NOIDA INTERNATIONAL UNIVERSITY

DEPARTMENT OF AGRICULTURE & ENVIRONMENTAL SCIENCES

SYLLABUS OF COURSES TO BE OFFERED

UNDERGRADUATE PROGRAMME (AGRICULTURE)

Effective from (Academic Year 2019-20)

NOIDA INTERNATIONAL UNIVERSITY DEPARTMENT OF AGRICULTURE (SOS) B.Sc. AGRICULTURE

Semester-wise distribution of courses

	I Semester	
1	Fundamentals of Horticulture	2 (1+1)
2	Fundamentals of Plant Biochemistry and Biotechnology	3(2+1)
3	Fundamentals of Soil Science	3(2+1)
4	Introduction to Forestry	2 (1+1)
5	Comprehension & Communication Skills in English	2 (1+1)
6	Fundamentals of Agronomy	4(3+1)
7	Introductory Biology*	2 (1+1)
8	Agricultural Heritage*	1(1+0)*
9	Rural Sociology & Educational Psychology	2 (2+0)
10	Human Values & Ethics (non gradial)	1(1+0)**
11	NSS/NCC/Physical Education & Yoga Practices**	2 (0+2)**
TOTAL		**18+03*+03****
***R: Remedial course; **NC: Non-gradial courses**		

II Semester

1	Fundamentals of Genetics	3(2+1)
2	Agricultural Microbiology	2(1+1)
3	Soil and Water Conservation Engineering	2(1+1)
4	Fundamentals of Crop Physiology	2(1+1)
5	Fundamentals of Agricultural Economics	2(2+0)

6	Fundamentals of Plant Pathology	4(3+1)
7	Fundamentals of Entomology	4(3+1)
8	Fundamentals of Agricultural Extension Education	3(2+1)
9	Communication Skills and Personality Development	2(1+1)
Total		**24(16+8)**
III Semester		
1	Crop Production Technology – I *(Kharif Crops)*	2 (1+1)
2	Fundamentals of Plant Breeding	3 (2+1)
3	Agricultural Finance and Cooperation	3 (2+1)
4	Agri- Informatics	2(1+1)
5	Farm Machinery and Power	2 (1+1)
6	Production Technology for Vegetables and Spices	2 (1+1)
7	Environmental Studies and Disaster Management	3(2+1)
8	Statistical Methods	2(1+1)
9	Livestock and Poultry Management	4 (3+1)
Total		**23(14+9)**
IV Semester		
1	Crop Production Technology –II *(Rabi Crops)*	2(1+1)
2	Production Technology for Ornamental Crops, MAP and Landscaping	2(1+1)
3	Renewable Energy and Green Technology	2(1+1)
4	Problematic Soils and their Management	2(2+0)
5	Production Technology for Fruit and Plantation Crops	2(1+1)
6	Principles of Seed Technology	3(1+2)
7	Farming System & Sustainable Agriculture	1(1+0)
8	Agricultural Marketing Trade & Prices	3(2+1)
9	Introductory Agro-meteorology & Climate Change	2(1+1)
10	Elective Course	3 credit
Total		**19(11+8) + 3**
V Semester		
1	Principles of Integrated Pest and Disease Management	3(2+1)
2	Manures, Fertilizers and Soil Fertility Management	3 (2+1)
3	Pests of Crops and Stored Grain and their Management	3 (2+1)
4	Diseases of Field and Horticultural Crops and their Management -I	3 (2+1)
5	Crop Improvement-I *(Kharif Crops)*	2 (1+1)
6	Entrepreneurship Development and Business Communication	2 (1+1)
7	Geoinformatics and Nano-technology and Precision Farming	2 (1+1)
8	Practical Crop Production – I (*Kharif* crops)	2 (0+2)

9	Intellectual Property Rights	1(1+0)
10	Elective Course	3 credit
Total		**21(12+09)+ 3**
VI Semester		
1	Rainfed Agriculture & Watershed Management	2 (1+1)
2	Protected Cultivation and Secondary Agriculture	2 (1+1)
3	Diseases of Field and Horticultural Crops and their Management-II	3 (2+1)
4	Post-harvest Management and Value Addition of Fruits and Vegetables	2 (1+1)
5	Management of Beneficial Insects	2 (1+1)
6	Crop Improvement-II *(Rabi crops)*	2 (1+1)
7	Practical Crop Production –II (*Rabi* crops)	2 (0+2)
8	Principles of Organic Farming	2 (1+1)
9	Farm Management, Production & Resource Economics	2 (1+1)
10	Principles of Food Science and Nutrition	2(2+0)
11	Elective Course	3 credits
Total		**21 (11 + 10)+ 3**

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

Agro- Industrial Attachment: The students would be attached with the agro-industries for aperiod of 3 weeks to get an experience of the industrial environment and working**.**

 Educational tour will be conducted in break between IV & V Semester or VI & VII Semester

Assessment Method:

	Theory				Practical	
	Internal Assessment	**Mid Term Examination**	**End Term Examination**	**Maximum Marks**	**Practical Examination**	**Maximum marks**
Marks	**20**	**20**	**60**	**100**	**50**	**50**
%	**20%**	**20%**	**60%**	**100 %**	**100 %**	**100 %**

B.Sc. (Hons.) Agriculture

I-Semester

S.NO	Course Code	Subject	Sessional Exam			Evaluation Scheme				Credit
						External Exam	PRACTICAL		Subject Total	
			CA	TA	Total		INTERNAL	EXTERNAL		
1	ATUG-101	Fundamentals of Horticulture	20	20	40	60	25	25	150	**2 (1+1)**
2	ATUG-102	Fundamentals of Plant Biochemistry and Biotechnology	20	20	40	60	25	25	150	**3(2+1)**
3	ATUG-103	Fundamentals of Soil Science	20	20	40	60	25	25	150	**3(2+1)**
4	ATUG-104	Introduction to Forestry	20	20	40	60	25	25	150	**2 (1+1)**
5	ATUG-105	Comprehension & Communication Skills in English	20	20	40	60	25	25	150	**2 (2+0)**
6	ATUG-106	Fundamentals of Agronomy	20	20	40	60	25	25	150	**4(3+1)**
7	ATUG-107	Introductory Biology*	20	20	40	60	25	25	150	**2 (1+1)**
8	ATUG-108	Agricultural Heritage*	20	20	40	60	-	-	150	**1(1+0)* **
9	ATUG-109	Rural Sociology & Educational Psychology	20	20	40	60	-	--	150	**2 (2+0)**
10	ATUG-110	Human Values & Ethics (non gradial)	20	20	40	60	-	-	150	**1(1+0)** **
11	ATUG-111	NSS/NCC/Physical Education & Yoga Practices**	20	20	40	60	25	25	50	**2 (0+2)** **

***R: Remedial course; **NC: Non-gradial courses**

Course Code : ATUG-101 **Course Name :** Fundamentals of Horticulture
Course Credit Hour : 2hr **Total Contact Hour :** 40hr

Course Objective :

- To identify and research career opportunities in the horticulture industry as well as emerging trends.
- To identify and practice safe use of tools, equipment and supplies used in horticulture careers.
- To propagate, grow, and maintain plants in horticulture production systems.

Course Description :

This course deals with the knowledge of horticulture in a brief and prescribed manner. Different branches, its scope and importance will be explained to the students. Different methods of propagation will be discussed and also performed by students practically. Seed dormancy, seed germination and various external and internal factors for their germination will be described. This course will explain about the sexual reproduction in plants. Various role of medicinal and aromatic plants will be discussed. Irrigation – methods and application of fertilizer in horticultural crops will be disucssed.

Course Contents :

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

Unit-II: Plant propagation-methods and propagating structures; Seed dormancy, Seed germination, principles of orchard establishment; Principles and methods of training and pruning.

Unit-III: Juvilinity and flower bud differentiation, unfruitfulness, pollination, pollinizers and pollinators, fertilization and parhenocarpy.

Unit-IV: Medicinal and aromatic plants; importance of plant bio-regulators in horticulture. Irrigation – methods, Fertilizer application in horticultural crops.

Course Learning Outcomes(CLOs) :

CLO1. To grasp the uses for different horticulture plants. They will be able to evaluate plant selection and identification for local landscape application.

CLO2. To understand the function of plant parts in propagation and can evaluate the sexual and asexual methods of plant propagation. Learn about environmental factors for optimal plant growth.

CLO3. To learn about the pollination, types and different pollinators. They will learn about fertilization and parthenocarpy.

CLO4. To understand the role and importance of medicinal and aromatic plants.

CLO5. To learn the methods of fertilization application in horticultural crops and to understand the importance of plant bio-regulators in horticulture.

Text books :

Chadha, K.L. (2002). Handbook of Horticulture. ICAR, New Delhi. Jitendra Singh (2011). Basic Horticulture. Kalyani Publications, New Delhi **Reference books :**

Singh, H.P. Advances in Horticulture Biotechnology Vol.-7: Diagnostics for Horticulture crops. Westville

Singh, H.P. Advances in horticulture Biotechnology, Vol-1: Fruit Crops. Westville

Online links for study & reference materials :

https://www.agrimoon.com/wp-content/uploads/Fundamentals-of-Horticulture.pdf

Course Code: ATUG-102 **Course Name:** Fundamentals of Plant Biochemistry and Biotechnology

Course Credit Hour: 2 Hr **Total Contact Hour:** 20 hours

Course Objective:

The overall objective of this course is to provide an environment for students to develop critical thinking on plant biotechnological tools for plant improvement. This will create awareness on the importance of plant diversity and its conservation both insitu and exsitu. Principles and applications of plant biotechnology in agriculture for crop improvement will be covered.

Course Description:

The course focuses on the biochemistry and biotechnology of plants. The course will give a brief understanding of fundamentals of plant biochemistry, metabolism of carbohydrates and lipids. The course introduces the various aspects and application of plant tissue culture to the learners. Various steps or stages in the process if micropropagation or tissue culture will be explained using videos. The course emphasizes critical thinking and application of transgenic plants or GMO's in crop improvement

Course Contents:

Unit-1 **(5 hours)**

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. Lipid: Importance and classification; Structures and properties of fatty acids; storage lipids and membrane lipids.

Unit-2 **(5 hours)**

Proteins: Importance of proteins and classification; Structures, titration and zwitterions nature of amino acids; Structural organization of proteins. Enzymes: General properties; Classification; Mechanism of action; Michaelis&Menten and Line Weaver Burk equation & plots; Introduction to allosteric enzymes. Nucleic acids: Importance and classification; Structure of Nucleotides, A,

B & Z DNA; RNA: Types and Secondary & Tertiary structure. Metabolism of carbohydrates: Glycolysis, TCA cycle, Glyoxylate cycle, Electron transport chain. Metabolism of lipids: Beta oxidation, Biosynthesis of fatty acids.

Unit-3 (5 hours)

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;

Unit-4 (5 hours)

Somaclonal variation and its use in crop improvement; cryo-preservation; Introduction to recombinant DNA methods: physical (Gene gun method), chemical (PEG mediated) and Agrobacterium mediated gene transfer methods; Transgenics and its importance in crop improvement; PCR techniques and its applications; RFLP, RAPD, SSR; Marker Assisted Breeding in crop improvement; Biotechnology regulations.

Course Learning Outcomes (CLOs):

On completion of the course the students will be

CO-1:	To understand the scope of plant biotechnology in agriculture.
CO-2:	To understand the applications of tissue culture and plant biotechnology those have resulted in great advances for agriculture and society.
CO-3:	The students do understand the importance of plant diversity and their conservation through invitro propagation and maintainance.

Text Books:

1. B. D. Singh (2006). Plant Biotechnology, Kalyani Publications, ISBN 8127227889, 9788127227883.

Reference Books:

1. H. S. Chawla (2002). Introduction to Plant biotechnology, Science Publishers, ISBN 1578082285, 9781578082285.
2. S. K. Verma and Mohit Verma. A text book of plant physiology, biochemistry and biotechnology. S. Chand Publishing, ISBN 9788121906272

Course Code: ATUG-103 **Course Name:** Fundamentals of Soil Science

Course Credit Hour: 3 **Total Contact Hour: 40**

hr Course Objective:

- To provide a better appreciation of the distribution and variability of soils and their properties across the landscape
- A knowledge of how these properties are created and how they effect landscape processes (both at a large and small scale)
- A preliminary ability to investigate soil characteristics
- An understanding how we manage (or not) soils and their properties for a multitude of

objectives.

Course Description:

The Soil Science Fundamentals Review Course is designed to provide an overview of the fundamental concepts in soil science: Genesis, Classification and Morphology, Physics Chemistry, Fertility, Biology, and Land Use. Instructors will use the Fundamentals Performance Objectives (POs) as a guide for discussing topics within each section, but will not go through each objective individually. However, students are encouraged to ask questions regarding specific POs if needed.

Course Contents:

UNIT-1 Soil as a natural body, Pedological and edaphological concepts of soil; Soil genesis: soil forming rocks and minerals; weathering, processes and factors of soil formation; Soil Profile, components of soil; Soil physical properties: soil-texture, structure, density and porosity, soil colour, consistence and plasticity.

UNIT-2 Elementary knowledge of soil taxonomy classification and soils of India; Soil water retention, movement and availability; Soil air, composition, gaseous exchange, problem and plant growth, Soil temperature; source, amount and flow of heat in soil; effect on plant growth,

UNIT-3 Soil reaction-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability; soil colloidsinorganic and organic; silicate clays: constitution and properties; sources of charge; ion exchange, cation exchange capacity, base saturation; soil organic matter: composition, properties and its influence on soil properties; humic substances - nature and properties.

UNIT-4 Soil organisms: macro and micro organisms, their beneficial and harmful effects; Soil pollution - behaviour ofpesticides and inorganic contaminants, prevention and mitigation of soil pollution

Practical

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

transfer in soil. Estimation of organic matter content of soil.

Course Learning Outcomes (CLOs):

CLO-1: Explain principles of soil formation and classification
CLO-2: Determine soil physical, chemical, and biological properties. CLO-3: Understand the relationship between crops and soils.
CLO-4: Understand how to utilize the principles of soil and water conservation. CLO-5: Interpret soil analysis
CLO-6: Understand how to determine the need for fertilizer application

Text books:

- Soil Science Fundamentals Exam – Performance Objectives This document can be downloaded for free from the SSSA website: https://www.soils.org/files/certifications/fundamentals-performance-objectives.pdf

Reference books:

- Schoeneberger, P.J., Wysocki, D.A., Benham, E.C., and Broderson, W.D. (editors), 2002. NRCS, National Soil Survey Center, Lincoln, NE.
- Soil Survey Staff. 1999. USDA-NRCS, Washington, DC Agriculture Handbook 436.

Online links for study & reference materials:

- **http://ecoursesonline.iasri.res.in/course/view.php?id=125**

Course Code : ATUG-104 **Course Name :** Introduction to Forestry
Course Credit Hour : 2hr **Total Contact Hour :** 40hr

Course Objective :

- The overall objective of this course is to provide knowledge about forest ecosystem concept, classification, forest policies, productivity and vegetation forms and natural regeneration of tree species.
- It will acquaint students with the forest mensuration in which students will be able to measure different parameters such as height, diameter of forest trees.

