultural operations.	05
Unit IV	Tools for Farm: Type of tools and 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	05
Practical	1. 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 atractor 2. Familiarization with lubrication and fuel supply system ofengine 3. Familiarization with brake, steering, hydraulic control system ofengine 4. Learning of tractordriving. 5. Familiarization with operation of power tiller, Implements for hill agriculture, 6. Familiarization with different types of primary and secondary tillage implements: mould plough, disc plough and discharrow. 7. Familiarization with seed cum- fertilizer drills their seed metering mechanism and calibration, planters andtransplanter. 8. Familiarization with different types of sprayers and dusters Familiarization with different inter cultivation equipment, Familiarization with harvesting and threshingmachinery	
Reference	1. Jagadishwar Sahay - Elements of Agricultural Engineering. 2. Surendra Singh. Farm Machinery - Principles and Applications.ICAR Publication. 3. S. C. Jain and C. R. Rai. Farm Tractor – Maintenance and Repair. Standard Publishers, 1705-B, Nai Sarak, Delhi – 110006. 4. Ojha, T. P. and Michael, A.M. Principles of Agricultural Engineering. Vol. I, Jain Brothers, 16/893, East Park Road, Karol Bagh, New Delhi – 110005.	

Course code	**AGS-306**			
Category	Core			
Course title	**Production Technology for Vegetables and Spices**			
Credits	**Credit**	**L**	**P**	
	2	1	1	
Objectives	In this course the students will learn about Crop production technology, management and plant protection of spices and vegetables.			

Outcomes	After completion of this course, the student will be able to: CO1: Understand practical knowledge on specialized production techniques of vegetables and spices. CO2: Understand will Importance of vegetables & spices in human nutrition improved and national economy. CO3: Explain knowledge about quality requirement and production and techniques CO4: Develop Managing skills for solving field problems.	
Course Content		
Unit	**Content**	**Hours**
Unit I	Importance of vegetables & spices in human nutrition and national economy, kitchen gardening, brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders, of important vegetables and spices Tomato, Brinjal, Chilli, Capsicum, Cucurbitaceous: - Cucumber, Melons, Gourds, Pumpkin, Malvaceae: - Okra and , leguminous: -French bean, Peas	**05**
Unit II	Importance of vegetables & spices in human nutrition and national economy, kitchen gardening, brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders of Cole crops (Cabbage, Cauliflower, Knol-khol)	**05**
Unit III	Importance of vegetables & spices in human nutrition and national economy, kitchen gardening, brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders, of Bulb crops such as Onion, Garlic; Root crops such as Carrot, Raddish, Beetroot;	**05**
Unit IV	Importance of vegetables & spices in human nutrition and national economy, kitchen gardening, brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders, of Tuber crops such as Potato; Leafy vegetables such as Amaranth, Palak, Perennial vegetables.	**05**
Practical	1. Identification of vegetables & spice crops and theirseeds. 2. Nurseryraising. 3. Direct seed sowing andtransplanting. 4. Study of morphological characters of different vegetables &spices. 5. Fertilizersapplications. 6. Harvesting & preparation formarket. 7. Economics of vegetables and spicescultivation	
References	1. S.P.Singh. 2012. Principles of Vegetable production. Oxford Book Company	

	2. T.K.Bose and M.G.Som Vegetable Crops in India. NayaProkash, 3. Hazra, P. and Som, M.G. 2011.Modern Technology for vegetable production and improvement. New India Publishing Agency-Nipa. 4. S. Thamburaj and N. Singh. 2014. Text book of Vegetable TuberCrops and spices. ICAR, New Delhi.

Course code	**AGS-307**			
Category	Core			
Course title	**Environmental Studies and Disaster Management**			
Credits	**Credit**	**L**	**P**	
	3	2	1	
Objectives	In this course the students will develop their careers as leaders in understanding and addressing complex environmental issues from a problem-oriented, interdisciplinaryperspective..			
Outcomes	After completion of this course, the student will be able to: CO1: Understand the natural environment and its relationships with human activities. CO2: Characterize and analyse human impacts on the environment. CO3: Integrate facts, concepts, and methods from multiple disciplines and apply to environmentalproblems. CO4: Capacity to integrate knowledge and to analyse, evaluate and manage the different public health aspects of disaster events at local and global levels. CO5: Capacity to obtain, analyse, and communicate information on risks, relief needs and lessons learned from earlier disasters in order to formulate strategies for mitigation in futurescenarios.			
Course Content				
Unit	**Content**			**Hours**
Unit I	Multidisciplinary nature of environmental studies; Definition, scope and importance. Natural Resources: Renewable and non-renewable resources; Natural resources and associated problems. a) Forest resources: Use and over-exploitation; Deforestation; Case studies. Timber extraction, mining; Dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water; Floods; Drought; Conflicts over water; Dams-benefits and problems. c) Mineral resources: Use and exploitation; Environmental effects of extracting and using mineral resources; Case studies. d) Food resources: World food problems; Changes caused by agriculture and overgrazing; Effects of modern agriculture; Fertilizer-pesticide problems; Water logging; Salinity; Case studies. e) Energy resources: Growing energy needs; Renewable and non-renewable energy sources; Use of alternate energy sources; Case studies.			**07**

	f) Land resources: Land as a resource; Land degradation; Man induced landslides; Soil erosion and desertification. Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.	
Unit II	Ecosystems; Define the ecosystem, Structure and function of ecosystem; Producers, consumers and decomposers; Energy flow in ecosystem; Ecological succession; Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of forest ecosystem, grassland ecosystem, desert ecosystem and aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). Biodiversity: Define and its conservation; genetic, species and ecosystem diversity and biogeographically classification of India; Value of biodiversity: Concept of biodiversity, consumptive use, productive use, social, ethical, aesthetic and option values; Biodiversity at global, national and local levels; India as a mega-diversity nation; Hot-sports of biodiversity; Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; Endangered and endemic species of India; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.	**06**
Unit III	Pollution: definition and their cause, effects and Types of pollution: air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution, nuclear hazards; Solid waste management: causes, effects and control measures of urban and industrial wastes; Role of an individual in prevention of pollution; Pollution case studies. Social issues and the environment; From unsustainable to sustainable development; Urban problems related to energy; Water conservation, rain water harvesting, watershed management; Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust; Wasteland reclamation; Consumerism and waste products; Environment Protection Act; Air (Prevention and Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act; Issues involved in enforcement of environmental legislation; Public awareness.	**07**
Unit IV	Human population and environment: population growth, variation among nations, population explosion, Family Welfare Programme; Environment and human health: human rights, value education, HIV/AIDS; Women and child welfare; Role of information technology in environment and human health; Case studies.	**03**
Unit V	Disaster Management Natural disasters - Meaning and nature of natural disasters; their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, heat and cold waves; Climatic change:globalwarming,sealevelrise,ozonedepletion.Man-made	**07**

	disasters - Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, air accidents, sea accidents. Disaster management - Effect to migrate natural disaster at national and global levels; International strategy for disaster reduction; Concept of disaster management; National disaster management framework; Financial arrangements; Role of NGOs, community-based organizations and media; Role of central, state, district and local administration; Armed forces, police and other organizationsin disaster response.	
Practical	1. Visit to a local area to document environmental assets: river/ forest/ grassland/ hill/mountain; 2. Visit to a local polluted site - urban/ rural/ industrial/agricultural; 3. Study of common plants, insects, birds and study of simpleecosystems - pond, river, hill slopes, etc.; Visit to disaster management 4. organizations; 5. Collection of statistics of national disasters occurred since 20thcentury	
References	1. Ahluwalia VK & Malhotra S. 2006. Environmental Science. AneBooks India. 2. Anjaneyulu Y. 2004. Introduction to Environmental Science. BS Publications. 3. Chauhan AS. 2009. Environmental Studies. 3rd Edition. JainBrothers. 4. Das RC & Behera DK. 2008. Environmental Science - Principles and Practice. Prentice –Hall of India PvtLtd. 5. Dhaliwal GS & Kukal SS. 2005. Essentials of EnvironmentScience. Kalyani Publishers.	

Course code	**AGS-308**			
Category	Core			
Course title	**Statistical Methods**			
Scheme and Credits	**Credit**	**L**	**P**	
	2	1	1	
Objectives	In this course the students will have the basic knowledge of statistics in agriculture			

Outcomes	After completion of this course, the student will be able to: CO1: Understand some basic concepts in statistics. CO2: Be familiar with some elementary statistical methods of analysis of data viz. Measures of Central Tendency, Dispersion, Moments, Skewness, and Kurtosis and to interpret them. CO3: Analyse data pertaining to attributes and to interpret the results. CO4: Understand statistics approach in agriculture research	
Course Content		
Unit	**Content**	**Hours**
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).	**05**
Unit II	Simple Problems Based on Probability. Binomial & Poisson Distributions, Definition of Correlation, Scatter Diagram.	**05**
Unit III	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.	**05**
Unit IV	Introduction to Analysis of Variance, Analysis of One Way Classification. Introduction ton Sampling Methods, Sampling versus Complete Enumeration, Simple Random Sampling with and without replacement, Use of Random Number Tables for selection of Simple Random Sample.	**05**
Practical	1. 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). 2. Measures of Dispersion (Grouped Data). Moments, Measures of Skewness & Kurtosis (Ungrouped Data). Moments, Measures of Skewness & Kurtosis (Grouped Data). Correlation & Regression Analysis. 3. ApplicationofOneSamplet-test.ApplicationofTwoSampleFisher'st- 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.	

	4. Selection of random sample using Simple Random Sampling.
References	1. NageswaraRao, G 2007.Statistics for Agricultural Sciences. B.S Publications,Hyderabad 2. Rangaswamy,R 2016. A Text Book of Agricultural Statistics. 2nd Ed.New Age International (P) Ltd., Publishers,Hyderabad. 3. Chandel SRS, Hand Book of Agricultural Statistics. Achal Prakashan Mandir Publications, NewDelhi. 4. Agrawal,B.L. 2009. Programmed Statistics. 2nd Edition, NewAge International Publishers, Hyderabad.

Course code	**AGS-309**			
Category	Core			
Course title	**Livestock and Poultry Management**			
Credits	**Credit**	**L**	**P**	
	4	3	1	
Objectives	In this course the students will learn the basic aspects of dairying in India compared with developed countries, problems and prospectus of dairying, detailed aspects of care and management of different classes of dairy cattle and buffaloes. To educate the students on advances in housing, feeding, breeding and health care in poultryfarming.			
Outcomes	After completion of this course, the student will be able to: CO-1: Develop and evaluate 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. CO-2: Locate, critically evaluate, and apply information from scholarly animal science literature and other sources to expand personal understanding and knowledge of animal sciences, providing a foundation for lifelong learning. CO-3: Create and interpret graphs, tables and diagrams illustrating scientific data and concepts, and understand basic concepts relating to the design and analysis of research in the animal sciences. CO-4: Communicate effectively about animal sciences to a range of audiences, both orally and in writing, using appropriate traditional and emerging media. CO-5: Engage actively and effectively in discussion of complex issues relevant to the animal sciences by understanding and appreciating: a. the importance of animals to the health and well-being of society; b. economic, environmental, animal welfare, and societal impacts of animal production and management systems at the global and local level; c. varied ethical perspectives on animal practices; d. the role of science in informing debates. CO-6:Appreciate the breadth and depth of professional opportunities in animal sciences relating to: The keeping of animals for food and fibre production and other purposes (e.g., companionship, research and teaching,biotechnology, sports, species conservation);The application of scientific principles to animal breeding, reproduction, feeding, growth and development, health			

	Management, housing, handling, and end – product safety and quality.	
Course Content		
Unit	**Content**	**Hours**
Unit I	Livestock: definition, importance and scope of national economy. Reproduction in farm animals and poultry. Housing principles, space requirements for different species of livestock and poultry.	**08**
Unit II	Management of calves, growing heifers and milch animals. Management of sheep, goat and swine. Incubation, hatching and brooding. Management of growers and layers. Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry. Improvement of farm animals and poultry.	**12**
Unit III	Digestion in livestock and poultry. Classification of feedstuffs. Proximate principles of feed. Nutrients and their functions. Feed ingredients for ration for livestock and poultry. Feed supplements and feed additives. Feeding of livestock and poultry.	**10**
Unit IV	Introduction of livestock and poultry diseases. Prevention (including vaccination schedule) and control of important diseases of livestock and poultry.	**10**
Practical	1. External body parts of cattle, buffalo, sheep, goat, swine and poultry. 2. Handling and restraining of livestock. Identification methods of farm animal's and poultry. 3. 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. 4. Culling of livestock and poultry. Planning and layout of housingfor different types of livestock. 5. Computation of rations for livestock. Formulation of concentrate mixtures. 6. Clean milk production, milking methods. 7. Hatcheryoperations,incubationandhatchingequipment's. Management of chicks, growers andlayers. 8. Debeaking, dusting andvaccination.	
References	1. Sastry NSR & Thomas CK. 2006. Livestock Production andManagement. Kalyani. 2. Dr. J. Prasad., 2019. Principles of Livestock Production and Management 3. V. N. Gautam and Shraddha Shrivastava, 2017. A Text Book of Livestock Production and Management. Aavishkar Publishers, Distributors,Jaipur 4. James R. Gillespie, Frank Flanders, 2009. Modern Livestock &Poultry Production. CengageLearning 5. C.K. Thomas & N.S.R. Sastry, 1991. Dairy Bovine Production.Kalyani.	