Course Description :

Forests and other natural resources play a very important role in our world. They provide timber, fodder, fuel, medicines, resin, gums, wood etc. In addition they also provide shelter to birds and animals and have various ecological benefits. The aim of this course is to make students understand about the scientific establishment of forests by natural and artificial regeneration methods. They will also learn different tending operations used in forestry. Students will learn more about forest ecology, management, and conservation. They will learn more about forestry related careers and important issues facing forestry professionals tod

Course Contents :

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

Crown classification. Tending operations – weeding, cleaning, thinning – mechanical, ordinary, crown and advance thinning.

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

Agroforestry – definitions, importance, criteria of selection

of trees in agroforestry, different agroforestry systems prevalent in the country, shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens. Cultivation practices of two important fast growing tree species of the region.

Course Learning Outcomes(CLOs) :

CLO-1 : To understand objectives of silviculture and agroforestry.

CLO-2 : To understand natural and artificial regeneration methods of forests.

CLO-3 : To learn about the different tending operations in forests.

CLO-4 : Students will be able to measure diameter, height of different forest trees by using different methods.

CLO-5: To learn about the different cultivation methods, their effects and benefits.

Text books :

K. T. Parthiban, N. Krishnakumar & M. Karthick (2018). Introduction to forestry & agroforestry, Scientific Publishers, ISBN 9387991741, 9789387991743.

Dwivedi A.P. (2006). A textbook of silviculture, International book distributors Dehradun, ISBN-10 : 8170891981 ISBN-13 : 978-8170891987.

Reference books :

Agroforestry: systems & practices (Sunil Puri& Pankaj Panwar). New India Publishing Agency, ISBN-10 : 8189422626 ISBN-13 : 978-8189422622

Online links for study & reference materials :

https://mail.google.com/mail/u/1/#search/forest+mensuration/QgrcJHsbdJHWvKSCQxhPgJBxxmrKlGjZlgL?projector=1&messagePartId=0.6

Course Code: ATUG-105 **Course Name: English Communication –I**

Course Credit Hour: 3 **Hour: 40 hr**

The Course Outcomes (COs).

On completion of the course the students will be

CO–1	Understanding importance of English language.
CO–2	Understanding the basics of communication
CO–3	Applying the written communication skills.

Course Contents:

Unit – I Introductory Sessions **(06 hours**)

- Self-Introduction
- Building Self Confidence: Identifying strengths and weakness, reasons of Fear of
- Failure,strategies to overcome Fear of Failure Importance of English Language in present scenario(Practice: Self-introduction session)

Unit – II Basics of Grammar **(12 hours)**

- Parts of Speech
- Tense
- Subject and Predicate
- Vocabulary: Synonym and Antonym

(Practice: Conversation Practice)

Unit – III Basics of Communication **(10 hours)**

- Communication : Process, Types, 7Cs of Communication, Importance & Barrier
- Language as a tool of communication
- Non-verbal communication: Body Language
- Etiquette & Manners
- Basic Problem Sounds

(Practice :Pronuciation drill and building positive body language)

Unit – IV Application writing **(08 hours)**

- Format & Style of Application Writing
- Practice of Application writing on common issues.

Unit – V Value based text reading: Short Story (Non- detailed study) **(04 hours)**

- Gift of Magi – O. Henry

Course Learning Outcomes (CLOs):

CLO-1: To Understand the importance of English language
CLO-2: How to pronciate correctly.
CLO-4: How to make active voic to passive
CLO-5: Vocabulary will be impoved

Text Books:

1. Singh R.P., An Anthology of Short stories, O.U.P. New Delhi. For Undergraduate

Reference Books:

- Kumar, Sanjay. &Pushp Lata. "Communication Skills" New Delhi: Oxford University Press.
- Carnegie Dale. "How to win Friends and Influence People" New York: Simon & Schuster.
- Harris, Thomas. A. "I am ok, You are ok" New York: Harper and Row.
- Goleman, Daniel. "Emotional Intelligence" Bantam Book.

Course Code: ATUG-106 **Course Name:** Fundamentals of Agronomy
Course Credit Hour: 3Hrs. **Total Contact Hour:** 40 hours

Course Objective:

- The course aims to provide the fundamental knowledge of agronomy which includes seeds; sowing of seeds; tillage; Agroclimatic zones. It aims to train the student in the basic concept of Agriculture discussed above.

Course Description:

- This course introduces the fundamental concepts of Agronomy like practices before sowing, types of seeds; seed rate of different crop; soil type; calculation of fertilizer requirement.

Course Contents:

Unit1 (10lectures)

Agronomy and its scope, seeds and sowing, tillage and tilth, crop density and geometry, Crop nutrition, manures and fertilizers, nutrient use efficiency, water resources, soil-plant-water relationship.

Unit2 (8 lectures)

Crop water requirement, water use efficiency, irrigation- scheduling criteria and methods, quality of irrigation water, water logging.

Unit3 **(8 lectures)**

Weeds- importance, classification, crop weed competition, concepts of weed management-principles and methods.

Unit4 **(8 lectures)**

Herbicides- classification, selectivity and resistance, allelopathy. Growth and development of crops, factors affecting growth and development, plant ideotypes, principles, adaptation and distribution of crops.

Unit5 **(6 lectures)**

Crop rotation and its crop management technologies in problematic areas, harvesting and threshing of crops.

Course Learning Outcomes (CLOs):
On completion of the course the students will be

CO - 1	Understanding the scope and practices of Agronomy.
CO - 2	Demonstrating the methods of irrigation, crop rotation, weeding in different crops
CO - 3	Applying the method of seed sowing, tillage, weeding, irrigation, and crop management in problematic areas
CO - 4	Analyzing the effect of weed-crop competition on agricultural productivity.

Text Books:

1. Handbook of Agriculture: Indian Council of Agricultural Research, New Delhi.
2. Principles of Agronomy - S. R. Reddy. Kalyani Publisher

Reference Books:

1. Manures and Fertilizers - K. S. Yawalkar, J.P. Agrawal and S. Bokde Agri-Horticultural Pub. House.
2. Fundamentals of Agronomy Gopal Chandra De. Oxford and IBH Publishing Co. PVT. LTD

Course Code: ATUG-107 **Course Name:** Introductory Biology

Course Credit Hour: 1 Hr **Total Contact Hour:** 10 hours

Course Objective:

The student will be able to explain the characteristics of living things and the levels of life. Students will understand how life has certain characteristics and begins at a molecular level.

Course Description:

Introductory Biology is a general biology course for nonmajors and provides an overview of the structure and function of living organisms. Topics covered in this course include essential information about characteristics of life, the scientific method, cell structure and function, genetics, microbiology, and comparative biology. Students will take from this course an understanding of the basic concepts in biology and role of plants and animals in agriculture.

Course Contents:

Unit-1 **(3 hours)**

Introduction to the living world, diversity and characteristics of life, origin of life, Evolution and Eugenics.

Unit-2 **(3 hours)**

Binomial nomenclature and classification Cell and cell division. Morphology of flowing plants. Seed and seed germination.

Unit-3 **(4 hours)**

Plant systematic- viz; Brassicaceae, Fabaceae and Poaceae. Role of animals in agriculture.

Course Learning Outcomes (CLOs):

On completion of the course the students will be

CO-1:	Describe elements of the scientific study of living things.
CO-2:	Discuss cells, including their elements, organization, and membranes.
CO-3:	Describe how scientists classify and systematize the study of plants.

Text Books:

P. S Dhami, G. Chopra and H. N. Srivastava (2020). A text book of Biology. Pradeep Publications.

Reference Books:

Handbook of Biology (2014). Arihant Publications.

Course Code : ATUG-108 **Course Name :Agriculture heritage**
Course Credit Hour : 1hr **Total Contact Hour :** hr

Course Objective :

- Agricultural Heritage is to promote student understanding, awareness about sustainable agriculture and to safeguard the social, cultural, economic and environmental goods and services these provide to family farmers, smallholders, indigenous peoples and local communities

Course Description :

- Students will learn on the historical dynamics of the agrarian system. Agricultural Heritage Systems Programme from a Social-ecological Systems Perspective.

Course Contents :

- 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
- Development of Human Culture and Beginning of Agriculture Journey of Indian agriculture and its development from past to modern era; Plant production and protection through indigenous traditional knowledge.
- Ancient Agricultural Techniques Crop voyage in India and world; Agriculture scope; Importance of agriculture and agricultural resources available in India; Crop significance and classificationsCurrent Scenario of Agriculture National agriculture setup in India; Current scenario of Indian agriculture; Indian agricultural concerns and future prospects

Course Learning Outcomes(CLOs) :

CLO-1 : Understand the Indian agricultural heritage practices

CLO2. Understand the development of human culture and beginning of agriculture

CLO3. To gain the knowledge about ancient agricultural Techniques

CLO4. Understand the national setup of agriculture in India

CLO5. The information about current scenario of agriculture.

Text books :

D. Kumari, Manimuthu Veeral. 2014. Text Book on Agricultural Heritage of India. Agrotech Publishing Academy

T2.Nene, Y.L., Choudhary, S.L. and Saxena, R.C. 2010. Textbook on Ancient History of Indian Agriculture, Asian
Agri-History Foundation

Reference books :

E-References: http://icar.res.in ww.webcast.gov.in ww.icar.org.in/nasm.html

Online links for study & reference materials :

ICAR. Introductory Agriculture. ICAR e-course. Indian Council of Agricultural Research, New Delhi.

Course Code : ATUG-109 **Course Name :** Rural Sociology and educational psychology

Course Credit Hour : 2 hr **Total Contact** Hour : **40 hr**

Course Objective :

- To impart knowledge to the students on sociological and psychological aspects of rural people.
- To acquaint students with some important features of rural society.

Course Description :

Definition and scope of rural sociology will be discussed in detail with the students. The difference between rural and urban community will be explained in detail. In this a group of students will be divided into smaller units for a short period called buzz session and discussion will be done. Social institution and different groups can be explained by giving various

examples and using power point presentations. All the topics such as personality, learning, motivation and intelligence will be discussed by using audio visuals aids such as animations and video lectures.

Course Contents :

Unit 1: Sociology and Rural sociology: Definition and scope, its significance in agriculture extension.

Unit 2: Social Ecology, Rural society, Social Groups, Social Stratification, Culture concept, Social Institution, Social Change & Development.

Unit 3: Educational psychology: Meaning & its importance in agriculture extension. Behavior: Cognitive, affective, psychomotor domain, Personality, Learning, Motivation, Theories of Motivation, Intelligence.

Course Learning Outcomes (CLOs) :

CLO-1 : Students will understand the characteristics of rural society, social institutions, culture, social values and relevance in agricultural extension.

CLO-2 : Students will understand the educational psychology, learning and teaching situation.

CLO-3 : Students will be able to access the personality types, emotions of human beings and motivation.

Text books :

Mondal, S. (2019). Rural sociology and educational psychology, Kalyani Publishers, ISBN: 9789327281392, 932728139X.

Velusamy, R. (2018). Textbook on Rural sociology and educational psychology, Daya Publishing House, ISBN-10 : 9789351249412, ISBN-13: 978-9351249412.

Reference books :

Sharma, O. P. and Somani, L. L. (2012). Fundamentals of rural sociology and educational psychology, Agrotech Publications, ISBN: 9788183212496.

Online links for study & reference materials :

http://rajneeshrajoria.weebly.com/uploads/4/9/0/6/49069889/rural_sociology.pdf

Course Code : ATUG-110 **Course Name :** Human values and ethics

Course Credit Hour : 1hr **Total Contact Hour :** 20hr

Course Objective :

- To help the students to appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Value based living in a natural way.
- To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
- To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life

Course Description :

Understanding happiness and prosperity correctly- A look at basic Human Aspirations. Right understanding of five human values i. e. love, non-violence, truth, right conduct and peace by conducting seminars in class and discussion.

Methods to fulfill the above human aspirations: understanding and living in harmony at various levels. By audio visual aids students will learn about ethics in profession, information and communications technology and duties for the environment. Duties and rights of the students while they are using public property, their relations with family will be discussed. Social evils such as drug abuse, dowry system, and communalism will help the students to understand the problems of society.

Benefits of working as a team and helping each other in management of any kind of stress and anger can be discussed.

Course Contents :

Unit-I: Happiness & prosperity; Human values & ethics; concept, definition, significance & sources; Fundamental values: Right conduct, peace, truth, love & non-violence; Ethics: professional, environmental, ICT; Sensitization towards others particularly senior citizens, developmentally challenged & gender.

Unit-II: Spirituality; positive attitude and scientific temper; Team work and volunteering; Rights and responsibilities; Road safety; Human relations and family harmony; Modern challenges and value conflict: Sensitization against drug abuse and other social evils; developing personal code of conduct (SWOT analysis); Management of anger and stress.

Course Learning Outcomes(CLOs) :

CLO-1 : Students will be familiar with the basic vocabulary and fundamental theories of ethics.

CLO-2 : To appreciate the rights of others, to inspire moral and social values and loyalty.

CLO-3 : Understand the value of harmonious relationship based on trust and respect in their life and profession

CLO-4 : Students will learn to value their argumentative opponents as valuable resources in ethical reasoning.

Text books :

R. R. Gaur, R. Sangal and G. P. Bagaria (2010). A foundation course in human values & professional ethics, Excel Books , ISBN-10 : 9788174467812, ISBN-13 : 978-8174467812.

S. Srivastava (2010). Human values and professional ethics, Scitech Publications, ISBN 8183714498, 9788183714495.

Reference books :

S. S. Mathur (2010). Education for values, environment and human rights. RSA International. ISBN: 9789380158471.

S. B. Gogate (2010). Human Values & Professional Ethics, Vikas Publishing House Pvt. Ltd., Noida, ISBN-10 : 8125937137 ISBN-13 : 978-8125937135

Online links for study & reference materials : https://lecturenotes.in/download/note/18532-note-for-applied-physics-phy-by-anshuman

B.Sc. (Hons.) Agriculture
II-SEMESTER

S.NO	Course Code	Subject	Sessional Exam			Evaluation Scheme				Credit
						External Exam	PRACTICAL		Subject Total	
			CA	TA	Total		INTERNAL	EXTERNAL		
1	ATUG-201 (T+P)	Fundamentals of Genetics	20	20	40	60	25	25	150	3(2+1)
2	ATUG-202 (T+P)	Agricultural Microbiology	20	20	40	60	25	25	150	2(1+1)
3	ATUG-203 (T+P)	Soil and Water Conservation Engineering	20	20	40	60	25	25	150	2(1+1)
4	ATUG-204 (T+P)	Fundamentals of Crop Physiology	20	20	40	60	25	25	100	2(1+1)
5	ATUG-205 (T+P)	Fundamentals of Agricultural Economics	20	20	40	60	25	25	150	2(2+0)
6	ATUG-206 (T+P)	Fundamentals of Plant Pathology	20	20	40	60	25	25	150	4(3+1)
7	ATUG-207 (T+P)	Fundamentals of Entomology	20	20	40	60	-	-	100	4(3+1)
8	ATUG-208 (T+P)	Fundamentals of Agricultural Extension Education	20	20	40	60	25	25	150	3(2+1)
	(T+P) : THEORY + PRACTICAL **(T): THEORY ONLY**									**23**

Course Code: ATUG 201 **Course Name:** Fundamentals of Genetics

Course Credit Hour: 4hr **Total Contact Hour:** 40hr

Course Objectives:

- To impart knowledge to the students on the ultra structure of cell and cell organelles, various principles of hereditary and variation, principles of genetics and their applications in plant breeding for improving agricultural productivity

Course Description:

- This course provides a stair-step introduction of genetics from the basic concepts to exploring more complex topics, Sex determination, Blood group genetics, linkage and crossing over concepts, mutation genetic disorder and gene concept including molecular biology, gene mapping and screening, and reverse and forward genetic research.

Course Contents:

Unit-I (10 Hours)

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

Unit-II (10 Hours)

Multiple alleles, pleiotropism and pseudo-alleles, Sex determination and sex linkage, sex limited and sex influenced traits, Blood group genetics, Linkage and its estimation, crossing over mechanisms, chromosome mapping. Structural changes in chromosome,

Unit-III (12 Hours)

Mutation, classification, Methods of inducing mutation & CIB technique, mutagenic agents and induction of mutation, Qualitative & Quantitative traits, Polygenes and continuous variations, multiple factor hypothesis, Epistatic interactions with examples, Cytoplasmic inheritance. Genetic disorders,. Nature, structure & replication of genetic material

Unit-IV (8 Hours)

Protein synthesis, Transcription and translational mechanism of genetic material, Gene concept: Gene structure, function and regulation, Lac and Trp operons.

Course Learning Outcomes (CLOs):

CLO-1: Understand the basic concepts of the ultra structure of cell, cell organelles, chromosomes and nucleic acids.

CLO-2: Apply the principles of inheritance to plant breeding

CLO-3: Acquaint with the fundamentals of chromosomal and cytoplasmic inheritance
CLO-4: Sex determination, mutations, chromosomal aberrations and Gene concept: Gene structure, function and regulation
CLO-5: Learning about Gene concept, structure and function.

Text books:

Pundhan Singh, 2006, Genetics, Kalyani Publishers, Ludhiana
Singh, B.D. 2015. Fundamentals of Genetics, Kalyani Publishers, Ludhiana

Reference books:

Gupta, P.K.2007. Genetics, Rastogi Publications, Meerut

Online links for study & reference materials:

Course Code : ATUG-202 **Course Name :**Agriculture Microbiology
Course Credit Hour :2hr **Total Contact Hour : 20** hr

Course Objective :

- Students will be able to understand basic and advanced techniques of various instrumentation like pH meter, spectroscopy, colorimetric, microscopy, chromatography, molecular techniques.
- The students would acquire basic knowledge of research data collection, processing and presentation of data and application of bioinformatics, biostatistics tools.
- The student will be able to demonstrate ability to provide advanced concept of microbial technology pharmaceutical technology, food microbiology process.
- The students will be able to demonstrate understanding of basic and advanced knowledge in agriculture microbiology disciplines

Course Description :

- Microbiology is an applied science, helping agriculture, health and medicine and maintenance of the environment, as well as the biotechnology industry. Microbiologists study the role of microbes at the level of the agriculture, at the level of the cell and at the level of proteins and genes. Microorganisms are extremely important in our everyday lives. Some are responsible for a significant proportion of the diseases affecting not only humans, but also plants and animals, while others are vitally important in the maintenance and modification of our environment. Still others play an essential role in industry, where their unique properties have been harnessed in the production of food, beverages and antibiotics.

knowledge in recent trends in microbiology especially in microbiology..

Course Contents :

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

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

Course Learning Outcomes(CLOs) :

CLO-1 :To understand microbial world, cell structure, Bacterial genetics. CLO-2 : To Understand the role of microbes in soil fertility and crop production.

CLO-3 :To Understand the Biological nitrogen fixation.

CLO-4 :To Understand the Microbes in human wel

D. J. BAGYARAJ, Agricultural microbiology,second edition,PHI Learning Pvt. Ltd.
R.P. Pareek,Agricultural microbiology, Scientific Publishers

Reference books

N.S. Subba Rao,Advances in Agricultural microbiology, Elsevier

Online links for study & reference materials : http://agrimoon.com/agricultural-microbiology-icar-ecourse-pdf-book/

Course Code: ATUG-203

Course Name: Soil and Water Conservation Engineering

Course Credit Hour: 2 Hr **Total Contact Hour:** 20 hr

Course Objective:

The course aims to provide the fundamental knowledge of Soil and Water Conservation Engineering. It enables to understand the basics of soil its conservation and engineering

Course Description:

This course gives the fundamental concepts soil & water conservation engineering .Measurement of soil erosion - Runoff plots, soil samplers. Water erosion control measures - agronomical measures - contour farming, strip cropping

Course Contents:

Theory

UNIT 1: **(5 LECTURES)**

Introduction to Soil and Water Conservation, causes of soil erosion. Definition and agents of soil erosion, water erosion: Forms of water erosion. Gully classification and control measures.

UNIT 2: **(5 LECTURES)**

Soil loss estimation by universal Loss Soil Equation. Soil loss measurement techniques. Principles of erosion control: Introduction to contouring, strip cropping. Contour bund.

UNIT 3: **(5 LECTURES)**

Graded bund and bench terracing. Grassed water ways and their design. Water harvesting and its techniques. Wind erosion: mechanics of wind erosion, types of soil movement. Principles of wind erosion control and its control measures.

UNIT 4: **(5 LECTURES)**

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

Course Learning Outcomes (CLOs):

CO – 1 Understanding the classification, cause and type of soil erosion
CO – 2 Applying and analyzing the control measures for soil erosion
CO – 3 Understanding and analyzing soil loss by USLE (universal soil loss equation)

Text Books:

1. Principles of soil conservation and water management Hanumappa Ramappa Arakeri, Roy LutherDonahue Rowman &Allanheld

Reference Books:

Reference Books:

1. Principles of Soil Conservation and Management,Humberto Blanco-Canqui, Rattan Lal,Springer.
2. Advances in Soil and Water Conservation Francis J. PierceCRCPress.
3. Integrated Watershed Management in Rainfed Agriculture, Suhas P. Wani, Johan Rockstrom, KanwarLal Sahrawat, CRCPress

Course Code : ATUG-204 **Course Name :** Fundamentals of Crop physiology
Course Credit Hour : 1hr **Total Contact Hour :** 20hr

Course Objective :

- To impart the students with basic knowledge of cell physiology and plant nutrition with relevance to agriculture.
- To learn about various plant metabolic processes and functions in plants.

Course Description :

The aim of this course is to give students a greater understanding of the various physiological processes in plants such as respiration, photosynthesis, glycolysis, TCA cycle, plants water relations etc., plant responses and environmental factors affecting growth and productivity of the agricultural crops we depend on. Students will learn about basic concepts in crop growth and development. The course will enable students to use the knowledge of crop physiology to answer practical questions. Basic concepts underlying crop physiology will be demonstrated through laboratory exercises.

Course Contents :

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

Mineral nutrition of Plants: Functions and deficiency symptoms of nutrients, nutrient uptake mechanisms.
Unit-III: Photosynthesis: Light and Dark reactions, C3, C4 and CAM plants Respiration: Glycolysis, TCA cycle and electron transport chain Fat Metabolism: Fatty acid synthesis and Breakdown.
Unit-IV: Plant growth regulators: Physiological roles and agricultural uses; Physiological aspects of growth and development of major crops: Growth analysis, Role of Physiological growth parameters in crop productivity.

Course Learning Outcomes(CLOs) :
CLO-1 : To know the importance of Physiology in Agriculture and Horticulture.
CLO-2 : To get fundamental ideas on various basic plant metabolic functions such as Diffusion and Osmosis, Plant Water Relations, Mineral Nutrition, Photosynthesis, Respiration, Fat Metabolism, Plant Growth and Development.
CLO-3 : To have information about plant cell and plant growth regulators.
CLO-4 : To learn about the growth and development in plants and use of growth parameters on crop
productivity.

Text books :

Vanangamudi M, Dr. Purohit S. S. (2017). A Textbook Of Crop Physiology, AGROBIOS, ISBN: 9788177546064.
S. C. Datta (2011). Plant Physiology, New Age International (P) Ltd., ISBN-10: 8122405178, ISBN-13: 9788122405178.

Reference books :

Sunil Kumar (2015). Handbook Of Plant And Crop Physiology, Scitus Academics LLC, ISBN-10 : 1681170272, ISBN-13 : 978-1681170275.

Online links for study & reference materials :
https://drive.google.com/file/d/1KrshFAQZMgNbfCdkGAbI-Cv4fDpnAiz7/view

Course Code :ATUG-205 **Course Name : Fundamentals of Agricultural Economics**
Course Credit Hour : 2 **Total Contact Hour :**

Course Objective :

- This course is intended to provide an overview of Agricultural economic theory and its applications. The course starts with the theory of consumer behavior consisting of consumer's utility maximization problem and demand theory.
- It intends to provide fundamental concepts and models in the theory of production and costs and sets out to provide a basic understanding of price and / or output determination under different types of market structures including factor markets

- This course will also expose the students to the theory of general equilibrium and welfare economics

Course Description :

- The purpose of this course is to introduce students to the use of economic tools and concepts in the analysis and evaluation of public policies affecting agriculture, food, natural resources, and the environment. Emphasis is placed on social valuation, civic responsibility, ethics and the practical analysis of public policy issues. The course is divided into two parts:
- Part I: Basic Concepts and Theoretical Background for Policy Analysis: the problem of collective action, basic economics of markets and human behavior, welfare economics, the role of the state, ethical and political dimensions of policy analysis.
- Part II: Economic Tools for Policy Analysis and Case Studies: benefit-cost analysis, market models, welfare analysis, and partial and general equilibrium analysis. These analytical methods are illustrated with case studies in food, agricultural, natural resource, and environmental policies.

Course Contents :

Unit- 1 *Economics:* Meaning, scope and subject matter, definitions, activities, approaches to economic analysis; micro and macro economics, positive and normative analysis. Nature of economic theory; rationality assumption, concept of equilibrium, economic laws as generalization of human behavior. Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare

Unit-2

Agricultural economics: meaning, definition, characteristics of agriculture, importance and its role in economic development. Agricultural planning and development in the country. *Demand:* meaning, law of demand, schedule and demand curve, determinants, utility theory; law of diminishing marginal utility, equi-marginal utility principle.

Unit-3

Law of variable proportions and law of returns to scale. *Cost:* concepts, short run and long run cost curves. Supply: Stock v/s supply, law of supply, schedule, supply curve, determinants of supply, elasticity of supply. Market structure: meaning and types of market, basic features of perfectly competitive and imperfect markets. Price determination under perfect competition; short run and long run equilibrium of firm and industry, shut down and break even points. Distribution theory: meaning, factor market and pricing of factors of production. Concepts of rent, wage, interest and profit. *National income:* Meaning and importance, circular flow, concepts of national income accounting and approaches to measurement, difficulties in measurement.

Unit- 4

Population: Importance, Malthusian and Optimum population theories, natural and socio-economic determinants, current policies and programmes on population control. Money: Barter system of exchange and its problems, evolution, meaning and functions of money, classification of money, 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.

Course Learning Outcomes(CLOs) :

CLO-1 : Generate a creative or scholarly product that requires broad knowledge, appropriate technical proficiency, information collection, synthesis, interpretation and reflection.
CLO-2 : Explain ethical principles, civics, and stewardship, and their importance to society.
CLO-3 : Write texts in various forms, with an identified purpose, that respond to specific audience needs, incorporate research or existing knowledge, and use applicable documentation and appropriate conventions of format and structure.
CLO-4 : Students will achieve an understanding of ethics, civic responsibility and the importance of public deliberation and analysis for society through class discussions, readings, problem sets and research conducted as the basis for a major student project that will constitute the schoo.l

Text books :

1. David M Kreps 1990. A Course in Microeconomic Theory. Princeton University Press. Dewitt KK. 2002.
2. Modern Microeconomics. The Macmillan Press. Silberberg E & Suen W. 2001. The Structure of Economics - A Mathematical Analysis. McGraw-Hill.
3. Modern Economic Theory. Sultan Chand & Co. Henderson JM & Quandt RE. 2000.
4. Microeconomic Theory: A Mathematical Approach. McGraw-Hill. Koutsoyiannis A. 2003.

Reference books :

1. Fundamentals of Agricultural Economics by Verma P K (Author)
2. Fundamentals Of Agricultural Extension Education (Prinsika)

Course Code: ATUG-206 **Course Name: Fundamentals of Plant Pathology**

Course Credit Hour:3 **Total Contact Hour: 45 hr**

CO – 1 Understanding the basic aspects of plant health and disease caused by

parasitic and non-parasitic pathogens

CO – 2 Understanding the plant disease management through chemical, cultural and biological practices

CO – 3 Identifying the importance of microorganisms in agriculture

Unit 1: (15 lectures)

Introduction: Importance of plant diseases, scope and objectives of Plant Pathology. History of Plant Pathology with special reference to Indian work. Terms and concepts in Plant Pathology. Pathogenesis. Causes / factors affecting disease development: disease triangle and tetrahedron and classification of plant diseases. Important plant pathogenic organisms, different groups**:** fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasmas, viruses, viroids, algae, protozoa, phanerogamic parasites and nematodes with examples of diseases caused by them. Diseases and symptoms due to abiotic causes.

Unit 2: (10 lectures)

Fungi: general characters, definition of fungus, somatic structures, types of fungal thalli, fungal tissues, modifications of thallus, reproduction (asexual and sexual). Nomenclature, Binomial system of nomenclature, rules of nomenclature, classification of fungi. Key to divisions, sub-divisions, orders and classes.

Unit 3: *Bacteria and mollicutes*: **(10 lectures)**

General morphological characters. Basic methods of classification and reproduction. *Viruses*: nature, structure, replication and transmission. Study of phanerogamic plant parasites. *Nematodes:* General morphology and reproduction, classification, symptoms and nature of damage caused by plant nematodes (*Heterodera, Meloidogyne*, *Anguina, Radopholus* etc.)

Unit 4: (10 lectures)

Growth and reproduction of plant pathogens. Liberation / dispersal and survival of plant pathogens. Types of parasitism and variability in plant pathogens. Pathogenesis. Role of enzymes, toxins and growth regulators in disease development. Defense mechanism in plants**.** Epidemiology: Factors affecting disease development. Principles and methods of plant disease management. Nature, chemical combination, classification, mode of action and formulations of fungicides and antibiotics.

Course Learning Outcomes (CLOs):

CLO-1: Explain principles of soil formation and classification

CLO-2: Determine soil physical, chemical, and biological properties. CLO-3: Understand the relationship between crops and soils.

CLO-4: Understand how to utilize the principles of soil and water conservation. CLO-5: Interpret soil analysis

CLO-6: Understand how to determine the need for fertilizer application.

Text Books:

1. Plant Pathology – P.D. Sharma. Rastogi Publications.

2. Principles of plant Pathology – R.S.SIngh

Reference Books:

1. Plant pathology by G. N. Agrios, Elsevier Academic press,London.
2. Introductory Plant Pathology by M. N. Kamat, Prakash Publ, Jaipur(l967).
3. Plant diseases by R. S. Singh. Oxford and IBH Publishing.
4. Soil Microbiology Rao Oxford and IBH Publishing.

essment method: (Continuous Internal Assessment = 40% , Final Examination = 60%)

Assessment -1	- 05%
Assessment-2	- 05%
Assessment-3(Midexam)	- 20%
Assessment-3	- 05%
Assessment-4	- 05%
Total Internal Assessment	**- 40%**

Course Code: ATUG-207 **Course Name: Fundamentals of Entomology**
Course Credit Hour: 4 **Total Contact Hour: 40 hr**

Course Objective:

- Identify terrestrial arthropods to Class by visual inspection.
- Identify insects to Order by inspection, and identify common forms to Family.
- Be able to identify unknown insects by use of standard taxonomic keys.
- Apply field-sampling techniques and carry out routine insect surveys.
- Collect, process, and prepare insect specimens for scientific study.
- Make a study collection of insects to learn investigative techniques and identification skills.