IV SEMESTER

Course code	AGS-401			
Category	Core			
Course title	Crop Production Technology –II *(Rabi Crops)*			
Scheme and Credits	Credit	L	P	
	2	1	1	
Objectives	In this course the students will learn about various production technologies, cultural practices and economic importance of rabi crops.			
Outcomes	On the completion of the course, students will be able to: 1. 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 3. To understand the yield attributing characters of Rabi crops and Estimate yield of Rabi crops 4. Acquire skill and technique involve in field and crop observation 5. Students will awareness of the nature of field crop production including the knowledge, skills and abilities required for field crop production. 6. Carry out field observations, including sowing-methods, depth, plant density, Nursery bed and transplanting, Crop density and geometry, Optimum plant population 7. To encourage the development of employability skills in field crop production. 8. Understand about the procedure of harvesting and threshing of crops			
Course Content				
Unit	Content			Hours
Unit I	Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops; cereals –wheat and barley			2
Unit II	Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops; – chickpea, lentils, pea			3
Unit III	Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops; – rapeseed, mustard, groundnuts and sunflower			3
Unit IV	Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops; – sugar crops-sugarcane			2
Unit V	Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops; medicinal and aromatic crops-mentha, lemon grass and citronella			4
Unit VI	Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops; Forage crops-ber seem, Lucerne and oat.			4
Practical	1. Sowing methods of wheat and sugarcane, identification of weeds in *rabi*season crops, study of morphological characteristics of *rabi* crops 2. Study of yield contributing characters of *rabi* season crops, yield and juice quality analysis of sugarcane, study of important agronomic experiments of *rabi* crops at experimental farms. 3. Study of *rabi* forage experiments, oil extraction of medicinal crops, visit to research stations of related crops.			

Course code	AGS-402			
Category	Core			
Course title	Production Technology for Ornamental Crops, MAP and Landscaping			
Scheme and Credits	Credit	L	P	
	2	1	1	
Objectives	To educate on Production Technology for Ornamental Crops, MAPs and Landscaping			
Outcomes	1.Importance and scope of Ornamental Crops, MAPs and Landscaping. 2.Knowledge about production technology of cut flower, loose flower, medicinal and aromatic plants. 3.Uses of tree, shrub, climbers, potted plants in landscaping. 4.Processing and value addition in ornamental plants and MAPs produce.			

Course Content		
Unit	Content	Hours
Unit I	Ornamental: Importance and scope ornamentals crops for national income, medicinal and aromatic plants and landscaping: Definition, Principles of landscaping. Landscape uses of trees, shrubs and climbers.	5
Unit-II	Production technology of important cut flowers like rose, gerbera, carnation, Lilium and orchids under protected conditions, Production technology of important cut flowers like gladiolus, tuberose, chrysanthemum under open conditions.	5
Unit-III	Package of practices for loose flowers like marigold and jasmine under open conditions. Production technology of important medicinal plants like ashwagandha, asparagus, aloe, costus, Cinnamomum, periwinkle, Isabgol.	5
Unit-IV	Production technology of important aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, rose, geranium, vetiver. Processing and value addition in ornamental crops and MAPs produce.	5
Practical	1. Identification of Ornamental plants. Identification of Medicinal and Aromatic Plants. Nursery bed preparation and seed sowing. 2. Training and pruning of Ornamental plants. Planning and layout of garden. Bed preparation and planting of MAP. Protected structures – care and maintenance. 3. 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.	

Course code	AGS-403			
Category	Core			
Course title	Renewable Energy and Green Technology			
Scheme and Credits	Credit	L	P	
	2	1	1	
Objectives	The course should enable the students to : Understand the various forms of conventional and renewable energy resources. Analyse the environmental aspects of renewable energy resources.			
Outcomes	1.Describe the environmental aspects of non-conventional and conventional energy resources 2. Know the need of renewable energy resources, historical and latest developments. 3. Describe the use of solar energy and the various components used in the energy production with respect to various applications. 4. Appreciate the need of Wind Energy and the various components used in energy generation 5. Understand the concept of Biomass energy resources and their classification, types of biogas Plants- applications 6. Compare Solar, Wind and bio energy systems, their prospects, Advantages and limitations.			
Course Content				
Unit	Content			Hours
Unit I	Classification of energy sources, contribution of these of sources in agricultural sector.			2
Unit II	Familiarization with biomass utilization for biofuel production and their application, Familiarization with types of biogas plants and gasifiers, biogas, bio alcohol, biodiesel and bio oil production and their utilization as bio energy resource.			4
Unit III	Introduction of solar energy, collection and their application, Familiarization with solar energy gadgets: solar cooker, solar water heater, application of solar energy: solar drying, solar pond, solar distillation, solar photovoltaic system and their application			6
Unit IV	Introduction of wind energy and their application.			3
Practical	1. Familiarization with renewable energy gadgets. 2. To study biogas plants, to study gasifier, to study the production process of biodiesel. 3. To study briquetting machine, to study the production process of bio-fuels. 4. 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.			

Course code	AGS-404

Category	Core			
Course title	Problematic Soils and their Management			
Scheme and Credits	Credit	L	P	
	2	2	0	
Objectives	To know about the soil and different problem occur during cultivation. How to identify the problem and what are the reclamation method requires improving the soil health			
Outcomes	1.The students get knowledge about different kind of problem soil in India and there characteristics 2.The students will understand how to control or improve the soil fertility.			
Course Content				
Unit	Content			Hours
Unit I	Soil quality and health, Distribution of Waste land and problem soils in India. Their categorization based on properties.			3
Unit II	Reclamation and management of Saline and sodic soils, Acid soils, Acid Sulphate soils, Eroded and Compacted soils, Flooded soils, Polluted soils.			8
Unit III	Irrigation water – quality and standards, utilization of saline water in agriculture. Remote sensing and GIS in diagnosis and management of problem soils.			5
Unit IV	Multipurpose tree species, bio remediation through MPTs of soils, land capability and classification, land suitability classification.			4
Unit V	Problematic soils under different Agro-ecosystems.			3
Practical	----------			

Course code	AGS-405			
Category	Core			
Course title	Production Technology for Fruit and Plantation Crops			
Scheme and Credits	Credit	L	P	
	2	2	0	
Objectives	1. To provide technical and scientific cultivation practices of different fruit and plantation crops. 2. To provide field knowledge and acquaint the students with practical field			
Outcomes	3. Students will get knowledge on technical cultivation techniques of different fruits and plantation crops. 4. Students will able to identify different practical issues related to fruits and planation crops			
Course Content				
Unit	Content			Hours
Unit I	Importance and scope of fruit and plantation crop industry in India; Importance of rootstocks			3
Unit II	Production technologies for the cultivation of major fruits-mango, banana, citrus, grape, guava			6
Unit III	Production technologies for the cultivation of major fruits- litchi, papaya, sapota, apple, pear, peach, walnut, almond.			8
Unit IV	Production technologies for the cultivation of minor fruits- date, ber, pineapple, pomegranate, jackfruit, strawberry,			7
Unit V	Production technologies for the cultivation plantation crops-coconut, arecanut, cashew, tea, coffee & rubber.			7
Practical	1. Seed propagation. Scarification and stratification of seeds. 2. Propagation methods for fruit and plantation crops. 3. Description and identification of fruit. Preparation of plant bio regulators and their uses, 4. Important pests, diseases and physiological disorders of above fruit and plantation crops, Visit to commercial orchards.			

Course code	AGS-406			
Category	Core			
Course title	Principles of Seed Technology			
Scheme and Credits	Credit	L	P	
	3	1	2	
Objectives	1. Develop an understanding of seed development, germination, vigor, deterioration and the relationship between laboratory tests and field performance. 2. Acquaint the students with the principles of seed production for agronomic and horticultural crops within and outside of the region of adaptation and the techniques used in seed conditioning. 3. Understand seed increase systems, seed testing and the laws and regulations related to marketing high quality seed.			
Outcomes	1.Core competency in the subject & comparative evidence on development of seed. 2.High analytical ability in understanding the application of scientific principles and students will acquire skills & handling operations of different equipment's in seed science laboratory.			

Course Content

Unit	Content	Hours
Unit I	Seed and seed technology: introduction, definition and importance. Deterioration causes of crop varieties and their control	3
Unit II	Maintenance of genetic purity during seed production, seed quality; Definition, Characters of good quality seed, Seed dormancy, different classes of seed. Foundation and certified seed production of important cereals, pulses, oilseeds, fodder and vegetables.	5
Unit III	Varietal Identification through Grow Out Test and Electrophoresis, Molecular and Biochemical test. Detection of genetically modified crops	3
Unit IV	Transgenic contamination in non-GM crops, GM crops and organic seed production.	3
Unit V	Seed drying, Importance of seed treatment, processing and their steps, seed testing for quality assessment, seed treatment, its importance, method and application seed packing. Seed storage; general principles, stages and factors affecting seed ongevity during storage. Measures for pest and disease control during storage.	8
UnitVI	Seed marketing: structure and organization, sales generation activities, promotional media. Factors affecting seed marketing, Role of WTO and OECD in seed marketing. Private and public sectors and their production and marketing strategies.	8
Practical	1. Seed production in major cereals: Wheat, Rice, Maize, Sorghum, Bajra and Ragi. Seed production in major pulses: Urd, Mung, Pigeonpea, Lentil, Gram, Field bean, pea. Seed production in major oilseeds: Soybean, Sunflower, Rapeseed, Groundnut and Mustard. Seed production in important vegetable crops. 2. Seed sampling and testing: Physical purity, germination, viability, etc. Seed and seedling vigour test. 3. Genetic purity test: Grow out test and electrophoresis. Seed certification: Procedure, Field inspection, Preparation of field inspection report. 4. Visit to seed production farms, seed testing laboratories and seed processing plant		

Course code	AGS-407			
Category	Core			
Course title	Farming System & Sustainable Agriculture			
Scheme and	Credit	L	P	

Credits	1	1	0	
Objectives	1.To impart knowledge to the students on the fundamentals of farming systems and sustainable agriculture 2. To study the various components of organic agriculture			
Outcomes	At the end of the course the student should be able to 1. Interpret farming systems and its significance 2. Design an efficient cropping system 3. Demonstrate sustainability in agriculture 4. Propose integrated farming systems 5. Determine the efficiency of farming systems			
Course Content				
Unit	Content			Hours
Unit I	Sustainable agriculture- definition, concept, goals; factors affecting ecological balance- land degradation, water and air pollution, global warming, impact and amelioration; sustainable agriculture practices-natural farming, alternative farming, integrated farming. HEISA, LEISA and BIOFARMS.			5
Unit II	Farming systems– principles, concepts, components; cropping systems; sequential cropping, crop rotation, relay and ratoon cropping, multi-storey cropping, filler and inter planting in orchards; Assessment of multiple cropping advantages; delineation of efficient cropping zones based on RYI and RSI and strategies for improving crop productivity in different zones.			8
Unit III	IFS models for dry, wet, wastelands and for different agro climatic situations. Organic farming: concept, definition, principles, components, scope, relevance in the present context; organic production requirement, permitted and restricted inputs in organic farming; biological intensive nutrient management, traditional and non-traditional additives in organic farming; Weeds, pests and diseases management practices in organic farming; Quality considerations, certification, accreditation, labelling, marketing and exports.			8
Unit IV	Definition of precision agriculture scope and concept of precision agriculture, components of precision agriculture. Global Positioning System (GPS), Geographic Information System (GIS), Computer software model and remote sensing for aerial/satellite imagery. Site Specific Nutrient Management (SSM) for nutrient and irrigation management practices. Comparative yield, quality and farm profits under SSM practices V/s Uniform Rate Technology (URT) practices.			8
Practical	1. Assessment of multiple cropping advantages and sustainability; Preparation of cropping schemes for rainfed situations, Preparation of cropping schemes for irrigated situations. 2. Preparation of IFS models for rainfed and irrigated lands; Preparation of IFS models for wet and wastelands; Recycling of crop residues in agriculture. 3. Preparation of enriched compost and vermicompost, composting industrial and urban biowastes; Resource allocation and management of dairy, poultry, piggery, sericulture as a component of IFS. 4. Labour resource management, labour saving techniques, farm records and farm book keeping; Indigenous technical knowledge in organic farming. 5. Preparation and use of botanicals in organic farming; Processing. Certification and accreditation in organic farming.			
Course code	AGS-408			
Category	Core			
Course title	Agricultural Marketing Trade & Prices			
Scheme and Credits	Credit	L	P	
	3	2	1	
Objectives	1.Explaining the importance of agribusiness and transformation of agriculture into agribusiness 2. Demonstrating the procedures of setting up and management of agro-based industries 3. Outlining the various activities and linkages in agri-value chain			

	management	
Outcomes	1. Acquire knowledge on transforming agriculture into agribusiness. 2. Comprehend the procedures of setting up of agro-based industries 3. Analyse the various activities and linkages in agri-value chain and the business environment 4. Assess the capital, financial and marketing management of agribusiness 5. Develop skills in project formulation, appraisal and evaluation 6. Do agribusiness	
Course Content		
Unit	Content	Hours
Unit I	Importance of Agricultural Marketing in India, 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;	5
Unit II	Product life cycle (PLC) and competitive strategies: Meaning and stages in PLC; characteristics of PLC; strategies in different stages of PLC; pricing and promotion strategies: pricing considerations and approaches – cost based and competition based pricing; market promotion – advertising, personal selling, sales promotion and publicity – their meaning and merits & demerits; marketing process and functions.	5
Unit III	Marketing process-concentration, dispersion and equalization; exchange functions – buying and selling; physical functions – storage, transport and processing; facilitating functions – packaging, branding, grading, quality control and labeling (Agmark); Market functionaries and marketing channels: Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel;number of channel levels; marketing channels for different farm products; Integration, efficiency, costs and price spread, FASSI,ISO, Trade marks	8
Unit IV	Meaning, definition and types of market integration; marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs;	3
UnitV	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	5
UnitVI	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.	5
Practical	1.Plotting and study of demand and supply curves and calculation of elasticities. 2. Study of relationship between market arrivals and prices of some selected commodities 3. Computation of marketable and marketed surplus of important commodities 4. Study of price behavior over time for some selected commodities 5. Construction of index numbers 6. 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. 7.Visit to market institutions – NAFED, SWC, CWC, cooperative marketing society, etc. to study their organization and functioning8. Application of principles of comparative advantage of international trade.	

Course code	AGS-409			
Category	Core			
Course title	Introductory Agro-meteorology & Climate Change			
Scheme and Credits	Credit	L	P	
	2	1	1	
Objectives	1. Demonstrate the role of crop models in studying soil, plant and water relationship 2. Discuss about different types of crop growth models to forecast crop yields 3. Outline the preparation of agro advisory bulletin based on weather forecast and its use			
Outcomes	Illustrate crop model concepts and soil-plant-atmospheric continuum 2. Summarize the importance of crop growth models to increase crop production 3. Develop yield models for different crops to predict yield 4. Comprehend weather forecasting 5. Explain about various simulation models for preparation of agro advisories 6. Make use of crop models and statistical approaches to predict yield of crops, forecast pests and diseases and prepare agro-advisories			

Unit		
Unit I	Meaning and scope of agricultural meteorology; Earth atmosphere- its composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze;	5
Unit II	Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, long wave and thermal radiation, net radiation, albedo; Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature,	5
Unit III	Energy balance of earth; Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud; Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification; Artificial rainmaking. Monsoon-mechanism and importance in Indian agriculture,	6
Unit IV	Weather forecasting: Its importance, Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold-wave. Agriculture and weather relations; Modifications of crop microclimate, climatic normals for crop and livestock production. Weather forecasting- types of weather forecast and their uses.	5
UnitV	Climate change, impact of its on agriculture climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture	3
Practical	1. Visit of Agrometeorological Observatory, site selection of observatory, exposure of instruments and weather data recording. 2. Measurement of total, shortwave and longwave radiation, and its estimation using Planck's intensity law. 3. Measurement of albedo and sunshine duration, computation of Radiation Intensity using BSS. Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis. 4. Measurement of soil temperature and computation of soil heat flux. Determination of vapor pressure and relative humidity. 5. Determination of dew point temperature. Measurement of atmospheric pressure and analysis of atmospheric conditions. 6. Measurement of wind speed and wind direction, preparation of wind rose. Measurement, tabulation and analysis of rain. 7. Measurement of open pan evaporation and evapotranspiration. Computation of PET and AET.	

V SEMESTER

Course code	**AGS-501**			
Category	Core			
Course title	**Principles of Integrated Pest and Disease Management**			
Scheme and Credits	**Credit**	**L**	**P**	
	3	2	1	
Objectives	In this course the students will learn Identification of pests and diseases, their hosts and beneficial organisms before taking action. Establish monitoring guidelines for each pest and pathogen species. Establish an integrated approach for their management.			
Outcomes	After completion of this course, the student will be able to: CO1: Create the awareness about adverse effects of pesticide on the environment and need for environment friendly approach for management of insect pests and pathogens. CO2: Gain knowledge about the concepts and tools of pest and disease management. CO3: Understand the planning of agricultural ecosystem, tolerance of pest damage, timing of different pest control tactics to manage the pest and pathogens population effectively. CO4: Learn about the use of different pest and pathogen control techniques in a harmonious manner. CO5: Understand the role of IPM in sustainable agriculture as the future of modern plant protection and pest and pathogens control strategy.			

Course Content		
Unit	**Content**	**Hours**
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.	**07**
Unit II	Methods of detection and diagnosis of insect pest and diseases. Calculation and dynamics of economic injury level and importance of Economic threshold level. Methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control.	**08**
Unit III	Ecological management of crop environment. Introduction to conventional pesticides for the insect pests and disease management. Survey surveillance and forecasting of Insect pest and diseases.	**07**
Unit IV	Definition and role integrated pest management, Development and validation of IPM module. Implementation and impact of IPM (IPM module for Insect pest and disease. Safety issues in pesticide uses for farmer. Political, social and legal implication of IPM. Case histories of important IPM programmers. Case histories of important IPM programmers.	**08**
Practical	1. Methods of diagnosis and detection of various insect pests, and plant diseases, Methods of insect pests and plant disease measurement. 2. Assessment of crop yield losses, calculations based on economics of	

	IPM, Identification of biocontrol agents, different predators and natural enemies. 3. Mass multiplication of *Trichoderma, Pseudomona*s, *Trichogramma*, NPV etc. Identification and nature of damage of important insect pests and diseases and their management. Crop (agroecosystem) dynamics of a selected insect pest and diseases. 4. Plan & assess preventive strategies (IPM module) and decision making. Crop monitoring attacked by insect, pest and diseases. 5. Awareness campaign at farmers' fields.
References	1. Rajeev K Upadhyay, K. G. Mukerji, B.P. Chamola, 2015. Integrated Pest & Disease Management. Aph Publishing Corporation. 2. David V. Alford, 2000. Pest and Disease Management Handbook 1st Edition. Wiley-Blackwell 3. A Ciancio and K.G Mukerji. 2007. General Concepts in Integrated Pest and Disease Management. Springer Nature. 4. Robert F. Norris Ph.D. (Author), Edward P. Caswell-Chen Ph.D. (Author), Marcos Kogan Ph.D. 2002. Concepts in Integrated Pest Management. Pearson Publisher.

Course code	**AGS-502**			
Category	Core			
Course title	**Manures, Fertilizers and Soil Fertility Management**			
Scheme and Credits	**Credit**	**L**	**P**	
	3	2	1	
Objectives	In this course the students will gain knowledge of fertilizers and manures as sources of plant nutrients and apprise about the integrated approach of plant nutrition and sustainability of soil fertility.			
Outcomes	After completion of this course, the student will be able to: CO1: Knowledge of different manure and fertilizers used in different crops according to soil condition CO2: To understand essentiality of plant nutrients and mechanism of nutrient transport to plant and factor affecting nutrient availability. CO3: Know how the soil fertility can be maintained for better crop production for longer period. CO4: To be able about procedure of soil testing and establish soil testing laboratory in future as an entrepreneur.			
Course Content				
Unit	**Content**			**Hours**
Unit I	Introduction and importance of organic manures, properties and methods of preparation of bulky and concentrated manures. Green/leaf manuring. Fertilizer recommendation approaches. Integrated nutrient management.			**07**
Unit II	Chemical fertilizers: classification, composition and properties of			**08**

	major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, Complex fertilizers, nano fertilizers Soil amendments, Fertilizer Storage, Fertilizer Control Order.	
Unit III	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.	**06**
Unit IV	Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients. Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil. Forms of nutrients in soil, plant analysis, and 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.	**09**
Practical	9. Introduction of analytical instruments and their principles, calibration and applications, Colorimetry and flame photometry. 10. Estimation of soil organic carbon, Estimation of alkaline hydrolysable N in soils. 11. Estimation of soil extractable P in soils. Estimation of exchangeable K; Ca and Mg in soils. 12. Estimation of soil extractable S in soils.. Estimation of DTPA extractable Zn in soils. 13. Estimation of N in plants. Estimation of P in plants. Estimation of K in plants. Estimation of S in plants.	
References	1. P. C. Das, 2009. Manures and Fertilizers. Kalyani Publishers, New Delhi 2. S. S. Singh, 2011. Soil Fertility and Nutrient Management. Kalyani Publishers, New Delhi 3. R. K. Mehra, 2017. Textbook of Soil Science. ICAR, New Delhi 4. Havlin, Beaton, Tisdale and Nelson, 2010. Soil Fertility and Fertilizers. PHI Learning Private Ltd, New Delhi 5. L. L. Somani and P. C. Kanthaliya, 2004. Soil and Fertilizers at a glance. Agrotech Publishing Academy, Udaipur	

Course code	**AGS-503**			
Category	Core			
Course title	**Pests of Crops and Stored Grain and their Management**			
Scheme and Credits	**Credit**	**L**	**P**	
	3	2	1	
Objectives	In this course the students will learn identification of pest causing economic damage in a crops and stored grains based on damage symptoms expressed by the plant, understanding their nature of damage, identifying weak links in their life cycle and utilizing economic and eco-friendly techniques of management in a compatible manner in order to maintain the pest population at levels below those causing economic injury/damage.			

Outcomes	After completion of this course, the student will be able to: CO1: Familiarized with identification of different insect pest of field, horticulture, ornamentals, vegetables and stored grains at the field level. CO 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. CO 3: Relate the biology, diversity, distribution of insects, and their relationships to crop and the environment condition of a particular area. CO 4: Understand identification of nature of damage and symptoms caused by the pest so suitable technique of pest management can be apply for effective control. CO 5: Management of crop pest through Integrated Pest Management approach without side effect on plant, animal and environment health.

Course Content

Unit	Content	Hours
Unit I	General account on nature and type of damage by different arthropods pests. Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage, and management of major pests.	**08**
Unit II	Scientific name, order, family, host range, distribution, nature of damage and control practice of other important arthropod pests of various field crop, vegetable crop, fruit crop, plantation crops, ornamental crops, spices and condiments.	**08**
Unit III	Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain.	**06**
Unit IV	Insect pests, mites, rodents, birds and microorganisms associated with stored grain and their management. Storage structure and methods of grain storage and fundamental principles of grain store management.	**08**

Practical	1. Identification of different types of damage. 2. Identification and study of life cycle and seasonal history of various insect pests attacking crops and their produce: (a) Field Crops; (b) Vegetable Crops; (c) Fruit Crops; (d) Plantation, gardens, Narcotics, spices & condiments. 3. Identification of insect pests and Mites associated with stored grain. Determination of insect infestation by different methods. 4. Assessment of losses due to insects. Calculations on the doses of insecticides application technique. Fumigation of grain store / godown. Identification of rodents and rodent control operations in godowns. 5. Identification of birds and bird control operations in godowns. Determination of moisture content of grain. Methods of grain sampling under storage condition. 6. Visit to Indian Storage Management and Research Institute, Hapur and Quality Laboratory, Department of Food., Delhi. Visit to nearest FCI godowns.
References	1. M. C. Bhargava, K. C. Kumawat, 2010. Pests of Stored Grains and Their Management. New India Publishing.