Course Description:

The program is designed to increase personal knowledge about insects, the most diverse group of animals on earth, and their importance to mankind and our environment. It will allow the student to appreciate the role of insect biology and diversity in relation to all forms of animal life. Students who complete this Program should be better prepared to teach in the field of science education, work in many fields of animal and plant science including the agricultural sciences, and have a better appreciation of the world in which they live.

Course Contents:

UNIT-1

History of Entomology in India. Major points related to dominance of Insecta in Animal kingdom Classification of phylum Arthropoda up to classes. Relationship of class Insecta

with other classes of Arthropoda. Harmful and Beneficial insect.Morphology: Structure and functions of insect cuticle and molting. Body segmentation. Structure of Head, thorax and abdomen. Structure and modifications of insect antennae, mouth parts, legs, Wing venation, modifications and wing coupling apparatus. Metamorphosis in insects. Types of larvae and pupae Structure of male and female genital organs; 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.

UNIT-2

Insect Ecology: Introduction, Environment and its components. Effect of abiotic factors– temperature, moisture, humidity, rainfall, light, atmospheric pressure and air currents. Effect of biotic factors – food competition, natural and environmental resistance.

Course Learning Outcomes (CLOs):

CLO-1 Student will have knowledge of insect identification, morphology, physiology and behavior.

CLO-2 Students will acquire, analyze, and synthesize entomological information

CLO-3 Students will demonstrate oral or written proficiency in the entomological sciences

CLO-4 To Introduce entomology (definitions, objective, concept, scope and importance)

CLO-5 To Understand roles the insect to cause damage to plant.

CLO-6 Studies the general characters, reproduction. Nomenclature, classification of insect.

Text books:

- Borror, D.J., C. A. Triplehorn, and N. F. Johnson. 1992. An introduction to the study of insects. Sixth ed. Saunders College Publishing.
- Williams, S. C. 2001. General Entomology  a course reader and laboratory manual. Available at SFSU Bookstore.

Reference books:

- Bland, R. G. and H. E. Jaques. How to know the insects. Wm C. Brown.
- Elzinga, R. J. Fundamentals of Entomology. Prentice Hall
- Powell, J. A. and C. L. Hogue. California Insects. Natural History Guides 44. Univ. California Press.

Online links for study & reference materials:

- https://www.agri-bsc.kkwagh.edu.in/uploads/department_course/Theory_Notes_on_ENTO-121.pdf
- http://ecoursesonline.iasri.res.in/course/view.php?id=142

Course Code : ATUG-208 **Course Name :** Fundamentals of Agricultural extension education

Course Credit Hour : 3hr **Total Contact Hour :** 54hr

Course Objective :

- To learn about different programmes to raise the standard of people living in rural areas by helping them in using their natural resources (eg. Land, water, livestock) in an efficient way.
- To learn how we can help rural people in planning and implementation of their family and village and for increasing agricultural production, improving existing village craft and industries.

Course Description :

This course deals with objectives, principles, philosophy and dimesions of extension. Programme planning is part of extension. Students will be informed about the historic efforts of planning and implementation of extension programmes which can provide them insights to develop future extension programmes. The implications of innovations and its consequences are the components that have been covered in the course. The latest trends in extension science herald significance of extension in agricultural production. An effort has been made todifferentiate between extension educationists and extension service providers. The understanding of fundamentals of extension education leads to development of extension professionals.

Course Contents :

Education: Meaning, definition & Types; Extension Education- meaning, definition, scope and process; objectives and principles of Extension Education; Extension Programme planning-Meaning, Process, Principles and Steps in Programme Development. Extension systems in India: extension efforts in pre-independence era (Sriniketan, Marthandam, Firka Development Scheme, Gurgaon Experiment, etc.) and post-independence era (Etawah Pilot Project, Nilokheri Experiment, etc.); various extension/ agriculture development programmes launched by ICAR/ Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND,NATP, NAIP, etc.). New trends in agriculture extension: privatization extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems, etc.

Rural Development: concept, meaning, definition; various rural development programmes

launched by Govt. of India. Community Dev.-meaning, definition, concept & principles, Philosophy of C.D. Rural Leadership: concept and definition, types of leaders in rural context; extension administration: meaning and concept, principles and functions. Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programmes; transfer of technology: concept and models, capacity building of extension personnel; extension teaching methods: meaning, classification, individual, group and mass contact methods, ICT Applications in TOT (New and Social Media), media mix strategies; communication: meaning and definition; Principles and Functions of Communication, models and barriers to communication. Agriculture journalism; diffusion and adoption of innovation: concept and meaning, process and stages of adoption, adopter categories.

Course Learning Outcomes(CLOs) :

CLO-1 : Education; Extension Programme planning Meaning, Process, Principles and Steps in Programme Development.

CLO-2 : Extension systems in India: Extension efforts in Pre-independence era.

CLO-3 : New trends in agriculture extension: privatization extension.

CLO-4 : Monitoring and evaluation – concept and definition, monitoring, and evaluation of extension programmes. Transfer of Technology- Concept and models.

Text books :

R. K. Talukdar and U. Barman (2014). Fundamentals of Agriculture Extension Education, Agrobios Publications, ISBN 9788177544428.

Reference books :

L. L. Somani (2009). Extension Education And Communication. Agrotech Publications, ISBN 9788183211406.

J. M. Deshmukh and V. G. Dhulgand. Text Book on Fundamentals of Agricultural Extension Education. Weser Books, ISBN 978-3-96492-011-9.

Online links for study & reference materials :

https://study.kreshee.com/wp-content/uploads/2020/07/Fundamentals-of-extnsion-education.pdf
http://nsdl.niscair.res.in/jspui/bitstream/123456789/307/1/AGRICULTURAL%20EXTENSION%20EDUCATION.pdf

B.Sc. (Hons.) Agriculture
III SEMESTER

S.NO	Course Code	Subject	Sessional Exam			Evaluation Scheme				Credit
						External Exam	PRACTICAL		Subject Total	
			CA	TA	Total		INTERNAL	EXTERNAL		
1	ATUG-301	Crop Production Technology – I (Kharif Crops) **(T+P)**	20	20	40	60	25	25	150	**2 (1+1)**
2	ATUG-302	Fundamentals of Plant Breeding(FPB) **(T+P)**	20	20	40	60	25	25	150	**3(2+1)**
3	ATUG-303	Agricultural Finance and Cooperation(AF) **(T+P)**	20	20	40	60	25	25	150	**3(2+1)**
4	ATUG-305	Farm Power and Machinery(FPM) **(T+P)**	20	20	40	60	25	25	100	**2 (1+1)**
5	ATUG-306	Production Technology for Vegetables and Spices **(T+P)**	20	20	40	60	25	25	150	**2(1+1)**
6	ATUG-307	Environmental Studies and Disaster Management **(T+P)**	20	20	40	60	25	25	150	**3 (2+1)**
7	ATUG-308	Statistical Methods **(T+P)**	20	20	40	60	-	-	100	**2(2+1)**
8	ATUG-309	Livestock and Poultry Management **(T+P)**	20	20	40	60	25	25	150	**4 (3+1)**

Course Code : ATUG-301 **Course Name :** Crop production-I (Kharif crop)

Course Credit Hour : 2hr **Total Contact Hour :** hr

Course Objective :

- Acquire skill in crop production
- Control measures for weed, insect-pest disease for enhanced yield.
- Ensuring sound use of natural resources, reducing soil erosion, and improving soil quality.

Course Description :

- This course expresses the basic principles involved in the production of field crops stressing the importance of field crop management and other agronomic practices that can bring about improve crop yield under good management practices.

Course Contents :

Unit-1 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 Unit-2 Pulses-pigeonpea, mungbean and urdbean

Unit-3 oilseeds crops- groundnut, and soybean

Unit-4 Fibre crops- cotton & jute

Unit-5 Forage crops-sorghum, cowpea, cluster bean and napier

Course Learning Outcomes(CLOs) :

CLO-1. Identify the major crops produced in India CLO2.

Identify the major crops produced in the world

CLO3. Understand the factors that affect which crops are grown

CLO4. Understand the agronomic practices

CLO5. Undaerstand the plant protection measures

Text books :

Chatterjee, B.N. 1989. Forage Crop Production- Principles and Practices, Oxford and IBH.New Delhi, ISBN= 8120403983

Chidda Singh, Prem Singh and Rajbir Singh. 2003. Modern Techniques of Raising Field Crops (2nd ed.). Oxford and IBH, New Delhi,ISBN=8120415997

Prasad, R. (ed.). 1999. A Text Book of Rice Agronomy, Jain Brothers, New Delhi,

Reference books :

ICAR [Indian Council of Agricultural Research],6th revised Hand Book of Agriculture. ICAR, New Delhi, ISBN no =81-7164-050-8

Course Code: ATUG 302 **Course Name:** Fundamentals of Plant Breeding

Course Credit Hour: 4hr **Total Contact Hour:** 40hr

Course Objectives:

- The impart knowledge to the students on the principles and procedure of plant breeding in self and cross pollinated crops for development of the high yielding varieties/ hybrids with the help of various conventional and modern molecular approaches

Course Description:

- This course examines the historical principles to plant improvement. Topics include breeding objectives, mating systems, selection, testing and germplasm in self and cross pollinated crops for development of the high yielding varieties/ hybrids with the help of various conventional and modern molecular approaches

Course Contents:

Unit-I (8 Hours)

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.

Unit-II (6 Hours)

Domestication, Acclimatization, introduction; Centre of origin/diversity, component of Genetic variation; Heritability and genetic advance;

Unit-III (8 Hours)

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,

Unit-IV **(6 Hours)**

Genetic basis and methods of breeding cross-pollinated crops, modes of selection; Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties;

Unit-V **(6 Hours)**

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

Unit-VI **(6 Hours)**

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

Course Learning Outcomes (CLOs):

CLO-1: Learn breeding procedures in self and cross pollinated crops
CLO-2: Understand exploitation of heterosis utilizing male sterility and other method
CLO-3: Know about the various population improvement programmes
CLO-4: Study about the fundamentals of mutation, polyploidy and wide hybridization and their role in crop improvement
CLO-5: Orientation regarding modern molecular approaches like Marker Assisted Selection
CLO-6: Learning about IPR, Patenting, Plant Breeders and & Farmer's Rights

Text books:

Principles of Plant Breeding - B. D. Singh
Essentials of Plant Breeding – Phundan Singh
Principles of Plant Breeding - R.W. Allard

Reference books:

Principles of Plant Breeding - R.W. Allard

Online links for study & reference materials:

http://ecoursesonline.iasri.res.in › course

Course Code : ATUG- 303 **Course Name : Agricultural Finance and Co-Operation**

Course Credit Hour : 2 hr **Total Contact Hour : 20** hr

Course Objective :

- To make the students aware about the agricultural Finance, Banking and Cooperation.
- To acquaint the students with the basic concepts, principles and functions of management.
- To understand the process of finance banking and cooperation.

Course Description :

- This subjects is very useful to students in agriculture how the loans provide by the banks to farmers. An introduction to higher financing institutions – RBI, NABARD, ADB, IMF, world bank, Insurance and Credit Guarantee Corporation of India..

Course Contents :

- Unit 1-

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

- Unit-2

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.

Course Learning Outcomes(CLOs) :

CLO-1 : Understand the scope and significance of Agricultural Finance

CLO2.Understand the credit need and its role in agriculture

CLO3. Learn about Working Capital Management Risk and Return and Venture Capital

CLO4.Learn about farmers' service cooperative societies in India

CLO5. Understand the concepts and process of Capital Budgeting and LongTerm Financing Capital Structure and Cost of Capital

Text books :

Muniraj, R., 1987, Farm Finance for Development, Oxford and IBH, New Delhi

Subba Reddy. S and P.Raghu Ram 2011, Agricultural Finance and Management, Oxford and IBH, New Delhi.

Reference books :

Lee W.F., M.D. Boehlje A.G., Nelson and W.G. Murray, 1998, Agricultural Finance, Kalyani Publishers, New Delhi.
Mammoria, C.B., and R.D. Saxena 1973, Cooperation in India, Kitab Mahal, Allahabad.

Online links for study & reference materials :
http://ecoursesonline.iasri.res.in/Courses/Agricultural%20Finance

Course Code: ATUG-305 **Course Name:** Farm Machinery Power
Course Credit Hour: 3 Hr **Total Contact Hour:** 30 hours

Course Objective:

The overall objective of this course is to provide an environment for students to develop critical thinking on farms and machinery. Source of farm power, working of engines, Familiarization with Plant Protection equipment.

Course Description:

Familiarization with different systems of I.C. engines: Air cleaning, cooling, lubrication ,fuel supply and hydraulic control system of a tractor. Power transmission system : clutch, gear box, differential and final drive of a tractor , Tractor types, Cost analysis of tractor power and attached implement

Course Contents:

Unit 1 (4 Hours)

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

Unit 2 (4 Hours)

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

Unit 3 (4 Hours)

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

Unit 4 (4 Hours)

Familiarization with Primary and Secondary Tillage implement, Implement for hill agriculture, implement for intercultural operations, Familiarization with sowing and

planting equipment,

Unit 5 (**4 Hours)**

Calibration of a seed drill and solved examples, Familiarization with Plant Protection equipment, Familiarization with harvesting and threshing equipment.

Course Learning Outcomes (COs).

On completion of the course the students will be

CO-1 Understanding the working, operation and uses of different farm machines

CO-2 Understanding the various scientific principles for the efficient operation of farming activities

CO-3 Applying the different farming machine-operational methods

O-5 Creating an appropriate method of farm machining that can give maximum crop productivity with minimum cost and human efforts.

Text Books

1. Farm Machinery Fundamentals,Marshall F. Finner, Richard J. Straub, American Publishing.

Reference Books

1. Principles of Farm Machinery, Roy Bainer, Read Books Design
2. Farm Machinery, Claude Culpin, Read Books.
3. Farm Machinery: Heavy Equipment,David Amentrout, Patricia Amentrout. * Latest editions of all the suggested books are recommended.

Course Code : ATUG-306 **Course Name :** Production technology for vegetables and spices

Course Credit Hour : 2hr **Total Contact Hour :** 40hr

Course Objective :

- To inform students about the use of vegetables and spices in human nutrition and economic growth of a nation.
- To educate students about production technology of vegetables and spices.

Course Description :

This course will inform students about importance of spices and various vegetables for proper growth and development, nutrition and economic growth of a nation. Time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders, of important vegetable and spices will be explained by conducting buzz session, discussion and seminar mode.

Course Contents :

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 vegetable and spices (Tomato, Brinjal, Chilli, Capsicum, Cucumber, Melons, Gourds, Pumpkin, French bean, Peas; Cole crops such as Cabbage, Cauliflower, Knol-khol; Bulb crops such as Onion, Garlic; Root crops such as Carrot, Raddish, Beetroot; Tuber crops such as Potato; Leafy vegetables such as Amaranth, Palak. Perennial vegetables).

Course Learning Outcomes(CLOs) :

CLO-1 : To know importance of vegetables and spices crops.
CLO-2 : Types of vegetable gardening with special reference to kitchen gardening.
CLO-3 : To understand the scientific cultivation methods of vegetables and spices.
CLO-4 : To know more about origin, area, climate, soil, improved varieties and cultivation practices such as time and methods of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield.

CLO-5 : Bulb crops such as Onion, Garlic; Root crops such as Carrot, Radish, Beetroot; Tuber crops such as Potato and Sweet potato; Leafy vegetables such as Amaranthus and Palak; Perennial vegetables such as drumstick and pointed gourd.

Text books :

P. Hazra, A. Chattopadhyay, K. Karmakar and S. Dutta (2010). Modern Technology in Vegetable Production. New India Publishing Agency,New Delhi, ISBN 9789380235325.
N. P. Singh (2007). Basic Concepts of Vegetable Science**.** International Book Distributing Co. New Delhi, Academic Press, New Delhi, ISBN: 9789385915215, 9789385915215.

Reference books :

K. G., Shanmugavelu, N. Kumar and K. V. Peter (2005). Production Technology of Spices and Plantation Crops. Agrobios(India), Jodhpur.

Online links for study & reference materials :

www.agrimoon.com
www.tnau.in

Course Code: ATUG-307
Course Name: Environmental Studies & Disaster Management

Course Credit Hour: 3 **Total Contact Hour: 30 hr**

Course Objective:

- **Disciplinary knowledge:** Enable students to develop a comprehensive understanding of various facets of life forms, ecological processes and how humans have impacted them during the Anthropocene era.
- **Critical thinking:** Capability to identify relevant environmental issues, analyse the various underlying causes, evaluate the practices and policies, and develop framework to make informed decisions.
- **Moral and ethical awareness/reasoning:** Develop empathy for various life forms and appreciate the various ecological linkages within the web of life.

Course Description:

Through interdisciplinary academic courses, internships, experiential, and co-curricular activities our students become passionate stewards of the environment, scholars in sustainability and environmental management, and experts in environmental studies.

With a focus on environmental justice, students develop critical-thinking skills, analyze real-world problems, and understand the power of narrative to create sustainable solutions for local and global communities.

Course Contents:

UNIT-1

- **Introduction to Environment**: Definition, Components of Environment, Relationship between different components, Man Environment relationship, Impact of Technology on the environment, Environmental Degradation, Sustainable Development, Environmental Education.

- **Ecology & Ecosystems: Introduction**: Ecology- Objectives and Classification, Concepts of an ecosystem- structure & function of ecosystem, Components of ecosystem- Producers, Consumers, Decomposers,

  Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of the following ecosystem:

  a. Forest ecosystem
  b. Grassland ecosystem
  c. Desert ecosystem
  d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) Bio-Geo-Chemical Cycles- Hydrological Cycle, Carbon cycle, Oxygen Cycle, Nitrogen Cycle, Sulfur Cycle

- **Environmental Pollution**:

  Air Pollution: Composition of air, Structure of atmosphere, Ambient Air Quality Standards, Classification of air pollutants, Sources of common air pollutants like SPM, SO2, NOX – Natural & Anthropogenic Sources, Effects of common air pollutants, Air Pollution Episodes

  Noise Pollution: Introduction, Sound and Noise measurements, Sources of Noise Pollution, Ambient noise levels, Effects of noise pollution, Noise pollution control measures.

  Water Pollution: Introduction – Water Quality Standards, Sources of Water Pollution, Classification of water pollutants, Effects of water pollutants, Eutrophication, Water Pollution Episodes

  Current Environmental Global Issues: Global Warming and Green Houses Effect, Acid Rain, Depletion of Ozone Layer

- **Energy Resources**: Renewable &Nonrenewable Resources: Renewable Resources, Nonrenewable Resources, Destruction versus Conservation.

  Energy Resources: Energy Resources - Indian Scenario , Conventional Energy Sources & its problems, non-conventional energy sources- Advantages and its Limitations.

UNIT-2

- **Types of Disaster Introduction**, Types of Natural Disasters, Accidental Disasters, Impact of Disasters on Trade and International Trade.

- **Natural Disasters**: Introduction, Earthquakes, Hurricanes, Tornadoes, Floods, Drought, Tsunami, Volcanoes, Cyclones and Storms, Forest Fires, Severe Heat Waves, Landslides and Avalanches, Epidemics and Insect Infestations

- **Technological and Social Disasters**: Introduction, Types of Technological Hazards, Hazardous Materials, Social Disasters, Political and Crowd Disasters,War and Terrorism.

- **Disaster Management**: Components of Disaster Management, Government's Role in Disaster Management through Control of Information, Actors in Disaster Management, Organizing Relief measures at National and Local Level, Psychological Issues, Carrying Out Rehabilitation Work, Government Response in Disaster
  .

Course Learning Outcomes (CLOs):

CLO-1 Understand the natural environment and its relationships with human activities.

CLO-2 Characterize and analyze human impacts on the environment.

CLO-3 Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems

CLO-4 Capacity to integrate knowledge and to analyse, evaluate and manage the different public health aspects of disaster events at a local and global levels

CLO-5 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 future scenarios.

Text books:

- Basics of Environmental Studies by Dr. N. S. Varandani, Books India Publications
- Disaster Management by MukeshDhunna, Vayu Education of India, Delhi Publication

Reference books:

- Environmental Studies by R. Rajagopalan, Oxford University Press Publication
- Environmental Science by Richard T Wright & Bernard J Nebel, Prentice Hall India Publication
- Environmental Science by Daniel B Botkin& Edward A Keller, Wiley Publications

Online links for study & reference materials:

http://www.jnkvv.org/PDF/210420201313252042018l1.pdf

Assessment method: (Continuous Internal Assessment = 40% , Final Examination = 60%)

Assessment -1	- 05%
Assessment-2	- 05%
Assessment-3(Midexam)	- 20%
Assessment-3	- 05%
Assessment-4	- 05%
Total Internal Assessment	**- 40%**

Course Code: ATUG-308 **Course Name: Statistical Methods**
Course Credit Hour: 2 Hr **Total Contact Hour:** 20 hours

Course Objective:

- The course aims to provide the fundamental knowledge of statistics commonly used in Agricultural studies. It enables to analyze the data scientifically and carry out the experiments in scientific way

Course Description:

- This course introduces the fundamental concept of Statistical methods and imparts the basic knowledge of statistics viz; graphical presentation; types of data; median ; mode; geometric mode ; standard deviation; Application of One Sample t-test. Application of Two Sample Fisher's t-test. Chi-Square test of Goodness of Fit.

Course Contents:

Unit 1(4 Hours)

Introduction to Statistics and its Applications in Agriculture, Concept of primary & secondary sources of data, Classification- objectives & types of classification, Construction of frequency distribution, Tabulation- meaning advantages & types of tabulation.

Unit 2(4 Hours)

Diagrammatic presentation- meaning , importance & rules for constructing diagrams, types of diagrams- bar, square, pie diagrams, cartograms, Graphical presentation- histogram, frequency curve, ogive.

Unit 3(4 Hours)

Measures of central tendency- meaning, objectives, characteristics of a good average, arithmetic mean, median, quartiles, mode & their applications.

Unit 4(4 Hours)

Measures of dispersion- meaning, objectives, characteristics of a good measure of dispersion, types – range, quartile deviation, mean deviation, standard deviation, coefficient of variation & their applications.

Unit 5(4 Hours)

Correlation analysis- meaning importance, types- positive, negative & linear correlation, methods- scatter diagram, Karl Pearson's coefficient of correlation (for ungrouped data), linear regression analysis- meaning utility, regression lines & regression coefficients (for ungrouped data).

Course Learning Outcomes (CLOs):
On completion of the course the students will be

CO-1: Understanding the basic concepts, uses & applications of statistics in agriculture.
CO-2: Understanding, applying & analyzing the concepts of diagrammatic & graphical representation of data.
CO-3: Understanding, applying &analyzing

Text Books:

1. Hand Book of Agricultural Statistics, Shri Ram Singh Chandel,Achal Prakashan Mandir.

Reference Books:

1. Agricultural Statistics. R. Singh, A.K.Sharma and S.P. Singh. Aman Publication.
2. Agricultural Mathematics and Statistics. R. Singh. Rama Publication
3. An Introduction to Statistical Methods. C. B. Gupta. Vikas Publication.

Assessment method: (Continuous Internal Assessment = 40%, Final Examination = 60%)

Assignment -1	- 05%
Assignment -2	- 05%
Assessment-3(Mid-Exam)	- 20%
Assignment-3/Quiz-1	- 05%
Assignment-4	- 05%
Total Internal Assessment	**- 40%**

Course Code: ATUG-309 **Course Name:** Livestock & Poultry Management
Course Credit Hour: 4Hr **Total Contact Hour:** 40 hr

Course Objective:

- The course aims to provide the fundamental knowledge of livestock & Poultry management. It enables to know the students regarding the importance of Livestock & Poultry and also it is one of the alternative for entrepreneurship.

Course Description:

- This course introduces the fundamental concepts of livestock & Poultry management like exotic and indigenous breeds of cattle; sheep; goat & birds. Selection of desired breeds to raise them in particular area and practical use of sustainable agriculture.

Course Contents: Unit

1(8 Hours)

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

Unit 2(8 Hours)

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

Unit 3(8 Hours)

Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry. Improvement of farm animals and poultry.

Unit 4(8 Hours)

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.

Unit 5(8 Hours)

Introduction of livestock and poultry diseases. Prevention (including vaccination schedule) and control of important diseases of livestock and poultry.

Course Learning Outcomes (CLOs):

CLO-1: Develop vocabulary building and basic grammar concepts. CLO-2: Inculcate speaking skills and listening skills.
CLO-3: Develop the writing skills.
CLO-4: Understand technical writing skills.
CLO-5: Demonstrate all skills in presentation and interviews

Text books:

1. Handbook of Agriculture: Indian Council of Agricultural Research, New Delhi.6thedition.

Reference books:

1. Fundamentals of Agriculture-Arun Katyayan- Kushal Publication
2. Agriculture and Live-stock in India, Indian Council of Agricultural Research.
3. Mineral Nutrition of Livestock, CABI By N. F. Suttle Manager of Publications [Government of India], 1939

Assessment method: (Continuous Internal Assessment = 40%, Final Examination = 60%)

Assignment -1	- 05%
Assignment -2	- 05%
Assessment-3(Mid-Exam)	- 20%
Assignment-3/Quiz-1	- 05%
Assignment-4	- 05%
Total Internal Assessment	**- 40%**

B.Sc. (Hons.) Agriculture
IV SEMESTER

S.NO	Course Code	Subject	Sessional Exam			Evaluation Scheme				Credit
						External Exam	PRACTICAL		Subject Total	
			CA	TA	Total		INTERNAL	EXTERNAL		
1	ATUG-401 **(T&P)**	Crop Production Technology –II (Rabi Crops)	20	20	40	60	25	25	150	**2 (1+1)**
2	ATUG-402 **(T&P)**	Production technology for ornamental palnts	20	20	40	60	25	25	150	**3(2+1)**
3	ATUG-403 (T&P)	Renewable Energy and Green Technology	20	20	40	60	25	25	150	**3(2+1)**
4	ATUG-404 (T)	Problematic Soils and their Management	20	20	40	60	25	25	100	**2 (1+1)**
5	ATUG-405 (T&P)	Production technology for Fruit and plantation crop	20	20	40	60	25	25	150	**2(1+1)**
6	ATUG-406 (T&P)	Principles of seed technology	20	20	40	60	25	25	150	**3 (2+1)**
7	ATUG-407 (T)	Farming system and sustainable agriculture	20	20	40	60	-	-	100	**2(2+1)**
8	ATUG-408 (T&P)	Agriculture marketing trade and prices	20	20	40	60	25	25	150	**4 (3+1)**
9	ATUG-409 (T&P)	Introductory Agro-meteorology & climate change	20	20	40	60	25	25	150	2(1+1)
10	ATUG-410 A	Elective Course BIOPESTICIDES & BIOFERTILIZERS	20	20	40	60	25	25	150	3(3+1)
	ATUG-410 B	Protected Cultivation								
	ATUG-410 C	Micro Propagation Technologies **Student has to Select any one Elective course among three**								
	(T+P) : THEORY + PRACTICAL **(T): THEORY ONLY**									**23**

Course Code : ATUG- 401 **Course Name :** Crop production tech-II(rabi crop)

Course Credit Hour : 3hr **Total Contact Hour : 60** hr

Course Objective :

- To know the Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of rabi crops
- Identify weeds in rabi season crops
- To understand the yield attributing characters of kharif crops an d Estimate yield of Rabi crops.

Course Description :

- To know the crops with relation to growing environment and develop competency in field crop production by knowing scientific technology

Course Contents :

Unit-1 Importance, origin, distribution, climate, varieties improved, agronomic practices managing and irrigation, plant protection, harvesting and processing of the following crops under various agro climatic conditions of U.P. Cereal crops- Wheat, Barley
Unit-2 Oilseed Crop- Rapeseed and mustrad Linseed, Sunflower
Unit-3 Pulse Crops- Chickpea,Field pea, Lentil.
Unit-4 Medicinal and aromatic crops- Lemon grass, Mentha, Citronella
Unit-5 Sugar Crop-Sugarcane
Unit-6 Forage Crops-Berseem Lucerne, Oat

Course Learning Outcomes(CLOs) :

CLO-1 : Understand the cropping system.
CLO-2: Understand the concept of agro-forestry.
CLO-3: Understand the concept of integrated farming.
CLO-4: Identify growing media.
CLO-5: Identify various type of fertilizers.
CLO-6: Identify various type of pesticides

Text books :

Rajendra Prasad. Textbook of Field Crops Production

Singh, Chhidda; Singh P. and Singh, R. 2003. Modern Techniques of Raising Field Crops, Oxford & IBH Publishing Co., New Delhi.

Reference books :

Field crops production-Food grain crops Volume I Dr. Rajendra Prasad

Field crops production-Commercial crops Volume II Dr. Rajendra Prasad

Online links for study & reference materials :

Course Code: ATUG-402 **Course Name:** Production technology for ornamental crops, MAP and lanscaping

Course Credit Hour: 1 Hr **Total Contact Hour:** 10 hours

Course Objective:

The objective of this course is to make students to understand about importance of ornamental, medicinal and aromatic plants. Students will learn about the production technology, packaging and processing of these plants.

Course Description:

This course will teach students the practical hands on training to grow different plant species that have medicinal, ornamental, aromatic, value. They will learn about the scientific cultivation methods that can be used for the commercial production of these plants.

Course Contents:

Unit-1 (3 hours)

Importance and scope of ornamental crops, medicinal and aromatic plants and landscaping. Principles of landscaping. Landscape uses of trees, shrubs and climbers.

Unit-2 (3 hours)

Production technology of important cut flowers like rose, gerbera, carnation, lilium and orchids under protected conditions and gladiolus, tuberose, chrysanthemum under open conditions. Package of practices for loose flowers like marigold and jasmine under open conditions.

Unit-3 (4 hours)

Production technology of important medicinal plants like ashwagandha, asparagus, aloe, costus, Cinnamomum, periwinkle, isabgol and aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, rose, geranium, vetiver. Processing and value addition in ornamental crops and MAPs produce.

Course Learning Outcomes (CLOs):

On completion of the course the students will be

CO-1:	To understand the importance and scope of Ornamental Crops, MAPs and Landscaping.
CO-2:	To learn about production technology of cut flower, loose flower, medicinal and aromatic plants.
CO-3:	To learn the uses of tree, shrub, climbers, potted plants in landscaping, processing and value addition in ornamental plants and MAPs produce.