	2. Omkar, 2018. Pests and Their Management. Springer. 3. V.P.S. Panwar, 2017. Agricultural Insect Pests of Crops and Their Control. 2nd Edition, Kalyani Publishers 4. Atwal A. S., Dhalwal G.S., 2015. Agricultural Pests Of South Asia And Their Management. Kalyani Publishers

Course code	**AGS-504**			
Category	Core			
Course title	**Diseases of Field and Horticultural Crops and their Management -I**			
Scheme and Credits	**Credit**	**L**	**P**	
	3	2	1	
Objectives	In this course the students will learnabout the symptoms of different diseases and identify them in field conditions, favourable environmental condition for disease development and ways to control them.			
Outcomes	After completion of this course, the student will be able to: CO-1. Know the common pathogens of different diseases. CO-2. Acquire the knowledge about etiology, and symptoms of these diseases which helps in diagnosis of the diseases of field and horticultural crops CO-3. Know means of dispersal of these diseases suitable management methods can be applied. CO-4. Adopt Eco-friendly and economically suitable management practices.			
Course Content				
Unit	**Content**			**Hours**
Unit I	Pathogen of Disease, 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			**08**
Unit II	Pathogen of Disease, Symptoms, etiology, disease cycle and management of major diseases of following crops: Field Crops: Soybean: Rhizoctonia blight, bacterial spot, seed and seedling rot and mosaic; Pigeonpea: Phytophthora blight, wilt and sterility mosaic; Finger millet: Blast and leaf spot; black & green gram: Cercospora leaf spot and anthracnose, web blight and yellow mosaic; Castor: Phytophthora blight;Tobacco: black shank, black root rot and mosaic.			**08**
Unit III	Pathogen of Disease, Symptoms, etiology, disease cycle and management of major diseases of following crops: 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.			**06**
Unit IV	Pathogen of Disease, Symptoms, etiology, disease cycle and management of major diseases of following crops: Cruciferous			**08**

	vegetables: Alternaria leaf spot and black rot; Brinjal: Phomopsis blight and fruit rot and Sclerotinia blight; Tomato: damping off, wilt, early and late blight, buck eye rot and leaf curl and mosaic; Okra: Yellow Vein Mosaic; Beans: anthracnose and bacterial blight; Ginger: soft rot; Colocasia: Phytophthora blight; Coconut: wilt and bud rot; Tea: blister blight; Coffee: rust	
Practical	1. Identification and histo-pathological studies of selected diseases of field and horticultural crops covered in theory. 2. Field visit for the diagnosis of field problems. 3. Collection and preservation of plant diseased specimens for Herbarium; Note: Students should submit 50 pressed and well mounted specimens.	
References	1. Manoj Kumar Kalita, 2018. Diseases Of Field And Horticultural Crops And Their Management – I. Kalyani Publications. 2. Rakesh Roshan Satapathy and Abhinandita Sahoo, 2020. Diseases of Field and Horticultural Crops and Their Management – I. AkiNik Publications. 3. Sanjeev Kumar, 2019. Textbook of Diseases of Field & Horticultural Crops & Their Management. New India Publishing Agency. 4. S Parthasarathy, G Thiribhuvanamala and K Prabakar, 2019. Diseases of Field Crops and their Management. Jaya Publishing House.	

Course code	**AGS-505**			
Category	Core			
Course title	**Crop Improvement-I *(Kharif Crops)***			
Scheme and Credits	**Credit**	**L**	**P**	
	2	1	1	
Objectives	In this course the students will learn to develop stable and high yielding varieties of both food and cash crops, to conserve germplasm of important crops and to breed for resistance or tolerance to pests, diseases and adverse conditions such as drought and soil acidity.			
Outcomes	After completion of this course, the student will be able to: CO-1: Learn importance of wild relative to produce new varieties of kharif crop. CO-2: Learn about gene preservation methods for further use to improve kharif crops. CO-3: Learn applications of breeding method to improve kharif crops. CO-4: Identify resistance gene related to kharif crop with high yield potential against pest and pathogen and utilization genes. CO-5: Apply new genetic approaches to achieve a definite ideotype of khaif crop.			
Course Content				

Unit	Content	Hours
Unit I	Centers of origin, distribution of species, wild relatives in different cereals, pulses, oilseeds, fibres, fodders and cash crops; vegetable and horticultural crops;	**08**
Unit II	Plant genetic resources, its utilization and conservation, study of genetics of qualitative and quantitative characters; Important, concepts of breeding, Definition of pollination and its type (self-pollinated and cross pollinated) and vegetative propagated crops,	**08**
Unit III	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);	**06**
Unit IV	Hybrid: Definition, Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeon pea, etc. Ideotype concept and climate resilient crop varieties for future.	**08**
Practical	1. Floral biology, emasculation and hybridization techniques in different crop species; viz., Rice, Jute, Maize, Sorghum, Pearl millet, Ragi, Pigeonpea, Urdbean, Mungbean, Soybean, Groundnut, Seasame, Caster, Cotton, Cowpea, Tobacco, Brinjal, Okra and Cucurbitaceous crops. 2. Maintenance breeding of different kharif crops. Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods; Study of field techniques for seed production and hybrid seeds production in Kharif crops. 3. Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments; Study of quality characters, donor parents for different characters. 4. Visit to seed production plots; Visit to AICRP plots of different field crops.	
References	1. R. C. Chaudhary, 2017. Introductory Principles Of Plant Breeding 2nd Edition Oxford & Ibh Publishing 2. Sultan Singh and I. S. Pawar, 2007. Genetic Basis And Methods Of Plant Breeding CBS PUBLICATION. 3. Amit Tomar, 2020. Crop Improvement - I (Kharif Crops) Practical Manual: Crop Improvement Techniques In Kharif Crops. LAP LAMBERT Academic Publishing. 4. Jack Brown, Peter Caligari, Hugo Campos, 2014. Plant Breeding. Wiley Publishers.	

Course code	**AGS-506**			
Category	Core			
Course title	**Entrepreneurship Development and Business Communication**			
Scheme and Credits	**Credit**	**L**	**P**	
	2	1	1	

Objectives	In this course the students will recognize the value of problem solving, effective business management and entrepreneurial thinking to business development. Be able to understand and apply financial and planning process within the development of a business. Be able to communicate effectively both verbally and in writing in relation to the topic.	
Outcomes	After completion of this course, the student will be able to: CO1 Understand the basic concepts, principles of entrepreneurship development and business communication CO2: Explain entrepreneurship development programme, government policies, schemes and incentives for promotion of entrepreneurship and social responsibility of business CO3: Develop strategies for marketing and management in small businesses venture. CO4 Analyze the business environment in order to identify business opportunities CO5 Interpret their own business plan CO6: Design a business model bases on different entrepreneurial strategies.	
Course Content		
Unit	**Content**	**Hours**
Unit I	Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs; SWOT Analysis & achievement motivation	**05**
Unit II	Government policy and programs and institutions for entrepreneurship development, Impact of economic reforms on Agri-business/ Agri-enterprises, Entrepreneurial Development Process	**05**
Unit III	Business Leadership Skills; Developing organizational skill (controlling, supervising, problem solving, monitoring & evaluation), Developing Managerial skills, Business Leadership Skills (Communication, direction and motivation Skills), Problem solving skill	**05**
Unit IV	Supply chain management and Total quality management, Project Planning Formulation and report preparation; Financing of enterprise, Opportunities for agri-entrepreneurship and rural enterprise.	**05**
Practical	1. Assessing entrepreneurial traits, problem solving skills, managerial skills and achievement motivation, exercise in creativity, time audit through planning, monitoring and supervision. 2. Identification and selection of business idea. 3. Preparation of business plan and proposal writing. 4. Visit to entrepreneurship development institute and entrepreneurs.	
References	1. Mohanty, S.K. 2009. Fundamentals of Entrepreneurship. Prentice Hall of India Pvt. Ltd., New Delhi. 2. Sagar Mondal and Ray, G.L. 2009.- Text Book of Entrepreneurship and Rural Development. Kalyani publishers, Ludhiana.	

	3. Anersen Peter, 2007. Nonverbal Communication: Forms and Functions (2nd ed.). Waveland Press. 4. Desai Vasant and Urmila Rai, 2013. Entrepreneurship Development and Business Communication. Himalaya Publishing House.

Course code	**AGS-507**			
Category	Core			
Course title	**Geoinformatics and Nano-technology and Precision Farming**			
Scheme and Credits	**Credit**	**L**	**P**	
	2	1	1	
Objectives	In this course the students will learn the basic concepts of geoinformatics and nanotechnology. This course will create awareness about various applications of geoinformatics and nanotechnology for precision agriculture as well as learn basic handling of various geoinfomatic tools.			
Outcomes	After completion of this course, the student will be able to: CO1 Recall the basic concepts, principles of geoinformatics and nanotechnology CO2: Explain various applications of geoinformatics and nanotechnology in agriculture. Also explain more effective use of inputs results in greater crop yield and/or quality, without polluting the environment. CO.3: Precision agriculture can address both economic and environmental issues that surround production agriculture today. CO.4: Encourage the farmers to study of spatial and temporal variability of the input parameters using primary data at field level. CO.5: Creating awareness amongst farmers about consequences of applying imbalanced doses of farm inputs like irrigation, fertilizers, insecticides and pesticides.			

Course Content

Unit	**Content**	**Hours**
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.	**05**
Unit II	Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies; Spatial data and their management in GIS; Remote sensing concepts and application in agriculture; Image processing and interpretation; Global positioning system (GPS), components and its functions;	**05**
Unit III	Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs; STCR approach for precision agriculture.	**03**

Unit IV	Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors, Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.	**07**
Practical	1. Introduction to GIS software, spatial data creation and editing. Introduction to image processing software. Visual and digital interpretation of remote sensing images. 2. Generation of spectral profiles of different objects. Supervised and unsupervised classification and acreage estimation. Multispectral remote sensing for soil mapping. 3. Creation of thematic layers of soil fertility based on GIS. Creation of productivity and management zones. Fertilizers recommendations based of VRT and STCR techniques. 4. Crop stress (biotic/abiotic) monitoring using geospatial technology. 5. Use of GPS for agricultural survey. 6. Formulation, characterization and applications of nanoparticles in agriculture. 7. Projects formulation and execution related to precision farming.	
References	1. S.R. Reddy, 2017. Geoinformatics and Nanotechnology for Precision Farming (Prinsika). Kalyani Publisher. 2. Newell R. Kitchen, 2018. Precision Agriculture Basics. Wiley. 3. B.L. Jana, 2016. Nanotechnology in Agriculture. Pioneer Publishers. 4. A. M. Chandra, 2015. Geoinformatics.New Academic Science Ltd.	

Course code	**AGS-508**			
Category	Core			
Course title	**Intellectual Property Rights**			
Scheme and Credits	**Credit**	**L**	**P**	
	1	1	0	
Objectives	In this course the students will learn the basics of Intellectual Property Rights, Copy Right Laws Trade Marks and Issues related to Patents. The overall idea of the course is to help and encourage the student for startups and innovations.			
Outcomes	After completion of this course, the student will be able to: CO1: Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP. CO2: Explain the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development. CO3: Identify activities and constitute IP infringements and the remedies			

	available to the IP owner and describe the precautious steps to be taken to prevent infringement of proprietary rights in products and technology development. CO4: Be familiar with the processes of Intellectual Property Management (IPM) and various approaches for IPM and conducting IP and IPM auditing and explain how IP can be managed as a strategic resource and suggest IPM strategy. CO5: Be able to anticipate and subject to critical analysis arguments relating to the development and reform of intellectual property right institutions and their likely impact on creativity and innovation. CO6: Be able to demonstrate a capacity to identify, apply and assess ownership rights and marketing protection under intellectual property law as applicable to information, ideas, new products and product marketing;	
Course Content		
Unit	**Content**	**Hours**
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.	**03**
Unit II	Types of Intellectual Property and legislations covering IPR in India:- Patents, Copyrights, Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets. Patents Act 1970 and Patent system in India, patentability, process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement, Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database.	**06**
Unit III	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 breeder's rights, Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights. Traditional knowledge-meaning and rights of TK holders.	**0**
Unit IV	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.	**05**
References	1. Anil Kumar, H. S. and B. Ramakrishna, 2017. Fundamentals of Intellectual Property Rights: For Students, Industrialist and Patent Lawyers. Notion Press. 2. Khushdeep Dharni and Neeraj Pandey, 2014. INTELLECTUAL PROPERTY RIGHTS. PHI Publishers. 3. Venkataraman, M. 2015. An Introduction to Intellectual Property Rights. Create Space Independent Publishing Platform.	