Text Books:

P. Muthukumar and R. Selvakumar. Glaustas Horticulture. New Vishal Publication.

Reference Books:

S. N. Gupta (2010). Instant Horticulture. Jain Brothers. ISBN 978-8183601153.

Course Code: ATUG 403 **Course Name:** Renewable Energy &

Green Technology

Course Credit Hour: 3hr **Total Contact Hour:** 32hr

Course Objectives:

- To impart the knowledge about green technology, renewable energy sources, and their utilization in Agriculture

Course Description:

- This course provides a stair-step introduction of energy sources, biogas plants and Gasifiers, biogas, bio alcohol, biodiesel and bio oil production and their utilization as bio energy resource, Introduction of solar energy, 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.

Course Contents:

Unit-I **(12 Hours)**

Classification of energy sources, 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

Unit-II **(12 Hours)**

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

Unit-III **(8 Hours)**

Introduction of wind energy and their application, Availability of bio mass and their application in different places

Course Learning Outcomes (CLOs):

CLO-1: Understand the basic concepts of the renewable energy resources and familiarization of biomass its application practically.

CLO-2: Acquaint with the biogas, biodiesel and bio-oil production

CLO-3: Understanding of solar energy gadgets and their utilization

Text books:

Green Technology: An A-to-Z Guide (The SAGE Reference Series on Green Society: Toward a Sustainable Future-Series Editor: Paul Robbins Book 10) 1st Edition, Kindle Edition: Dustin R. Mulvaney

Renewable Energy: Power for a Sustainable Future Book by Godfrey Boyle 3rd Edition.

Reference books:

Renewable Energy: Power for a Sustainable Future Book by Godfrey Boyle 3rd Edition.

Online links for study & reference materials:

https://learnengineering.in/renewable-energy-books/

Course Code : ATUG-404 **Course Name :** Problematic soils and their management

Course Credit Hour : 2hr **Total Contact Hour :** 40hr

Course Objective :

- To introduce students to problematic soils, identify processes resulting in deterioration of soil physical and chemical properties.
- To identify the problem of soil and different reclamation methods require to improve the soil health.

Course Description :

The aim of this course is to introduce the students to the factors that are affecting soil quality and its health. Students will be introduced various reasons that are causing deterioration of soil health and methods to manage damaged soil. Students will understand the quality standards for use of irrigation water in agricultural fields. Role of remote sensing and GIS in diagnosis of soil problem will be explained. This course will help to apply scientific knowledge to solve various soil problems.

Course Contents :

Soil quality and health, Distribution of Waste land and problem soils in India. Their categorization based on properties. Reclamation and management of Saline and sodic soils, Acid soils, Acid Sulphate soils, Eroded and Compacted soils, Flooded soils, Polluted soils. Irrigation water – quality and standards, utilization of saline water in agriculture. Remote sensing and GIS in diagnosis and management of problem soils.

Multipurpose tree species, bio remediation through MPTs of soils, land capability and classification, land suitability classification. Problematic soils under different Agro-ecosystems.

Course Learning Outcomes(CLOs) :

CLO-1 : Students will learn about the identification of problem soil and associated problems.

CLO-2 : To learn different methods to improve soil fertility, that necessary to improve the yield.

CLO-3 : Students could explain the role of multipurpose trees in bioremediation.

Text books :

R. R. Agarwal, J. S. P. Yadav and R. N. Gupta (1982). Saline Alkali soils of India, ICAR, New Delhi.

D. K. Das (2019). Problematic soils and their management. Kalyani Publishers, ISBN : 9789353592769.

Reference books :

L. L. Somani (2019). Textbook of Problematic Soils and their Management, ATPA, ISBN: 9788183214995, 9788183214995.

Course Code :ATUG-405 **Course Name :**Production Technology for Fruit and Plantation Crops

Course Credit Hour :2h **Total Contact Hour : 30** hr

Course Objective :

- To provide technical and scientific cultivation practices of different fruit and plantation crops.
- To provide field knowledge and acquaint the students with practical field
- To provide technical and scientific cultivation practices of different fruit and plantation crops.

Course Description :

- To teach about basic concepts and fundamental aspects of production technology of fruits and plantation crops
- To impart skills to design nursery lay out, orchard establishment, vegetative propagation techniques, care and maintenance of important fruits and plantation crops

Course Contents :

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

Unit-2 Production technologies for the cultivation of major fruits-mango, banana, citrus,

grape, guava, litchi, papaya, sapota, apple, pear, peach, walnut, almond

Unit-3 Minor fruits- date, ber, pineapple, pomegranate, jackfruit, strawberry, Unit-4 plantation crops-coconut, arecanut, cashew, tea, coffee & rubber.

Course Learning Outcomes(CLOs) :

CLO-1 :To know importance of different fruit crops and plantation crop

CLO-2 :To Understand the scientific cultivation methods of different fruit crops likemango,banana, citrus, grape, guava, litchi, papaya, sapota, apple, pear, peach, walnut, almond

CLO-3 :ToUnderstand the scientific cultivation methods ofMinor fruits- date, ber, pineapple, pomegranate, jackfruit, strawberry

CLO-4 :To Understand the scientific cultivation methodsof plantation crops-coconut, arecanut, cashew, tea, coffee & rubber.

Text books :

1. Amar Singh. Fruit Physiology and Production
2. R.S. Singh. Diseases of Fruit Crops
3. K.L. Chadha. Handbook of Horticulture

Reference books :

1. Chattopadhya, P. K. Year.Text Book on Pomology (Fundamentals of Fruit Growing). Kalyani Publishers, Ludhiana.
2. Bijendra Singh. 2012. Horticulture at a Glance. Kalyani Publishers, Ludhiana
3. Parthasarathy, V. A., P.K.Chattopadhyay and Bose, T.K. 2006. Plantation Crops. Vol I and II. Parthasankarbasu Naya Udyog, Kolkata.

Course Code: ATUG 406 **Course Name:** Principles of seed Technology

Course Credit Hour: 4hr **Total Contact Hour:** 40hr

Course Objectives:

- To strengthen undergraduate student in the field of seed science & technology by learning Foundation and certified seed production of important cereals, pulses, oilseeds, fodder and vegetables.
- To initiate basic research related to genetic purity, seed health and seed storage, Deterioration Seed Act and Seed Act enforcement, Seed certification and Private and public sectors and their production and marketing strategies.

Course Description:

- This course is designed to provide upper level undergraduate and beginning graduate students with a basic knowledge of seeds and their role in agriculture. Principles followed during seed production, conditioning, testing, and marketing. The seed laws, regulations, and organizations relating to seed distribution and uses

Course Contents:

Unit-I **(10 Hours)**

Seed and seed technology: introduction, definition and importance, Deterioration causes of crop varieties and their control; Maintenance of genetic purity during seed production, seed quality; Definition, Characters of good quality seed, different classes of seed. Foundation and certified seed production of important cereals, pulses, oilseeds, fodder and vegetables.

Unit-II **(12 Hours)**

Seed certification, phases of certification, procedure for seed certification, field inspection, Seed Act and Seed Act enforcement, Duty and powers of seed inspector, offences and penalties, Seeds Control Order 1983, Varietal Identification through Grow Out Test and Electrophoresis, Molecular and Biochemical test, Detection of genetically modified crops, Transgene contamination in non-GM crops, GM crops and organic seed production

Unit-III **(10 Hours)**

Seed drying, processing and their steps, seed testing for quality assessment, seed treatment, its importance, method of application and seed packing, Seed storage; general principles, stages and factors affecting seed longevity during storage, Measures for pest and disease control during storage.

Unit-IV **(8 Hours)**

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.

Course Learning Outcomes (CLOs):

CLO-1: Develop an understanding of seed development, germination, vigour, deterioration and the relationship between laboratory tests and field performance.

CLO-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.

CLO-3: Understand seed increase systems, seed testing and the laws and regulations related to marketing high quality seed.

CLO-4: Know about the hybrid seed production and seed certification with production and marketing strategies.

.

Text books:

Seed technology-R.L. Agarwal

Principles of seed technology- G.M. Kulkarini

Reference books:

Principles of seed science & technology-L.O. Copeland & M. B. Kc Donald

Structure development & reproduction in Angiosperms- V. Singh, P. C. Pande & D. K. Jain

Online links for study & reference materials:

https://onlinecourses.swayam2.ac.in

Assessment method: (Continuous Internal Assessment = 40%, Final Examination = 60%)

Assessment-1	- 05%
Assessment-2	- 05%
Assessment-3 (Mid-exam)	- 20%
Assessment-3	- 05%
Assessment-4	- 05%
Total Internal Assessment	**- 40%**

Course Code : ATUG-407 **Course Name :** Farming system and

sustainable agriculture

Course Credit Hour : 1hr **Total Contact Hour :** 40hr

Course Objective :

- To acquaint the students from agricultural as well as other disciplines with conventional and alternative agricultural production practices throughout the world and their effect on long-term sustainability and environmental quality.
- To show how agricultural scientists are attempting to minimize agricultural pollution and sustain food production adequate for the world's population.

Course Description :

This course is designed as an introduction to the concepts, types and principles associated with farming systems and sustainable agriculture. Cropping systems, problems and impacts of sustainable agriculture will be discussed with the students. The economic, environmental and social aspects of sustainability in agroecosystems will be addressed. This course includes case studies and field trips to connect principles of sustainable agriculture to local farming systems. The students' interests and goals in sustainable agriculture will also be explored.

Course Contents :

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

Course Learning Outcomes(CLOs) :

CLO-1 : The student will be able to explain the major aspects of agricultural practices and traditions through time.

CLO-2 : The student will be able to explain in general the relationships among culture, economics, politics, science, and agricultural development.

CLO-3 : Students will gain an understanding of the current social, economic and technical challenges and opportunities in sustainable food production.

Text books :

R. K. Nanwal (2019). Farming Systems And Sustainable Agriculture, New India Publishing Agency- Nipa, ISBN: 9789389130089.

A. Zaman (2019). Integrated Farming Systems and Agricultural Sustainability, New India Publishing Agency- Nipa, ISBN: 9789387973725.

Reference books :

S. C. Panda (2016). Cropping System And Sustainable Agriculture, Agrobios, ISBN: 9788177545647, 9788177545647.

Online links for study & reference materials :

https://www.coabnau.in/uploads/1609844393_Agron.5.6.pdf

Course Code : ATUG-408 **Course Name :** Agriculture marketing trade and prices

Course Credit Hour : 3hr **Total Contact Hour :** hr

Course Objective :

- The objective of this course is to provide students with a theoretical and empirical basis for valuating agricultural marketing organization and actors for market performance and public policy decision, and to enable them develop and use the tools of economic theory to analyze issues related to the marketing of agricultural commodities..

Course Description :

- Maximize your business and improve your marketing with this course. Explore innovative and different approaches to improve sales and profit for any agricultural enterprise, on or off farm.

Course Contents :

- Unit-1 Agricultural Marketing: Concepts and definitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation,
- Unit-2 Classification and characteristics of agricultural markets; demand, supply and producer's surplus of agri-commodities: nature and determinants of demand and supply of farm products, producer's surplus – meaning and its types, marketable and marketed surplus, factors affecting marketable surplus of agri-commodities; product life cycle (PLC) and competitive strategies: Meaning and stages in PLC; characteristics of PLC; strategies in different stages of PLC; pricing and promotion strategies: pricing considerations and approaches – cost based and competition based pricing; market promotion – advertising, personal selling, sales promotion and publicity – their meaning and merits & demerits; marketing process and functions.
- Unit-3 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);
- Unit-4 Market functionaries and marketing channels: Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel; number of channel levels; marketing channels for different farm products; Integration, efficiency, costs and price spread: Meaning, definition and types of market integration; marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs; Role of Govt. in agricultural marketing: Public sector institutions- CWC, SWC, FCI, CACP & DMI – their objectives and functions; cooperative marketing in India;
- Unit-5 -Types of risk in marketing; speculation & hedging; an overview of futures trading; Agricultural prices and policy: Meaning and functions of price; administered prices; need for agricultural price policy; Trade: Concept of International Trade and its need, theories of absolute and comparative advantage. Present status and prospects of international trade in agri- commodities; GATT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR.

Course Learning Outcomes(CLOs) :

CLO-1 : To understand about agricultural marketing, market structure.

CLO-2 : To understand about Classification and characteristics of agricultural markets, producer's surplus, product life cycle.

CLO-3 : To gain knowledge about Design strategies for effective market performance.

CLO-4 : To Understand the Use of marketing concepts for analyzing market structure and performance in agriculture and formulate effective agricultural marketing policy.

CLO-5: To understand about the Risk in marketing and Agricultural prices and policy.

Text books :

ES. S. Acharya, Agricultural Marketing In India,Oxford and IBH Publishing, 2004

Reference books :

F. Bailey Norwood and Jayson L. Lusk, Agricultural Marketing and Price Analysis,20018
G.

Course Code: ATUG-409 **Course Name:** Introductory Agro-meteorology & climate change

Course Credit Hour: 2 hr **Total Contact Hour:** 30hr

Course Objective:

- To study about different climatic factors affecting crop growth and development
- Study about different weather aberrations
- Study about climate change, it's cause and impacts

Course Description :

- Write a brief summary indicating how this will be conducted specifying the key topics of the whole course.
- Write about 4 to 5 lines or till 7 lines, if some course description demands.

Course Contents:

UNIT-1 Earth atmosphere its composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze.

UNIT-2 solar radiation Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, longwave and thermal radiation, net radiation, albedo; Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature.

UNIT-3 Energy balance of earth; Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud; Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification; Artificial rainmaking. Monsoon- mechanism and importance in Indian agriculture,

UNIT-4 Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold-wave

UNIT-5 Agriculture and weather relations; Modifications of crop microclimate, climatic normals for crop and livestock production. Weather forecasting- types of weather forecast and their uses. Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture.

Course Learning Outcomes (CLOs):

CLO-1: To Introduce agro meteorology (definitions, aims, scope and importance)

CLO-2: To Understand roles of agro meteorology in agriculture and its relation to other areas of agriculture.

CLO-3: To acquaint with recent developments in agrometeorology with historical developments.

CLO-4: Studies the characteristics, behavior or phenomenon of the atmosphere CLO-5: Studies the changes

of individual weather elements. (such as temperature)

Text books:

Introductory Agro-meteorology & climate change **by B.S Chouhan**

Reference books:

- Fundamentals of Agrometeorology Mahi, G.S. and Kingra, P.K. 2015 Publisher: Kalyani Publishers, New Delhi
- Agrometeorology Reddy, S. R. and Reddy, D.S. 2014 Publisher: Kalyani Publishers New Delhi
- Comprehensive Agrometeorology Mahi, G.S. and Kingra, P.K.
- Introduction to Agriculture and Agrometeorology Reddy, S. R. 2014 Publisher: Kalyani Publishers New Delhi

Online links for study & reference materials :

Web sites: http://www.agrimoon.com/ http://www.agriinfo.in/ eagri.org
http://www.agriglance.com/ http://agritech.tnau.ac.in/

Course Code : ATUG-410 A **Course Name : Biopesticides & Biofertilizer**

Course Credit Hour : 3hr **Total Contact Hour :** 40 hrs

Course Objective :

Understanding the basics of bio-pesticide and bio-fertilizers. Explaining the application of mass production technology of bio-pesticide

Course Description :

Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and biorationales. Botanicals and their uses. Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes.