	4. V.K. Ahuja, 2015.Intellectual Property Rights In India. Lexis Nexis.

Course code	**AGS-551**			
Category	Core			
Course title	**Practical Crop Production – I (*Kharif* crops)**			
Scheme and Credits	**Credit**	**L**	**P**	
	2	0	2	
Objectives	This course will guarantee learning opportunity to the undergraduate students through integration of basic knowledge and conceptual aspects with hands on training and practice in a real life work environment. It also aims to instil greater confidence, competitiveness and competence among the graduates to meet needs of private sector and to undertake self-employment in vocations of their choice			
Outcomes	After completion of this course, the student will be able to: CO1: In the course study students will be acquainted with the knowledge of profitable crop production technology. CO2: Course content will help to students/farmers about ruminative crop production techniques. CO3: It helps to adopt diversified farming system according to available farming situation. CO4: It will assist to encourage the sustainable agriculture system. CO.5. Profitable based farming system can we adopted with the help of course content			
Course Content				
Unit	**Content**			**Hours**
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.			**04**
Unit II	Types of Intellectual Property and legislations covering IPR in India:- Patents, Copyrights, Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets. Patents Act 1970 and Patent system in India, patentability, process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement, Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database.			**06**
Unit III	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 breeder's rights, Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights. Traditional knowledge-meaning and rights of TK			**06**

	holders.	
Unit IV	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.	**04**
References	1. W. F. Massey, 2017. Practical Farming: A Plain Book on Treatment of the Soil and Crop Production. Forgotten Books Publishers. 2. Singh, C., 2020. Modern Techniques Of Raising Field Crops. 2nd Ed. OXFORD & IBH PUBLISHING. 3. Wolfe TK and Kipps MS, 2004. Production Of Field Crops. IBDC Publishers. 4. Ozturk, 2019. Crop Production Technologies For Sustainable Use And Conservation Physiological And Molecular Advances. TAYLOR & FRANCIS LTD	

VI SEMESTER

Course code	**AGS-601**			
Category	Core			
Course title	**Rainfed Agriculture & Watershed Management**			
Scheme and Credits	**Credit**	**L**	**P**	
	2	1	1	
Objectives	In this course the students will understand basic knowledge of rainfed agriculture and water shed management. Study the crop adaptation and mitigation strategies, crop planning and crop management techniques. Main objective is to increase / stabilize production of crops, forage, fruits, fuel and timber in rainfed areas by introduction of improved soil and moisture conservation measures, better crop and range land management practices.			
Outcomes	After completion of this course, the student will be able to: CO.1. Understand about rainfed agriculture and its introduction, problem and prospects in India as well as objectives, principles and component of watershed management CO.2. Perform 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. CO.3 Utilization of rainfall water for a larger area by suitable watershed management techniques CO.4. Conservation of soil by adopting latest soil conservation techniques will help in obtaining higher production of Rainfed crops			
Course Content				

Unit	Content	Hours
Unit I	Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India; Problems and prospects of rainfed agriculture in India	**05**
Unit II	Soil and climatic conditions prevalent in rainfed areas; Soil and water conservation techniques, Drought: types, effect of water deficit on physio-morphological characteristics of the plants, Crop adaptation and mitigation to drought;	**05**
Unit III	Water harvesting: importance, its techniques, Efficient utilization of water through soil and crop management practices, management of crops in rainfed areas, Contingent crop planning for aberrant weather conditions	**05**
Unit IV	Concept, objective, principles and components of watershed management, factors affecting watershed management.	**05**
Practical	6. Studies on climate classification, studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons. 7. Studies on cropping pattern of different rainfed areas in the country and demarcation of rainfed area on map of India. 8. Interpretation of meteorological data and scheduling of supplemental irrigation on the basis of evapo-transpiration demand of crops. 9. Critical analysis of rainfall and possible drought period in the country, effective rainfall and its calculation. 10. Studies on cultural practices for mitigating moisture stress. 11. Characterization and delineation of model watershed. 12. Field demonstration on soil & moisture conservation measures. 13. Field demonstration on construction of water harvesting structures. 14. Visit to rainfed research station/watershed.	
References	1. S.R. Reddy and Prabhakara Reddy, 2018. Rainfed Agriculture & Watershed Management. Kalyani Publishers. 2. Dr. Rayees Ahmad Shah, 2017. Rainfed Agriculture and Watershed Management. Kushal Publications and Distributors 3. Das M.M (Author), 2012. Watershed Management. Prentice Hall India Learning Private Limited 4. J.V.S. Murthy, 2017. Watershed Management. New Age Publishers	

Course code	**AGS-602**			
Category	Core			
Course title	**Protected Cultivation and Secondary Agriculture**			
Scheme and Credits	**Credit**	**L**	**P**	
	2	1	1	
Objectives	In this course the students will learn about Greenhouse technology to be applied at various locations as well as for different crops.			

Outcomes	After completion of this course, the student will be able to: CO-1: Gain knowledge about greenhouse technology, types of green houses and construction of green houses. CO-2: Course will give the knowledge of Greenhouse equipment's, materials of construction for traditional and low cost green houses. CO-3: This course will help the students to learn about Irrigation systems used in greenhouses, shade net house in protected cultivation. CO-4: By this course student get the of concepts of cleaning and grading Moisture measurement. CO-5: Students will be able to understand the Material handling equipment, principle and working.	
Course Content		
Unit	**Content**	**Hours**
Unit I	Green house technology: Introduction, Types of Green Houses; Plant response to Greenhouse environment, Planning and design of greenhouses, Design criteria of green house for cooling and heating purposes	**05**
Unit II	Green house equipment's, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, typical applications, passive solar greenhouse, hot air greenhouse heating systems, green house drying. Cost estimation and economic analysis.	**05**
Unit III	Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation.	**04**
Unit IV	Drying and dehydration; moisture measurement, EMC, drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, re-circulatory dryer and solar dryer). Material handling equipment; conveyer and elevators, their principle, working and selection.	**06**
Practical	1. Study of different type of greenhouses based on shape. 2. Determine the rate of air exchange in an active summer winter cooling system. 3. Determination of drying rate of agricultural products inside green house. 4. Study of greenhouse equipment's. 5. Visit to various Post Harvest Laboratories. 6. Determination of Moisture content of various grains by oven drying & infrared moisture methods. 7. Determination of engineering properties (shape and size, bulk density and porosity of biomaterials). 8. Determination of Moisture content of various grains by moisture meter. 9. Field visit to seed processing plant	
References	1. RadhaManohar, K. and Igathinathene.C. greenhouse Technology and Management, 2nd edition, BS publications 2. G.N. Tiwary. Greenhouse Technology for Controlled Environment. Narosa	

	Publishing House. Pvt Ltd. 3. Brrahma Singh and Balraj Singh. 2014. Advances in Protected Cultivation, New India Publishing Company 4. K.M. Sahay and K.K. Singh, 1994. Unit Operation of Agricultural Processing. Vikas Publishing House Pvt Ltd., New Delhi

Course code	**AGS-603**			
Category	Core			
Course title	**Diseases of Field and Horticultural Crops and their Management-II**			
Scheme and Credits	**Credit**	**L**	**P**	
	3	2	1	
Objectives	In this course the students will learn the about major diseases of Horticultural crops and their management.			
Outcomes	After completion of this course, the student will be able to: CO1: Know the common pathogens of different diseases. CO2: Acquire the knowledge about etiology, and symptoms of these diseases which helps in diagnosis of the diseases of field and horticultural crops. CO3: By knowing means of dispersal of these diseases suitable management methods can be applied. CO4: Eco-friendly and economically suitable management practices may be adopted.			
Course Content				
Unit	**Content**			**Hours**
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;			**08**
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.			**12**
Unit III	Symptoms, etiology, disease cycle and management of major diseases of following 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;			**10**

Unit IV	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; Colocassia: Phytophthora blight; Coconut: wilt and bud rot; Tea: blister blight; Coffee: rust	**10**
Practical	1. Identifcation and histopathological studies of selected diseases of field and horticultural crops covered in theory. 2. Field visit for the diagnosis of field problems. 3. Collection and preservation of plant diseased specimens for Herbarium; (Note: Students should submit 50 pressed and well-mounted specimens).	
References	1. Reddy, P.P. Plant protection in horticulture vol. 1-3 2. Rangaswami, G.K.Mahadevan.2001. Diseases of crop plants in India. Prentice Hall of India Pvt. Ltd., New Delhi 3. Singh, R.S.2005. Plant Diseases. Oxford &IBH Publication, New Delhi 4. Kalita, M.K. Diseases of field and horticulture crops and their management-II.	

Course code	**AGS-604**			
Category	Core			
Course title	**Post-harvest Management and Value Addition of Fruits and Vegetables**			
Scheme and Credits	**Credit**	**L**	**P**	
	2	1	1	
Objectives	In this course the students will learn about importance and practices of post-harvest management as well as value-addition of fruits and vegetables			
Outcomes	After completion of this course, the student will be able to: CO.1: Understand the post-harvest technology of horticultural crops. CO.2: Understand the value addition of horticulture crops. CO.3: Understand the work space, tool and equipment design for PHT and value addition. CO.4: study the various certification and accreditation i.e. FPO, ISO and other levelling.			
Course Content				
Unit	**Content**			**Hours**

Unit I	Importance of post-harvest processing of fruits and vegetables, extent and possible causes of post- harvest losses; Pre-harvest factors affecting postharvest quality, maturity, ripening and changes occurring during ripening; Respiration and factors affecting respiration rate; Harvesting and feld handling;	**06**
Unit II	Storage (ZECC, cold storage, CA, MA, and hypobaric); Value addition concept; Principles and methods of preservation;	**04**
Unit III	Intermediate moisture food- Jam, jelly, marmalade, preserve, candy – Concepts and Standards; Fermented and non-fermented beverages. Tomato products- Concepts and Standards;	**05**
Unit IV	Drying/ Dehydration of fruits and vegetables – Concept and methods, osmotic drying. Canning -– Concepts and Standards, packaging of products.	**05**
Practical	1. Applications of different types of packaging, containers for shelf life extension. 2. Effect of temperature on shelf life and quality of produce. 3. Demonstration of chilling and freezing injury in vegetables and fruits. 4. Extraction and preservation of pulps and juices. 5. Preparation of jam, jelly, RTS, nectar, squash, osmotically dried products, fruit bar and candy and tomato products, canned products. 6. Quality evaluation of products - physico-chemical and sensory. 7. Visit to processing unit/ industry.	
References	1. Rathore, N.S., Mathur, G.K., Chasta, S.S. 2012. Post-harvest Management and Processing of Fruits and Vegetables. ICAR, New Delhi 2. Srivastava, R.P. and Sanjeev Kumar, 2002. Fruit and vegetable Preservation: Principles and Practices. International Book Distributio Company, Lucknow. 3. Giridharilal, G.S., Siddappa and Tondon, G.L. 2007. Preservation of Fruits and Vegetables. ICAR, New Delhi.	

Course code	**AGS-605**			
Category	Core			
Course title	**Management of Beneficial Insects**			
Scheme and Credits	**Credit**	**L**	**P**	
	2	1	1	

Objectives	In this course the students will learn the beneficial insects with respect to its commercial use in agriculture.	
Outcomes	After completion of this course, the student will be able to: CO 1: Adopt apiculture, sericulture and lac culture as an entrepreneur according to agro climatic zone. CO 2: 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. CO 3: Identify of different bio control agents (Predator, Parasite and Parasitoids) and their use for sustainable pest management. CO 4: Learn about mass multiplication technique of biological control agents and established a bio control lab in future as an entrepreneur.	
Course Content		
Unit	**Content**	**Hours**
Unit I	Importance of beneficial Insects, Beekeeping and pollinators, bee biology, commercial methods of rearing, equipment used, seasonal management, bee enemies and disease. Bee pasturage, bee foraging and communication. Insect pests and diseases of honey bee. Role of pollinators in cross pollinated plants.	**05**
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.	**05**
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.	**05**
Unit IV	Insect orders bearing predators and parasitoids used in pest control and their mass-multiplication techniques. Important species of pollinator, weed killers and scavengers with their importance.	**05**
Practical	1. Honey bee species, castes of bees. Beekeeping appliances and seasonal management, bee enemies and disease. 2. Bee pasturage, bee foraging and communication. 3. Types of silkworm, voltinism and biology of silkworm. 4. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. 5. Species of lac insect, host plant identification. 6. Identification of other important pollinators, weed killers and scavengers. 7. Visit to research and training institutions devoted to beekeeping, sericulture, lac culture and natural enemies. 8. Identification and techniques for mass multiplication of natural	

	enemies.
References	1. Vasantharaj David, B.,and V.V.Ramanamurthy, 2003. Elements of Economic Entomology. Popular Book Depot, Coimbatore. 2. Ganga, G. and Sulochana Chetty, J 1997 (2nd edt). An introduction to Sericulture .Oxford and IBH Publishing Co. Pvt Ltd., New Delhi 3. Hisao Aragu 1994.Principles of Sericulture. Oxford and IBH Publishing Co. Pvt Ltd., New Delhi 4. Glover P M 1937. Lac cultivation in India>The Indian Lac Research Institute, Ranchi 5. Mishra R C 1995. Honey bees and their management in India. ICAR, New Delhi

Course code	**AGS-606**			
Category	Core			
Course title	**Crop Improvement-II *(Rabi crops)***			
Scheme and Credits	**Credit**	**L**	**P**	
	2	1	1	
Objectives	In this course the students will get acquainted with the basic knowledge of rabi crops and it`s crop improvement approach			
Outcomes	After completion of this course, the student will be able to: CO-1: Learn importance of wild relative to produce new varieties of Rabi crop. CO-2: Learn Gene preservation method for further use to improve Rabi varieties. CO-3: Learn s to apply breeding method to improve Rabi crops. CO-4: Identify resistance gene relate to Rabi crop with high yield potential against Pest and pathogen and utilization genes. CO-5: Learn new genetic approaches to achieve a definite ideotype of Rabi crop. .			
Course Content				
Unit	**Content**			**Hours**
Unit I	Centres of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fodder crops and cash crops; vegetable and horticultural crops;			**05**
Unit II	Plant genetic resources, its utilization and conservation; study of genetics of qualitative and quantitative characters;			**04**
Unit III	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			**06**

	tolerance and quality (physical, chemical, nutritional);	
Unit IV	Hybrid seed production technology of rabi crops. Ideotype concept and climate resilient crop varieties for future.	**05**
Practical	1. Floral biology, emasculation and hybridization techniques in different crop species; viz., Rice,Jute, Maize, Sorghum, Pearl millet, Ragi, Pigeonpea, Urdbean, Mungbean, Soybean, Groundnut, Seasame, Caster, Cotton, Cowpea, Tobacco, Brinjal, Okra and Cucurbitaceous crops. 2. Maintenance breeding of different kharif crops. 3. Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods. 4. Study of field techniques for seed production and hybrid seeds production in Kharif crops. 5. Estimation of heterosis, inbreeding depression and heritability. 6. Layout of field experiments. 7. Study of quality characters, donor parents for different characters. 8. Visit to seed production plots. 9. Visit to AICRP plots of different field crops	
References	1. Dr. Rajendra Prasad, 2013. Textbook of field crops production. IARI Publisher 2. Mukund Joshi, 2015. Text Book of field crops. PHI Learning 3. C. Singh, 2020. Modern Techniques Of Raising Field Crops 2Ed.OXFORD & IBH PUBLISHING 4. Jeyaraman, S. Field Crops Production & Management. OXFORD & IBH PUBLISHING	

Course code	**AGS-607**			
Category	Core			
Course title	**Principles of Organic Farming**			
Scheme and Credits	**Credit**	**L**	**P**	
	2	1	1	
Objectives	In this course the students will get acquainted with the basic knowledge of rabi crops and it`s crop improvement approach			
Outcomes	After completion of this course, the student will be able to: CO-1: Learn importance of wild relative to produce new varieties of Rabi crop. CO-2: Learn Gene preservation method for further use to improve Rabi varieties. CO-3: Learn s to apply breeding method to improve Rabi crops. CO-4: Identify resistance gene relate to Rabi crop with high yield potential			

	against Pest and pathogen and utilization genes. CO-5: Learn new genetic approaches to achieve a definite ideotype of Rabi crop. .	
Course Content		
Unit	**Content**	**Hours**
Unit I	History of Organic farming, principles and its scope in India; Initiatives taken by Government (central/ state), NGOs and other organizations for promotion of organic agriculture;	**05**
Unit II	Organic ecosystem and their concepts; Organic nutrient resources and its fortification; Restrictions to nutrient use in organic farming; Choice of crops and varieties in organic farming;	**04**
Unit III	Fundamentals of insect, pest, disease and weed management under organic mode of production; Operational structure of NPOP;	**06**
Unit IV	Certification process and standards of organic farming; Processing, leveling, economic considerations and viability, marketing and export potential of organic products.	**05**
Practical	1. Visit of organic farms to study the various components and their utilization. 2. Preparation of enrich compost, vermicompost, bio-fertilizers/bio-inoculants and their quality analysis. 3. Indigenous technology knowledge (ITK) for nutrient, insect, pest disease and weed management. 4. Cost of organic production system. 5. Post-harvest management. 6. Quality aspect, grading, packaging and handling.	
References	1. Arun K. Sharma. 2006. A hand book of organic farming - Agrobios (India) Jodhpur 2. Mamta Bansal, 2017. Basics Of Organic Farming by Bansal and Mamta, CBS PUBLICATION 3. Sarath Chandran, Unni M.R and Sabu Thomas. 2017. Organic Farming: Global Perspectives And Methods, 1st Edition. Kalyani Publishers. 4. S.R. Reddy, 2015. Principles of organic farming. . Kalyani Publishers. 5. Rajendra Prasad: organic farming	

Course code	**AGS-608**
Category	Core
Course title	**Farm Management, Production & Resource Economics**

Scheme and Credits	**Credit**	**L**	**P**	
	2	1	1	
Objectives	In this course the students will get acquainted with the basic knowledge of rabi crops and it`s crop improvement approach			
Outcomes	After completion of this course, the student will be able to: CO-1: Gain Knowledge on a comprehensive treatment of the traditional agricultural production economics topics employing both detailed graphics and differential calculus. CO-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. CO-3: Understand limited resources available in the economy. Realize the need to exploit and utilize through development and improvement of production techniques. CO-4: Make them aware of the availability of rich natural endowments to achieve sustainable agricultural development with this knowledge they can challenge the problems of unemployment inequality shortage of food productions , poverty and be useful to compete advanced agricultural economies. CO-5: 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			
Course Content				
Unit	**Content**			**Hours**
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 ,			**04**
Unit II	Study of different components of I.C. engine, I.C. engine terminology and solved problems, Familiarization with different systems of I.C. engines: Air cleaning, cooling, lubrication ,fuel supply and hydraulic control system of a tractor			**05**
Unit III	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,			**04**
Unit IV	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			**07**
Practical	1. Study of different components of I.C. engine. 2. To study air cleaning and cooling system of engine.			

	3. Familiarization with clutch, transmission, differential and final drive of a tractor. 4. Familiarization with lubrication and fuel supply system of engine. 5. Familiarization with brake, steering, hydraulic control system of engine, Learning of tractor driving, 6. Familiarization with operation of power tiller, Implements for hill agriculture. 7. Familiarization with different types of primary and secondary tillage implements: mould plough, disc plough and disc harrow. 8. Familiarization with seed cum-fertilizer drills their seed metering mechanism and calibration, planters and transplanter. 10. Familiarization with different types of sprayers and dusters. 11.Familiarization with different intercultivation equipment. 12.Familiarization with harvesting and threshing machinery.
References	1. S. Singh, 2007. Farm Machinery - Principles and Applications. ICAR Publication. 2. S. C. Jain and C.R. Rai, 2012. Farm Tractor – Maintenance and Repair. Standard Publishers

Course code	**AGS-609**			
Category	Core			
Course title	**Principles of Food Science and Nutrition**			
Scheme and Credits	**Credit**	**L**	**P**	
	2	2	0	
Objectives	In this course the students will get acquainted with the basic knowledge of Food Science and Nutrition.			
Outcomes	After completion of this course, the student will be able to: CO.1- Critically evaluates the information on food science and nutrition issues appearing in the popular press. CO.2- Discuss the important pathogen and spoilage microorganism in foods. CO.3- Discuss basic principles and practices of cleaning and sanitation in food preparation operation. CO.4- Identify and explain nutrients in foods and the specific functions in maintaining health.			
Course Content				
Unit	**Content**			**Hours**
Unit I	Concepts of Food Science (definitions, measurements, density, phase change, pH, osmosis, surface tension, colloidal systems etc.);			**04**
Unit II	Food composition and chemistry (water, carbohydrates, proteins, fats, vitamins, minerals, flavours, colours, miscellaneous bioactives, important reactions); Food microbiology (bacteria, yeast, moulds,			**06**

	spoilage of fresh & processed foods, Production of fermented foods)	
Unit III	Principles and methods of food processing and preservation (use of heat, low temperature, chemicals, radiation, drying etc.)	**04**
Unit IV	Food and nutrition, Malnutrition (over and undernutrition), nutritional disorders; Energy metabolism (carbohydrate, fat, proteins); Balanced/ modifed diets, Menu planning, New trends in food science and nutrition.	**06**
References	9. Sunetra Roday, 2018. Food Science and Nutrition. Oxford Publication. 10. B. Laxmi, 2017. Food Science. New Age International Publisher 11. A. Sharma, 2017. Text Book of Food Science and Technology. CBS Publishers and Distributers Pvt. Ltd. 12. Swati Gupta and Minna Bagga, 2019. Principles of Food Science and Nutrition. Kalyani Publishers. 13. Vaclavik, Vickie and Christian, Elizabeth W., 2014. Essentials of Food Science. Springer.	

Course code	**AGS-651**			
Category	Core			
Course title	**Practical Crop Production –II (*Rabi* crops)**			
Scheme and Credits	**Credit**	**L**	**P**	
	2	1	1	
Objectives	In this course the students will learnabout package and practices of Rabi crops			
Outcomes	After completion of this course, the student will be able to: CO.1: Get acquainted with the knowledge of profitable crop production technology. CO.2: Help students/farmers about ruminative crop production techniques. CO.3. Help to adopt diversified farming system according to available farming situation. CO.4. Encourage the sustainable agriculture system. CO.5. Adopt Profitable based farming system with the help of course content			
Course Content				
Unit	**Content**			**Hours**
Unit I	Centres of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fodder crops and cash crops; vegetable and horticultural crops;			**05**
Unit II	Plant genetic resources, its utilization and conservation; study of genetics of qualitative and quantitative characters;			**04**
Unit III	Major breeding objectives and procedures including conventional			**06**

	and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional);	
Unit IV	Hybrid seed production technology of rabi crops. Ideotype concept and climate resilient crop varieties for future.	**05**
Practical	1. Crop planning, raising feld crops in multiple cropping systems: 2. Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce. 3. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. 4. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.	
References	1. http://www.agrimoon.com/practical-crop-production-pdf-book/ 2. L. K. Jain, 2013. Manual on Fundamentals of Agronomy. Scientific Publishers. 3. N. R. Das 2009. Practical Manual on Basic Agronomy with Theory 2 nd Ed. Scientific Publishers (India)	

SEMESTER-VII				
Subject Code	**Subject Name**	**L**	**P**	**Cr**
AGS-771	Rural Agricultural Work Experience and Agro-industrial Attachment(RAWE &AIA):			
	Activities	0	1	1
	General orientation & On campus training by different faculties	0	2	2
	Village attachment	0	4	4
	Unit attachment in Univ. / College. KVK/ Research Station Attachment	0	7	7
	Plant clinic	0	2	2
	Agro- Industrial Attachment: The students would be attached with the agro-industries for a period of 3 weeks to get an experience of the industrial environment and working.	0	3	3
	Project Report Preparation, Presentation and Evaluation	0	1	1
NGC-	Educational tour**	0	2	--
		0	20+02**	20+02**

SEMESTER-VIII				
Subject Code	**Subject Name**	**L**	**P**	**Cr**
AGS-851	Production Technology for Bio agents and Bio fertilizer	0	10	10
AGS-852	Seed Production and Technology	0	10	10

AGS-853	Mushroom Cultivation Technology	0	10	10
AGS-854	Soil, Plant, Water and Seed Testing	0	10	10
AGS-855	Commercial Beekeeping	0	10	10
AGS-856	Poultry Production Technology	0	10	10
AGS-857	Commercial Horticulture	0	10	10
AGS-858	Floriculture and Landscaping	0	10	10
AGS-859	Food Processing	0	10	10
AGS-860	Agriculture Waste Management	0	10	10
AGS-861	Organic Production Technology	0	10	10
AGS-862	Commercial Sericulture	0	10	10

- Educational tour will be conducted in break between VI & VII Semester
- Modules for Skill Development and Entrepreneurship: A student has to register 20 credits opting for two modules of (0+10) credits each (total 20 credits) from the package of modules in the VIII semester

DEPARTMENT ELECTIVE

Course code	DAG- 01			
Category	Elective			
Course title	Agribusiness Management			
Scheme and Credits	**Credit**	**L**	**P**	
	3	2	1	
Objectives	In this course, students will be able to know business management in agriculture and the detailed process and the agricultural business policies.			
Outcomes	After completion of this course, students will be able to: CO1: learn the important agricultural policies, agribussiness management and understand the types and functioning of agro-based industries. CO2: learn to set up the agro-based industries. CO3: learnt the different aspects of business environment. CO4: learn the planning and implementation of business plans and capital management. CO5: learn the different aspects of management of agri-market.			
Course Content				
Unit	**Content**			**Hours**
Unit I	Transformation of agriculture into agribusiness, various stakeholders and components of agribusiness systems. Importance of agribusiness in the Indian economy and New Agricultural Policy. Distinctive features of Agribusiness Management: Importance and needs of agro-based industries, Classification of industries and types of agro based			06

	industries.	
Unit II	Institutional arrangement, procedures to set up agro based industries. Constraints in establishing agro-based industries. Agri-value chain: Understanding primary and support activities and their linkages.	08
Unit III	Business environment: PEST & SWOT analysis. Management functions: Roles & activities, Organization culture. Planning, meaning, definition, types of plans. Purpose or mission, goals or objectives, Strategies, polices procedures, rules, programs and budget.	08
Unit IV	Components of a business plan, Steps in planning and implementation. Organization staffing, directing and motivation. Ordering, leading, supervision, communications, control. Capital Management and Financial management of Agribusiness. Financial statements and their importance.	**08**
Unit V	Marketing Management: Segmentation, targeting & positioning. Marketing mix and marketing strategies. Consumer behaviour analysis, Product Life Cycle (PLC). Sales & Distribution Management. Pricing policy, various pricing methods. Project Management definition, project cycle, identification, formulation, appraisal, implementation, monitoring and evaluation. Project Appraisal and evaluation techniques.	05
Practical	1. Study of agri-input markets: Seed, fertilizers, pesticides. 2. Study of output markets: grains, fruits, vegetables, flowers. 3. Study of product markets, retails trade commodity trading, and value added products. 4. Study of financing institutions- Cooperative, Commercial banks, RRBs, Agribusiness Finance Limited, NABARD. 5. Preparations of projects and Feasibility reports for agribusiness entrepreneur. 6. Appraisal/evaluation techniques of identifying viable project- Non-discounting techniques. 7. Case study of agro-based industries. 8. Trend and growth rate of prices of agricultural commodities. 9. Net present worth technique for selection of viable project. Internal rate of return.	