Course Contents :

Unit 1 **(4 Hours)**

History and concept of biopesticides. Importance, scope and potential of biopesticide. Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and biorationales. Botanicals and their uses.

Unit 2 **(4 Hours)**

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.

Unit 3 **(4 Hours)**

Biofertilizers - Introduction, status and scope. Structure and characteristic features of bacterial biofertilizers- *Azospirillum, Azotobacter, Bacillus, Pseudomonas, Rhizobium* and *Frankia*; Cynobacterial biofertilizers-
Anabaena, *Nostoc*, Hapalosiphon and fungal biofertilizers- AM mycorrhiza and ectomycorhiza.

Unit 4 **(4 Hours)**

Nitrogen fixation -Free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilization and phosphate mobilization, K solubilization. Production technology: Strain selection, sterilization, growth and fermentation,

Unit 5 **(4 Hours)**

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.

Course Outcomes (COs).

CO – 1: Understanding the basics of bio-pesticide and bio-fertilizers
CO – 2: Explaining the application of mass production technology of bio-pesticide
CO – 3: Describing the quality control and marketing of bio-fertilizers

Text Books:

1. Integrated Pest Management. G.S.Dhaliwal and Ramesh Arora. Kalyani **3.** Elements of Entomology: Rajendra Singh. Rastogi Publications

Reference books:

1. **The complete technology book on Bio-fertilizer and organic farming**,NIIR Board of National Institute of Industrial Technology
2. 2 . Principles of Agronomy - S. R. Reddy. Kalyani Publisher.
3. 3.Principles of Agronomy - S. R. Reddy. Kalyani Publisher.

4 .Manures and Fertilizers - K. S. Yawalkar, J.P. Agrawal and S. BokdeAgri- Horticultural Pub. House

Course Code : ATUG-410 B **Course Name : Protected Cultivation**

Course Credit Hour : 3hr **Total Contact Hour :** 40 hrs

Course Objective :

The main objectives of protected cultivation are to protect the crops from harmful temperatures, wind, rain, hail and snow, and from pests, diseases and predators, creating a microclimate that allows for the improvement of their productivity and quality contributing to a better use of resources

Course Description :

Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and biorationales. Botanicals and their uses. Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes.

Course Contents

Unit 1 **(4 Hours**

Protected cultivation- importance and scope, Status of protected cultivation in India and World types of protected structure based on site and climate. Cladding material involved in greenhouse/ poly house.

Unit 2 **(4 Hours)**

Greenhouse design, environment control, artificial lights, Automation. Soil preparation and management, Substrate management. Types of benches and containers.

Unit 3 **(4 Hours)**

Irrigation and fertigation management. Propagation and production of quality planting material of horticultural crops.

Unit 4 **(4 Hours)**

Greenhouse cultivation of important horticultural crops – rose, carnation, chrysanthemum, gerbera, orchid,

anthurium, lilium, tulip, tomato, bell pepper, cucumber, strawberry, pot plants, etc.

Unit 5 **(4 Hours)**

Cultivation of economically important medicinal and aromatic plants. Off-season production of flowers and vegetables. Insect pest and disease management.

Course Outcomes (COs).

On completion of the course the students will be

CO-1:	Understanding importance and scope of protected cultivation.
Understanding greenhouse technology and its application in cultivation of important horticultural crops Analyzing the propagation and production of quality planting material of horticultural crops.	

Text Books

1. Greenhouse Technology and Management, Nicolas Castilla, CABI,

Reference Books

1.Postharvest Management and Value Addition,Ashwai K.Goel, Rajinder Kumar, Satwinder S. Mann Daya Books,

2.Postharvest Technology of Fruits and Vegetables: General concepts and principles L. R. Verma, Dr. V. K. JoshiIndus Publishing Company.

3. Greenhouse Technology and Management, Nicolas Castilla, CABI

Course Code: ATUG-410 C **Course Name: Micro propagation Technologies**

Course Credit Hour: 3hr

Total Contact Hour: 30 hrs

Course Objective :

Understanding the basics of Micro propagation Technologies. Explaining the application of this techology

Course Description :

Stages of micropropagation, Axillary bud proliferation. Somaclonal variation, Cryopreservation

Course Outcomes (COs).

On completion of the course the students will be

CO–1 Understanding the concepts and principles of micropropagation

CO–2 Recognizing the different pathways of plant regeneration under in vitro conditions

CO–3 Applying various micro propagation methods to conserve germplasm and vitro, production of secondary metabolites.

Course Contents :

Unit 1: **(4 Hours)**

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

Unit 2: **(4 Hours)**

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

Unit: 3 **(4 Hours)**

Organogenesis (callus and direct organ formation)

Unit:4 **(4 Hours)**

Somatic embryogenesis, cell suspension cultures

Unit:5 **(4 Hours)**

Production of secondary metabolites , Somaclonal variation, Cryopreservation

Text Books:

1. BasicHorticulture-Jitendra Singh. Kalyani Publisher

Reference Books:

1.Basics of Horticulture by K.V. Peter. New India Publishing Agency, New Delhi

2. Principles of Horticulture by C.R. Adams, M.P. Early. Routledge

3. Terminology of Horticulture by Neeraj Pratap Singh.International Book Distributing Co (IBDC Publishers)

B.Sc. (Hons.) Agriculture
V-SEMESTER

S.NO	Course Code	Subject name	Sessional Exam			Evaluation Scheme				Credit
						External Exam	PRACTICAL		Subject Total	
			CA	TA	Total		INTERNAL	EXTERNAL		
1	ATUG-501	Principles of Integrated Pest and Disease Management	20	20	40	60	25	25	150	
2	ATUG-502	Manures, Fertilizers and Soil Fertility Management	20	20	40	60	25	25	150	
3	ATUG-503	Pests of Crops and Stored Grain and their Management	20	20	40	60	25	25	150	
4	ATUG-504	Diseases of Field and Horticultural Crops and their Management -I	20	20	40	60	25	25	150	
5	ATUG-505	Crop Improvement-I *(Kharif Crops)*	20	20	40	60	25	25	150	
	ATUG-508	Practical Crop Production – I (*Kharif* crops)	20	20	40	60	25	25	150	
9	ATUG-509	Intellectual Property Rights	20	20	40	60	25	25	150	
10	ATUG-510 A	Commercial plant breeding	20	20	40	60	25	25	150	3(2+1)
	ATUG-510 B	Weed Mnagement								
	ATUG-510 C	Hi-tech. Horticulture **Student has to Select any one Elective course among three**								
10	**Total**								**22**	

Course Code : ATUG-501 **Course Name :** Principles of Integrated Pest and Disease Management
Course Credit Hour : 3hr **Total Contact Hour :** 60hr

Course Objective :

- At the end of the semester students will be able to understand:
- What is a pest and categories of Pest?
- IPM and tools of IPM.
- Cultural, Mechanical, Physical, Biological, Microbial and Legislative methods of Pest and Disease Management.
- Chemical Control of Pests

Course Description :

- This subject can help to students to know about pest and damage, how to control pest and what are the methods were useful to prevent insect pest &disease. students can learn different types of symptoms were take place in plant parts. they can know about what is IPM and their use.

Course Contents :

UNIT-1
Introduction, history, importance, concepts, principles and tools of IPM. Economic importance of insect pests, diseases and pest risk analysis.
UNIT-2
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.
Unit-3
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.
Unit- 4
Development and validation of IPM module. Implementation and impact of IPM (IPM module for Insect pest and disease. Safety issues in pesticide uses. Political, social and legal implication of IPM.
Unit-5
Case histories of important IPM programmes. Case histories of important IPM programmes.

Course Learning Outcomes(CLOs) :

CLO-1 : Understand the meaning, concept, categories of pest and diseases
CLO2. Understand Principles of pest management, Components of IPM
CLO3**.** Learn the IPM integration tactics
CLO4. Develop an understanding on Agro-ecosystem analysis
CLO5. Discuss the Successful IPM case

Text books :

Integrated Pest Management: Principles and Practice by Dharam P. Abrol, Uma Shankar CABI

ISBN- 9781786390318
13:
Integrated Pest Management: Current Concepts and Ecological Perspective by Dharam P Abrol ISBN-13: 978-0123985293

Reference books :
Singh, R.S. 2002. Introduction to Principles of Plant Pathology. Oxford & IBH Publishing Co.Pvt. Ltd.,New Delh, ISBN-8120401786, 9788120401785

Online links for study & reference materials :
http://agrimoon.com/insect-ecology-integrated-pest-management-pdf-book/

Course Code: ATUG-502

Course Name: Manures, fertilizers and soil fertility management

Course Credit Hour: 3 **Total Contact Hour: 40 hr**

Course Objective:

- **To know about different manures, fertilizers.**
- **To manage the soil quality**
- **To improve soil health**
- **The relationship between soil fertility and plant health**
- **Goals of a sustainable fertility/soil management program**

Course Description:
Manures, fertilizers and soil fertility management Review Course is designed to provide an overview of the fundamental manure and fertilizers. Genesis, Classification and importance of organic manure show the importance of organic farming. Instructors will use the Fundamentals Performance Objectives (POs) as a guide for discussing topics within each section, but will not go through each objective individually. However, students are encouraged to ask questions regarding specific POs if needed.

Course Contents:

UNIT-1 Classification and importance of organic manures, properties and methods of preparation of bulky manures. Green/leaf manuring. ii. Transformation reactions of organic manures in soil and importance of C:N ratio in rate of decomposition. iii. Integrated nutrient management

UNIT-2 Chemical fertilizers: classification, composition and properties of major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, Complex fertilizers, nano-fertilizers, Soil amendments, v. Fertilizer Storage, Fertilizer Control Order. History of soil fertility and plant nutrition, Criteria of essentiality. Role,

deficiency and toxicity symptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants. Critical levels of different nutrients in soil. Forms of nutrients in soil

UNIT-3 Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients viii. Soil fertility evaluation, Soil testing, plant analysis, rapid plant tissue tests. Indicator plants. ix. Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated condition.

Practical

Introduction of analytical instruments and their principles, calibration and applications, Colorimetry and flame photometry;Estimation of soil available Nitrogen, Phosphorus, Potassium, Ca, Mg, Zn, Fe, Boron.

Course Learning Outcomes (CLOs):

CLO-1: **The students get knowledge about different kind of manures, fertilizers**

CLO-2: **The students will learn how to maintain the soil health.**

CLO-3**The students acquire practical knowledge of nutrient analysis soil.**

Text books:

1. Fundamentals of Soil (1999) by V. N. Sahai
2. Introductory Soil Science (1999) by D. K. Das.

Reference books:

Reference Books

1. Manures and Fertilizes (1992), Seventh Edition by K. S. Yawalkar, J. P. Agarwal and S. Bokde
2. Soil Fertility, theory and practice (1976) by J. S. Kanwar
3. Soil Fertility and Fertilizers (1985) by S.L. Tisdale, W.L. Nelson and J. D. Beaton

Online links for study & reference materials:

- http://www.agriinfo.in/
- http://www.agrimoon.com/

Course Code: ATUG-503 **Course Name: Pests of Crops and Stored Grain and their Management**

Course Credit Hour: 4 Hr **Total Contact Hour:** 45 hours

Course Objective:

The overall objective of this course is to equip the students by the demage caused by different insects of Arthropod group. Major pest problems of stored grains their symptoms nature of demage and symptomology further management practices will also be learned by the students

Course Description:

The course focuses on the 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 scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests of various field crop, vegetable crop, fruit crop and the factor affecting the losses

Course Contents:

Unit-1 **(10 hours)**

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

Unit-2 **(15 hours)**

scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests of various field crop, vegetable crop, fruit crop, plantation crops, ornamental crops, spices and condiments.

Unit-3 **(10 hours)**

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

Unit-1 **(10 hours)**

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

Course Learning Outcomes (CLOs):

On completion of the course the students will be

CO-1: Understanding the classification of different arthropods pests and importance of beneficial insects..
CO-2: Identifying the different insect pest of field and stored grains.
CO-3: Applying various procedures and approaches for insect-pests management

Text Books:

1 Stored Grain Pests and Their Management, B.P. Khare. Kalyani Publisher.

Reference Books:

3. Pests of Stored grains and Their management. M.C. Bhargava, and K.C. Kumawat.
4. Agricultural Pests of South Asia and Their Management. G.S.Dhaliwal and Ramesh Arora. Kalyani Publisher
5. Integrated Pest Management. G.S.Dhaliwal and Ramesh Arora. Kalyani Publisher
6. Principles of Insect Morphology. R. E. Snodgrass. Cornell University Press

Course Code: ATUG-504 **Course Name: Diseases of Field & Horticultural Crops-I**

Course Credit Hour: 4 Hr **Total Contact Hour:** 40 hours

Course Objective:

The overall objective of this course is to provide an environment for students to develop critical thinking on identification of diseases of field crops by studying Symptomology; Epidemiology; survival structures and management of diseases of field and horticultural crops

Course Description:

The course focuses on the study of diseases of field crops & Horticultural crops with special reference to Symptomology; Epidemiology; survival structures and management of diseases of field and horticultural crops. Students are also able to learn the hindi name of the diseases so that they can interact with the farmers and give remedies for their problems of crops

Course Contents:

Unit-1 **(10 hours)**

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;

Unit-2 **(10 hours)**

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.

Unit 3 **(10 hours)**

Horticultural Crops: Guava: wilt and anthracnose; Banana: Panama wilt, bacterial wilt, Sigatoka and bunchy top;Papaya: foot rot, leaf curl and mosaic, Pomegranate: bacterial blight; Cruciferous vegetables: Alternaria leaf spot 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;

Unit-4 **(10 hours)**

Ginger: soft rot; Colocasia: Phytophthora blight; Coconut: wilt and bud rot; Tea: blister blight; Coffee: rust Practical Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory. Field visit for the diagnosis of field problems. Collection and preservation of plant diseased specimens for Herbarium; Note: Students should submit 50 pressed and wellmounted specimens

Course Learning Outcomes (CLOs):

On completion of the course the students will be

CO-1:	To understand the symptomology; etiology; of diseases of field crops.
CO-2:	To understand the symptomology; etiology; of diseases of Horticultural crops.
CO-3:	The students do understand the management of diseases of field & Horticultural crops

Text Books:

1. R. S. Singh (2010). Plant Disease oxford & IBH Publications.

Reference Books:

7. G.N. Agrios (2006). Plant Pathology, Academic Press.

Course Code: ATUG 505 **Course Name:** Crop Improvement II (Rabi Crop)

Course Credit Hour: 3hr **Total Contact Hour:** 30hr

Course Objectives:

- This subject aims to know about techniques, which is used to improve crop and study about hybrids and varieties for yield & how to improve it To know about the Major breeding objectives and procedures and improvement strategies of rabi crops.

Course Description:

- This course is designed to provide upper level undergraduate and students with a basic knowledge of crop improvement in agriculture.

Course Contents:

Unit-I **(6 Hours)**

Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fodder crops and cash crops; vegetable and horticultural crops;

Unit-II **(4 Hours)**

Plant genetic resources, its utilization and conservation,

Unit-III **(12 Hours)**

study of genetics of qualitative and quantitative characters; Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional)

Unit-IV **(8 Hours)**

Hybrid seed production technology of Rabi crops. Ideotype concept and climate resilient crop varieties for future

Course Learning Outcomes (CLOs):

CLO-1: Develop an understanding of Centres of origin and crop diversity in crop.
CLO-2: Understand seed increase systems, seed production in major field crops of rabi season.
CLO-3: This subject is very helpful to know about different techniques like emasculation and hybridization techniques in different crops
CLO-4: Know about Ideotype breeding for future utilization in agriculture
.