Course code	**DAG- 02**			
Category	Core			
Course title	Agrochemicals			
Scheme and Credits	**Credit**	**L**	**P**	
	3	2	1	
Objectives	In this course, students will be able to learn the use of different agrochemicals, their mechanism of action, their effects on plants, animals and humans and their alternatives that can be used.			
Outcomes	After completion of this course, students will be able to learn: CO1: use of agrochemicals and their merits and demerits in agriculture. CO2: different herbicides and fungicides and their mode of action.			

	CO3: different insecticides, their use and fate in India and their alteratives. CO4: different types of fertilizers and their application to crop. CO5: complex and mixed fertilizers and the fertilizer control order.	
Course Content		
Unit	**Content**	**Hours**
Unit I	An introduction to agrochemicals, their type and role in agriculture, effect on environment, soil, human and animal health, merits and demerits of their uses in agriculture, management of agrochemicals for sustainable agriculture.	**06**
Unit II	Herbicides-Major classes, properties and important herbicides. Fate of herbicides. Fungicides - Classification – Inorganic fungicides - characteristics, preparation and use of sulfur and copper, Mode of action-Bordeaux mixture and copper oxychloride. Organic fungicides- Mode of action- Dithiocarbamates-characteristics, preparation and use of Zineb and maneb.	**06**
Unit III	Systemic fungicides- Benomyl, carboxin, oxycarboxin, Metalaxyl, Carbendazim, characteristics and use. Introduction and classification of insecticides: inorganic and organic insecticides Organochlorine, Organophosphates, Carbamates, Synthetic pyrethroids Neonicotinoids, Biorationals, Insecticide Act and rules, Insecticides banned, withdrawn and restricted use, Fate of insecticides in soil & plant. IGRs Biopesticides, Reduced risk insecticides, Botanicals, plant and animal systemic insecticides their characteristics and uses	**06**
Unit IV	Fertilizers and their importance. Nitrogenous fertilizers: Feedstocks and Manufacturing of ammonium sulphate, ammonium nitrate, ammonium chloride, urea. Slow release N-fertilizers. Phosphatic fertilizers: feedstock and manufacturing of single superphosphate. Preparation of bone meal and basic slag. Potassic fertilizers: Natural sources of potash, manufacturing of potassium chloride, potassium sulphate and potassium nitrate.	**06**
Unit V	Mixed and complex fertilizers: Sources and compatibility–preparation of major, secondary and micronutrient mixtures. Complex fertilizers: Manufacturing of ammonium phosphates, nitrophosphates and NPK complexes. Fertilizer control order. Fertilizer logistics and marketing. Plant bio-pesticides for ecological agriculture, Bio-insect repellent.	**06**
Practical	1. Sampling of fertilizers and pesticides. 2. Pesticides application technology to study about various pesticides appliances. Quick tests for identification of common fertilizers. 3. Identification of anion and cation in fertilizer. 4. Calculation of doses of insecticides to be used. 5. To study and identify various formulations of insecticide available kin market. Estimation of nitrogen in Urea. 6. Estimation of water soluble P2 O5 and citrate soluble P2 O5 in single super phosphate. 7. Estimation of potassium in Muraite of Potash/ Sulphate of Potash by flame photometer. 8. Determination of copper content in copper oxychloride. 9. Determination of sulphur content in sulphur fungicide. 10. Determination of thiram. 11. Determination of ziram content.	

Course code	**DAG- 03**			
Category	Elective			
Course title	Commercial Plant Breeding			
Scheme and Credits	**Credit**	**L**	**P**	
	3	2	1	
Objectives	In this course, students will be able to learn the use of different plant breeding methods, quality seed production and IPR status of plant breeding in India.			
Outcomes	After completion of this course, students will be able to learn: CO1: methods of plant reproduction, pollination and overview of seed production. CO2: genetic purity test of hybrids and hybrid seed production of different crops. CO3: production of quality seeds of vegetables under open and protected environment. CO4: biotechnological tools for development of cultivars and tissue culture techniques. CO5: IPR issues related to commercial plant breeding.			

Course Content		
Unit	**Content**	**Hours**
Unit I	Types of crops and modes of plant reproduction. Line development and maintenance breeding in self and cross pollinated crops (A/B/R and two line system) for development of hybrids and seed production.	05
Unit II	Genetic purity test of commercial hybrids. Advances in hybrid seed production of maize, rice, sorghum, pearl millet, castor, sunflower, cotton pigeon pea, Brassica etc.	05
Unit III	Quality seed production of vegetable crops under open and protected environment.	05
Unit IV	Alternative strategies for the development of the line and cultivars: haploid inducer, tissue culture techniques and biotechnological tools.	**05**
Unit V	IPR issues in commercial plant breeding: DUS testing and registration of varieties under PPV & FR Act. Variety testing, release and notification systems in India.	**05**
Unit VI	Principles and techniques of seed production, types of seeds, quality testing in self and cross pollinated crops.	**05**
Practical	1. Floral biology in self and cross pollinated species, selfing and crossing techniques. 2. Techniques of seed production in self and cross pollinated crops using A/B/R and two line system. 3. Learning techniques in hybrid seed production using male-sterility in field crops. 4. Understanding the difficulties in hybrid seed production, Tools and techniques for optimizing hybrid seed production. 5. Concept of rouging in seed production plot. Concept of line its multiplication and purification in hybrid seed production. 6. Role of pollinators in hybrid seed production. 7. Hybrid seed production techniques in sorghum, pearl millet, maize, rice,		

	rapeseed-mustard, sunflower, castor, pigeon pea, cotton and vegetable crops. 8. Sampling and analytical procedures for purity testing and detection of spurious seed. 9. Seed drying and storage structure in quality seed management. Screening techniques during seed processing viz., grading and packaging. 10. Visit to public private seed production and processing plants.

Course code	**DAG- 04**			
Category	Elective			
Course title	Landscaping			
Scheme and Credits	**Credit**	**L**	**P**	
	3	2	1	
Objectives	In this course, students will be able to learn the use of different landscaping methods, principles of maintenance of gardens, lawns and urban landscaping.			
Outcomes	After completion of this course, students will be able to learn: CO1: principles of landscaping, gardens and their types. CO2: selection and propagation of trees and their use in architecture. CO3: selection and propagation of climbers and creepers and their use in architecture and pot management. CO4: bio-aesthetic planning and different types of landscaping of public places. CO5: bonsai and lawn management.			
Course Content				
Unit	**Content**			**Hours**
Unit I	Importance and scope of landscaping. Principles of landscaping, garden styles and types, terrace gardening, vertical gardening, garden components, adornments, lawn making, rockery, water garden, walk-paths, bridges, other constructed features etc. gardens for special purposes.			06
Unit II	Trees: selection, propagation, planting schemes, canopy management, shrubs and herbaceous perennials: selection, propagation, planting schemes, architecture.			06
Unit III	Climber and creepers: importance, selection, propagation, planting, Annuals: selection, propagation, planting scheme, Other garden plants: palms, ferns, grasses and cacti succulents. Pot plants: selection, arrangement, management.			06
Unit IV	Bio-aesthetic planning: definition, need, planning; landscaping of urban and rural areas, Peri-urban landscaping, Landscaping of schools, public places like bus station, railway station, townships, river banks, hospitals, play grounds, airports, industries, institutions.			**06**
Unit V	Bonsai: principles and management, lawn: establishment and maintenance. CAD application.			**06**
Practical	1. Identification of trees, shrubs, annuals, pot plants 2. Propagation of trees, shrubs and annuals, care and maintenance of plants, potting and repotting. 3. Identification of tools and implements used in landscape design, training			

	and pruning of plants for special effects. 4. Lawn establishment and maintenance, layout of formal gardens, informal gardens, special type of gardens (sunken garden, terrace garden, rock garden). 5. Designing of conservatory and lathe house. 6. Use of computer software, visit to important gardens/ parks/ institutes.

Course code	**DAG-05**			
Category	Elective			
Course title	**Food Safety and Standards**			
Scheme and Credits	**Credit**	**L**	**P**	
	3	2	1	
Objectives	In this course the students will learn to develop a better understanding of produce safety and how it may impact your fruit and vegetable farm. Identify the types of human pathogens that contaminate fresh produce and give an example of each and strategies to prevent and reduce risks of contamination by human pathogens.			
Outcomes	After completion of this course, the student will be able to: CO1: Recall the basic concepts, principles and practices involved in food safety. CO2: Explain the type of food contaminants and their identification as well as their management. CO3: Apply control measures against contamination using best storage practices and safe temperatures CO4: Examine the different methods hazards management in various food items. CO5: Understand the importance of maintaining a written food safety management system to control food safety hazards.			
Course Content				
Unit	**Content**			**Hours**
Unit I	Food Safety – Definition, Importance, Scope and Factors affecting Food Safety. Hazards and Risks, Types of hazards - Biological, Chemical, Physical hazards. Management of hazards - Need. Control of parameters. Temperature control. Food storage. Product design.			**07**
Unit II	Hygiene and Sanitation in Food Service Establishments- Introduction. Sources of contamination and their control. Waste Disposal. Pest and Rodent Control. Personnel Hygiene.			**06**
Unit III	Food Safety Measures. Food Safety Management Tools- Basic concepts. PRPs, GHPs, GMPs, SSOPs etc. HACCP. ISO series. TQM - concept and need for quality, components of TQM, Kaizen. Risk Analysis. Accreditation and Auditing, Water Analysis, Surface Sanitation and Personal Hygiene.			**08**
Unit IV	Food laws and Standards- Indian Food Regulatory Regime, FSSA. Global Scenario CAC. Other laws and standards related to food. Recent concerns- New and Emerging Pathogens. Packaging, Product labeling and Nutritional labeling. Genetically modified foods\ transgenics. Organic foods. Newer approaches to food safety. Recent Outbreaks. Indian and International Standards for food products.			**09**

Practical	1. Water quality analysis physico-chemical and microbiological. 2. Preparation of different types of media. Microbiological Examination of different food samples. 3. Assessment of surface sanitation by swab/rinse method. 4. Assessment of personal hygiene. 5. Biochemical tests for identification of bacteria. 6. Scheme for the detection of food borne pathogens. Preparation of plans for Implementation of FSMS - HACCP, ISO: 22000.
References	1. Vidhi Jain Akalank Kumar Jain. 2013. Food Safety and Standards Act, Rules & Regulations. Akalank Publications. 2. Paul L. Knechtges, 2011. Food Safety: Theory and Practice. Jones & Bartlett Publications. 3. Veena Jha, 2005.Environmental Regulation and Food Safety: Studies of Protection and Protectionism. IDRC Publications. 4. David McSwane, Nancy R. Rue, and Richard Linton, 2005.Essentials of Food Safety and Sanitation. Pearson/Prenticeb Hall Publications.

Course code	**DAG- 06**			
Category	Elective			
Course title	Biopesticides & Biofertilizers			
Scheme and Credits	**Credit**	**L**	**P**	
	3	2	1	
Objectives	In this course the students will learn to develop a better understanding of history and importance of biofertilizers and biopesticides. They will learn different types of microorganisms used as biofertilizers and biopesticides, their isolation and mass-multiplication.			
Outcomes	After completion of this course, the student will be able to: CO1: Recall the basic concepts, principles and practices of biopesticides. CO2: mass production and quality control of biopesticides. CO3: learn different types of biofertilizers. CO4: learn production and usage of cyanobacterial and mycorrhizal biofertilizers. CO5: mass production and quality control of biofertilizers and their storage.			

Course Content		
Unit	**Content**	**Hours**
Unit I	History and concept of biopesticides. Importance, scope and potential of biopesticide. Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and biorationales. Botanicals and their uses.	06
Unit II	Mass production technology of bio-pesticides. Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes. Methods of application of biopesticides. Methods of quality control and Techniques of biopesticides. Impediments and limitation in production and use of biopesticide.	06
Unit III	Biofertilizers - Introduction, status and scope. Structure and characteristic features of bacterial biofertilizers- *Azospirillum, Azotobacter, Bacillus, Pseudomonas, Rhizobium* and *Frankia*	06
Unit IV	Cynobacterial biofertilizers- Anabaena, Nostoc, Hapalosiphon and fungal biofertilizers- AM mycorrhiza and ectomycorhiza. Nitrogen fixation -Free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilization and phosphate mobilization, K solubilization.	**06**
Unit V	Production technology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertiizers. FCO specifications and quality control of biofertilizers. Application technology for seeds, seedlings, tubers, sets etc. Biofertilizers -Storage, shelf life, quality control and marketing. Factors influencing the efficacy of biofertilizers.	**06**
Practical	1. Isolation and purification of important biopesticides: *Trichoderma Pseudomonas, Bacillus, Metarhyzium* etc. and its production. 2. Identification of important botanicals. 3. Visit to biopesticide laboratory in nearby area. 4. Field visit to explore naturally infected cadavers. 5. Identification of entomopathogenic entities in field condition.	

	6. Quality control of biopesticides. 7. Isolation and purification of Azospirillum , Azotobacter, Rhizobium, P-solubilizers and cyanobacteria. 8. Mass multiplication and inoculums production of biofertilizers. 9. Isolation of AM fungi -Wet sieving method and sucrose gradient method. Mass production of AM inoculants.

Course code	**DAG- 07**			
Category	Elective			
Course title	Protected Cultivation			
Scheme and Credits	**Credit**	**L**	**P**	
	3	2	1	
Objectives	In this course the students will learn to develop a better understanding of history and importance of protected cultivation. They will learn different types of protected cultivation and their uses.			
Outcomes	After completion of this course, the student will be able to: CO1: Recall the basic concepts, principles and practices of protected cultivation. CO2: designing and materials used in greenhouse making. CO3: learn different types of irrigation methods and planting materials used in protected cultivation. CO4: learn basic concepts and production of different horticultural crops in greenhouses. CO5: learn basic concepts and production of different medicinal and aromatic plants in greenhouses.			
Course Content				
Unit	**Content**			**Hours**
Unit I	Protected cultivation- importance and scope, Status of protected cultivation in India and World types of protected structure based on site and climate.			06
Unit II	Cladding material involved in greenhouse/ poly house. Greenhouse design, environment control, artificial lights, Automation. Soil preparation and management, Substrate management.			06
Unit III	Types of benches and containers. Irrigation and fertigation management. Propagation and production of quality planting material of horticultural crops.			06
Unit IV	Greenhouse cultivation of important horticultural crops – rose, carnation, chrysanthemum, gerbera, orchid, anthurium, lilium, tulip, tomato, bell pepper, cucumber, strawberry, pot plants, etc.			**06**
Unit V	Cultivation of economically important medicinal and aromatic plants. Off-season production of flowers and vegetables. Insect pest and disease management.			**06**
Practical	1. Raising of seedlings and saplings under protected conditions. 2. Use of protrays in quality planting material production. 3. Bed preparation and planting of crop for production. 4. Inter cultural operations, Soil EC and pH measurement. 5. Regulation of irrigation and fertilizers through drip, fogging ad misting.			

Course code	**DAG- 08**			
Category	Elective			
Course title	Micro propagation Technologies			
Scheme and Credits	**Credit**	**L**	**P**	
	3	2	1	
Objectives	In this course the students will learn to develop a better understanding of history and importance of protected cultivation. They will learn different types of protected cultivation and their uses.			
Outcomes	After completion of this course, the student will be able to: CO1: Recall the basic concepts, principles and practices of micropropagation techniques. CO2: Learn different stages micropropagation. CO3: learn different types of techniques used for micropropagation. CO4: learn about cryopreservation.			
Course Content				
Unit	**Content**			**Hours**
Unit I	Introduction, History, Advantages and limitations; Types of cultures (seed, embryo, organ, callus, cell).			**06**
Unit II	Stages of micropropagation.			06
Unit III	Axillary bud proliferation (Shoot tip and meristem culture, bud culture), Organogenesis (callus and direct organ formation).			06
Unit IV	Somatic embryogenesis, cell suspension cultures, Production of secondary metabolites.			**06**
Unit V	Somaclonal variation, Cryopreservation			**06**
Practical	1. Identification and use of equipments in tissue culture Laboratory. 2. Nutrition media composition, sterilization techniques for media, containers and small instruments. 3. Sterilization techniques for explants. 4. Preparation of stocks and working solution, Preparation of working medium. 5. Culturing of explants: Seeds, shoot tip and single node, Callus induction. 6. Induction of somatic embryos regeneration of whole plants from different explants, Hardening procedures.			

Course code	**DAG- 09**			
Category	Elective			
Course title	Hi-tech. Horticulture			
Scheme and Credits	**Credit**	**L**	**P**	
	3	2	1	
Objectives	In this course the students will learn to develop a better understanding of history and importance of horticultural crop cultivation. They will learn different types of protected cultivation and their uses.			

Outcomes	After completion of this course, the student will be able to: CO1: Recall the basic concepts, principles and practices of micropropagation techniques for horticultural crops. CO2: Learn different methods of protected cultivation. CO3: learn different types of techniques and components of precision farming. CO4: learn about precision farming for horticultural crops.	
Course Content		
Unit	**Content**	**Hours**
Unit I	Introduction & importance; Nursery management and mechanization; micro propagation of horticultural crops; Modern field preparation and planting methods.	08
Unit II	Protected cultivation: advantages, controlled conditions, method and techniques	04
Unit III	Micro irrigation systems and its components; EC, pH based fertilizer scheduling, canopy management, high density orcharding.	06
Unit IV	Components of precision farming: Remote sensing, Geographical Information System (GIS), Differential Geo-positioning System (DGPS), Variable Rate applicator (VRA)	**06**
Unit V	Application of precision farming in horticultural crops (fruits, vegetables and ornamental crops); mechanized harvesting of produce.	**06**
Practical	1. Types of polyhouses and shade net houses. 2. Intercultural operations. 3. Tools and equipments identification and application. 4. Micro propagation, Nursery-protrays, micro-irrigation. 5. EC, pH based fertilizer scheduling, canopy management. 6. Visit to hi-tech orchard/nursery.	

Course code	**DAG-10**			
Category	Elective			
Course title	Weed Management			
Scheme and Credits	**Credit**	**L**	**P**	
	3	2	1	
Objectives	In this course the students will learn to develop a better understanding of history and importance of weed management. They will learn different types of weeds and their control measures.			
Outcomes	After completion of this course, the student will be able to: CO1: Recall the basic concepts, characterization and classification of weeds. CO2: Learn different types of herbicides and their mode of action. CO3: learn different types of techniques and components of bio-herbicides. CO4: learn about components of integrated herbicide management.			
Course Content				
Unit	**Content**			**Hours**
Unit I	Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem. Crop weed competition, Beneficial weed, Classification, reproduction and dissemination of weeds.			**08**

Unit II	Herbicide classification, concept of adjuvant, surfactant, herbicide formulation and their use. Introduction to mode of action of herbicides and selectivity. Allelopathy and its application for weed management.	**08**
Unit III	Bio-herbicides and their application in agriculture. Concept of herbicide mixture and utility in agriculture. Herbicide compatibility with agro-chemicals and their application	**07**
Unit IV	IWM: Integrated weed management, Integration of herbicides with non-chemical methods of weed management. Herbicide Resistance and its management	**07**
Practical	1. Techniques of weed preservation. 2. Weed identification and their losses study. Biology of important weeds. 3. Study of herbicide formulations and mixture of herbicide. 4. Herbicide and agrochemicals study. 5. Shift of weed flora study in long term experiments. 6. Study of methods of herbicide application, spraying equipments. 7. Calculations of herbicide doses and weed control efficiency and weed index.	

Course code	**DAG- 11**			
Category	Elective			
Course title	System Simulation and Agro-advisory			
Scheme and Credits	**Credit**	**L**	**P**	
	3	2	1	
Objectives	In this course the students will learn to develop a better understanding of history and importance of system simulation and agro-advisory. They will learn different types of crop models and their applications.			
Outcomes	After completion of this course, the student will be able to: CO1: learn the different system approach and crop models. CO2: Learn elementary crop growth models, their calibration and validation. CO3: learn different types of modelling techniques for crop production estimations. CO4: learn about components of weather forecasting and its tools and techniques. CO5: learn the basic concepts of crop simulation models.			

Course Content		
Unit	**Content**	**Hours**
Unit I	System Approach for representing soil-plant-atmospheric continuum, system boundaries, Crop models, concepts & techniques, types of crop models, data requirements, relational diagrams.	08
Unit II	Evaluation of crop responses to weather elements; Elementary crop growth models; calibration, validation, verification and sensitivity analysis.	06
Unit III	Potential and achievable crop production- concept and modelling techniques for their estimation. Crop production in moisture and	04

	nutrients limited conditions; components of soil water and nutrients balance.	
Unit IV	Weather forecasting, types, methods, tools & techniques, forecast verification; Value added weather forecast, ITK for weather forecast and its validity; Crop-Weather Calendars; Preparation of agro-advisory bulletin based on weather forecast.	**06**
Unit V	Use of crop simulation model for preparation of Agro-advisory and its effective dissemination.	**08**
Practical	1. Preparation of crop weather calendars. 2. Preparation of agro-advisories based on weather forecast using various approaches and synoptic charts. 3. Working with statistical and simulation models for crop growth. 4. Potential & achievable production; yield forecasting, insect & disease forecasting models. 5. Simulation with limitations of water and nutrient management options. 6. Sensitivity analysis of varying weather and crop management practices. 7. Use of statistical approaches in data analysis and preparation of historical, past and present meteorological data for medium range weather forecast. 8. Feedback from farmers about the agroadvisory.	

Course code	**DAG- 12**			
Category	Elective			
Course title	Agricultural Journalism			
Scheme and Credits	**Credit**	**L**	**P**	
	3	2	1	
Objectives	In this course the students will learn to develop a better understanding of history and importance of agricultural journalism in India. They will learn different types of agricultural journalism and their management measures.			
Outcomes	After completion of this course, the student will be able to: CO1: Recall the basic concepts, history and classification of agricultural journalism. CO2: Learn different components of agricultural journalism and newspaper designing. CO3: learn different types of techniques and components of agricultural stories and other agricultural news sources. CO4: learn about components of writing agricultural stories and editorial mechanics.			
Course Content				
Unit	**Content**			**Hours**
Unit I	Agricultural Journalism: The nature and scope of agricultural journalism characteristics and training of the agricultural journalist, how agricultural journalism is similar to and different from other types of journalism.			08
Unit II	Newspapers and magazines as communication media: Characteristics; kinds and functions of newspapers and magazines, characteristics of newspaper and magazine readers. Form and content of newspapers			06

	and magazines: Style and language of newspapers and magazines, parts of newspapers and magazines.	
Unit III	The agricultural story: Types of agricultural stories, subject matter of the agricultural story, structure of the agricultural story. Gathering agricultural information: Sources of agricultural information, interviews, coverage of events, abstracting from research and scientific materials, wire services, other agricultural news sources.	06
Unit IV	Writing the story: Organizing the material, treatment of the story, writing the news lead and the body, readability measures. Illustrating agricultural stories: Use of photographs, use of artwork (graphs, charts, maps, etc.), writing the captions. Editorial mechanics: Copy reading, headline and title writing, proofreading, lay outing.	**06**
Practical	1. Practice in interviewing. Covering agricultural events. 2. Abstracting stories from research and scientific materials and from wire services. 3. Writing different types of agricultural stories. Selecting pictures and artwork for the agricultural story. 4. Practice in editing, copy reading, headline and title writing, proofreading, layouting. 5. Testing copy with a readability formula. 6. Visit to a publishing office.	