Text books:

Crop Breeding and Biotechnology : By HariHar Ram: Kalyani Publication New Delhi

Reference books:

Breeding of Asian Field crops: By D. A. Sleper J.M. Poehlman: Blackwell Publishers

Course Code : ATUG- 508 **Course Name:**Practical Crop Production-I (Kharif Crops)
Course Credit Hour : 2hr **Total Contact Hour : 32** hr

Course Objective :

- To know the Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Kharif crops
- Identify weeds in Kharif season crops
- To understand the yield attributing characters of kharif crops an d Estimate yield of crops.

Course Description :

- To know the crops with relation to growing environment and develop competency in field crop production by knowing scientific technology

Course Contents :

Practical Crop planning, raising field crops in multiple cropping systems: Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.

Course Learning Outcomes(CLOs) :

CLO-1 : Understand the cropping system.
CLO-2: Understand the concept of agro-forestry.
CLO-3: Understand the concept of integrated farming.
CLO-4: Identify growing media.
CLO-5: Identify various type of fertilizers.
CLO-6: Identify various type of pesticides

Text books :

Rajendra Prasad. Textbook of Field Crops Production
Singh, Chhidda; Singh P. and Singh, R. 2003. Modern Techniques of Raising Field Crops, Oxford & IBH Publishing Co., New Delhi.

Reference books :

Field crops production-Food grain crops Volume I Dr. Rajendra Prasad
Field crops production-Commercial crops Volume II Dr. Rajendra Prasad

Online links for study & reference materials :

Assessment method : (Continuous Internal Assessment = 40% , Final Examination = 60%)

Assessment -1	- 05%
Assessment-2	- 05%
Assessment-3(Midexam)	- 20%
Assessment-3	- 05%
Assessment-4	- 05%
Total Internal Assessment	**- 40%**

Course Code: ATUG- 509 **Course Name :** Intellectual Property Rights

Course Credit Hour: 1hours **Total Contact Hour :** 16 h

Course Objective :

- This course is aimed at familiarizing researchers with the nuances of Intellectual
- Property Rights (IPR) so as to help them integrate the IPR process in their research activities.
- IPR internalisation process to help the researchers to set targeted objectives in their research project and also to design and implement their research to clearly differentiate their work vis-a-vis the existing state of knowledge/ prior art.
- To give the Students "hands- on –training" in literature, including patent search
- and documentation of research activities that would aid an IPR expert to draft, apply
- and prosecute IPR applications.
- Research, development and commercialization.
- Facilitate the students to explore career options in IPR.

Course Description :

- This course deals with overall provides a thorough grounding in the field of intellectual property law, including areas such as copyrights, trademarks, patents, trade secrets, the programme also covers emerging issues such as the ownership and licensing of new media content, internet streaming, technology and software, and pharmaceutical patenting and commercialization.

Course Contents :

Theory Introduction and meaning of intellectual property, brief introduction to GATT, WTO, TRIPs and WIPO, Treaties for IPR protection: Madrid protocol, Berne Convention, Budapest treaty, etc. Types of Intellectual Property and legislations covering IPR in India:-Patents, Copyrights, 108 109 Report of the ICAR Fifth Deans' Committee Report of the ICAR Fifth Deans' Committee Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets. Patents Act 1970 and Patent system in India, patentability, process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement, Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database. Origin and history including a brief introduction to UPOV for protection of plant varieties, Protection of plant varieties under UPOV and PPV&FR Act of India, Plant breeders rights, Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights. Traditional knowledge-meaning and rights of TK holders. Convention on Biological Diversity, International treaty on plant genetic resources for food and agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing.

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Course Learning Outcomes(CLOs) :

CLO-1 :. This course will introduce the concept of intellectual property and explain how it creates value..

CLO-2: You will learn about the major forms of intellectual property protection - copyright, trademarks, and patents, as well as alternative forms of intellectual property protection .

CLO-3: You will examines the effect of intellectual property law on the modern economy, and the policy reasons behind providing intellectual property protection. .

CLO-4: You will examines alternative forms of intellectual property protection, and explores the benefits and drawbacks of those alternatives.

Text books :

1.Ganguli Prabuddha Gearing up for Patents…..The Indian Scenario", Universities Press (1998)

2. Ganguli Prabuddha “Intellectual Property Rights--Unleashing the Knowledge Economy”, Tata McGrawHill (2001)
3. Ganguli Prabuddha “Geographical Indications--its evolving contours” accessible in http://iips.nmims.edu/files/2012/05/main_book.pdf (2009)

Reference books :

Fundamentals of patent law: interpretation and scope of protection. By Matthew Fisher. Hart, 2007. (KD1369 .F57x 2007, Library 4 West)

· A Guide for the preparation of patent drawings. USPTO, 2002. (C21.14/2:D79/2, Library 3 East)

· A guide to filing a design patent application. USPTO, 2009. (C 21.14/2:D 46/2009, Library 3 East)

· A guide to filing a utility patent application. USPTO, 2008. (C 21.14/2:UT 4/2008, Library 3 East)

· A Guide to the international registration of marks under the Madrid Agreement and the Madrid Protocol. WIPO, 2004. (K1557 .G85x 2004, Reference, Library 2 East)

Online links for study & reference materials :

https://www.rvskvv.net/images/INTELLECTUAL-PROPERTY-RIGHTS_20.04.2020.pdf

Course Code: ATUG 510 A **Course Name:** Commercial Plant Breeding
Course Credit Hour: 4hr **Total Contact Hour:** 40hr

Course Objectives:

- This subject aims to know about the advances in hybrid seed production of major field crops IPR issue in commercial plant breeding, DUS testing Genetic and Agronomic principles of quality seed production and its characteristics.

Course Description:

- This course examines the Classifications of crops, Hybrid varieties & features, Development of hybrid varieties, Principles of quality seed production of Field and vegetables crops, DUS testing, Variety testing, release and notification major steps in India.

Course Contents:

Unit-I **(10 Hours)**

Types of crops and modes of plant reproduction: Line development and maintenance breeding in self and cross pollinated crops (A/B/R and two line system) for development of hybrids and seed production, Genetic purity test of commercial hybrids.

Unit-II **(12 Hours)**

Advances in hybrid seed production of maize, rice, sorghum, pearl millet, castor, sunflower, cotton pigeon pea, Brassica etc, Quality seed production of vegetable crops under open and protected environment.

Unit-III **(8 Hours)**

Alternative strategies for the development of the line and cultivars: haploid inducer, tissue culture techniques and biotechnological tools.

Unit-IV **(10 Hours)**

IPR issues in commercial plant breeding: DUS testing and registration of varieties under PPV & FR Act Variety testing, release and notification systems in India. Principles and techniques of seed production, types of seeds, quality testing in self and cross pollinated crops

Course Learning Outcomes (CLOs):

CLO-1: Learn classification of crops

CLO-2: Understand exploitation of male sterility utilization in hybrid seed production

CLO-3: Know about advances in hybrid seed production of field and vegetable crops

CLO-4: Study about the fundamentals of IPR, DUS testing Patenting, Plant Breeders and & Farmer's Rights

Text books:

Hybrid Seed Production in Field Crops: Principles and Practices by N. C. Singhal, 2003, Kalyani publication, Delhi
Principles of Seed Technology by P.K. Agrawal, 2002, Oxford
Seed Production of Vegetables. By Prabhakar Singh and B. S. Asati

Reference books:

Principles of Plant Breeding - R.W. Allard

Course Code: ATUG-510 B **Course Name: Weed Management**

Course Credit Hour: 2hr **Total Contact Hour:** 20 hrs

Course Objective :

Identification of weeds and to know the hindi names of weeds. Management of weeds in major field crops

Course Description :

Herbicide classification, concept of adjuvant, surfactant, herbicide formulation and their use. Introduction to mode of action of herbicides and selectivity. Integration of herbicides with non chemical methods of weed management

The Course Outcomes (Cos).

On completion of the course the students will be

CO – 1	Understanding the principles of weed management
CO – 2	Applying different tools and techniques for weed management.

Course Contents :

Unit 1 **(4 Hours)**

Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem. Classification, reproduction and dissemination of weeds.

Unit 2 **(4 Hours)**

Herbicide classification, concept of adjuvant, surfactant, herbicide formulation and their use. Introduction to mode of action of herbicides and selectivity.

Unit 3 **(4 Hours)**

Allelopathy and its application for weed management. Bio-herbicides and their application in agriculture.

Unit 4 **(4 Hours)**

Concept of herbicide mixture and utility in agriculture. Herbicide compatibility with agro-chemicals and their application.

Unit 5 **(4 Hours)**

Integration of herbicides with non chemical methods of weed management. Herbicide Resistance and its management.

Text books:

1. Handbook of Agriculture: Indian Council of Agricultural Research, New Delhi

Reference books:

1.Principles of Agronomy - S. R. Reddy. Kalyani Publisher
2.Manures and Fertilizers -K. S.Yawalkar, J.P. Agrawal and S. Bokde Agri-Horticultural Pub. House
3.Fundamentals of Agronomy Gopal Chandra De. Oxford and IBH Publishing Co. PVT. LTD.

Course Code: ATUG-510 C **Course Name: Hi-tech. Horticulture**

Course Credit Hour: 2hr **Total Contact Hour:** 20 hrs

Course Objective :

Importance of Hi-tech. Horticulture in Modern Agriculture and its application in new world of Agriculture.

Course Description :

Introduction & importance; Nursery management and mechanization; micro propagation of horticultural crops; Modern field preparation. High density orcharding, Components of precision farming: Remote sensing, Geographical Information System (GIS),

Course Outcomes (COs).

On completion of the course the students will be

CO – 1 Understanding the importance of Hi-tech Horticulture and protected cultivation.
CO – 2 Describing the Differential Geo-positioning System (DGPS). .

– 3 Applying the high density orcharding, precision farming and micro propagation in horticultural crops

Course Content

Unit 1 **(4 Hours)**

Introduction & importance; Nursery management and mechanization; micro propagation of horticultural crops; Modern field preparation and planting methods,

Unit 2 **(4 Hours)**

Protected cultivation: advantages, controlled conditions, method and techniques, Micro irrigation systems and its components; EC, pH based fertilizer scheduling, canopy management,

Unit 3 **(4 Hours)**

High density orcharding, Components of precision farming: Remote sensing, Geographical Information System (GIS),

Unit 4 **(4 Hours)**

Differential Geo-positioning System (DGPS), Variable Rate applicator (VRA),

Unit 5 **(4 Hours)**

Application of precision farming in horticultural crops (fruits, vegetables and ornamental crops); mechanized harvesting of produce.

Text Books:

1. BasicHorticulture-Jitendra Singh. Kalyani Publisher

Reference Books:

1.Basics of Horticulture by K.V. Peter. New India Publishing Agency, New Delhi
2. Principles of Horticulture by C.R. Adams, M.P. Early. Routledge
3. Terminology of Horticulture by Neeraj Pratap Singh.International Book Distributing Co (IBDC Publishers)

B.Sc. (Hons.) Agriculture
VIth - SEMESTER

S.NO	Course Code	Subject	Sessional Exam			Evaluation Scheme				Credit
			CA	TA	Total	External Exam	PRACTICAL		Subject Total	
							INTERNAL	EXTERNAL		
1	ATUG-601 (T+P)	Rainfed Agriculture & Watershed Management	20	20	40	60	25	25	150	2 (1+1)
2	ATUG-602 (T+P)	Protected Cultivation and Secondary Agriculture	20	20	40	60	25	25	150	2 (1+1)
3	ATUG-603 (T+P)	Diseases of Field and Horticultural Crops and their Management-II	20	20	40	60	25	25	150	3 (2+1)
4	ATUG-604 (T+P)	Post-harvest Management and Value Addition of Fruits and Vegetables	20	20	40	60	25	25	100	2 (1+1)
5	ATUG-605 (T+P)	Management of Beneficial Insects	20	20	40	60	25	25	150	2 (1+1)
6	ATUG-606 (T+P)	Crop Improvement-II *(Rabi crops)*	20	20	40	60	25	25	150	2 (1+1)
7	ATUG-607 (P)	Practical Crop Production –II (*Rabi* crops)	20	20	40	60	-	-	100	2 (0+2)
8	ATUG-608 (T+P)	Principles of Organic Farming	20	20	40	60	25	25	150	2 (1+1)
9	ATUG-609 A	Agro-Chemicals	20	20	40	60	25	25	150	3(2+1)
	ATUG-609 B	LandScaping								
	ATUG-609 C	Agricultural Journalism **Student has to Select any one Elective course among three**								
	(T+P) : THEORY + PRACTICAL **(T): THEORY ONLY**									**19**

Course Code: ATUG-601

Course Name: Rainfed Agriculture and Watershed Management

Course Credit Hour: 2 Total Contact Hour: 20 hr

Course Objective:

- Students learn basic knowledge of rain fed 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.

Course Description: History of rainfed agriculture & watershed in India Review Course is designed to provide an over. basic knowledge of rain fed agriculture and water shed management.Instructors will use the Fundamentals Performance Objectives (POs) as a guide for discussing topics within each section, but will not go through each objective individually. However, students are encouraged to ask questions regarding specific POs if needed.

Course Contents:

UNIT-1 Introduction, types, History of Rainfed Agriculture in India. Problems and prospects of Rainfed Agriculture in India. Soil and climatic conditions prevalent in rainfed areas. Soil erosion; water and wind, Soil and water conservation techniques. Types, effect of water deficit on physiomorphological characteristics of the plants

UNIT-2 Crop adaptation and mitigation to drought. 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. History of watershed in India, Concept, objective, principles and components and Factors affecting Watershed Management

Practical syllabus:
Studies on climate classification, studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons. Studies on cropping pattern of different dry land areas in the country and demarcation of dry land area on map of India. Interpretation of meteorological data and scheduling of supplemental irrigation on the basis of evapo-transpiration demand of crops. Critical analysis of rainfall and possible drought period in the country, effective rainfall and its calculation. Studies on cultural practices viz; mulching, plant density, depth of sowing, thinning and leaf removal for mitigating moisture stress. Characterisation and delineation of model watershed. Field demonstration on soil & moisture conservation measures. Field demonstration on construction of water harvesting structures. Visit to rainfed research station/watershed.

Course Learning Outcomes (CLOs):

CLO-1: Student can able to understand about rainfed agriculture and its introduction, problem and prospects in India.

CLO-2: Rain fed agriculture is used to describe farming practices that rely on rainfall for water.

CLO-3: Student can able to understand objective, principles and component of watershed management .

CLO-4: Conservation of soil by adopting latest soil conservation techniques will help in obtaining higher production of Rainfed crops.

Text books:

1. Handbook of Agriculture, ICAR, New Delhi
2. Suresh, 2016, Soil and Water Conservation Engineering, New Delhi

Reference books:

1. Principles of Agronomy by SR Reddy
2. Rainfed Agriculture and watershed Management by Rayees Ahmad Shah, 2017

Online links for study & reference materials:

- http://www.agriinfo.in/
- http://agriinfo.in/agronomy/42/

Course Code: ATUG 602 **Course Name:** Protected Cultivation and secondary Agriculture
Course Credit Hour: 3hr **Total Contact Hour:** 30hr

Course Objectives:

- This subject imparts knowledge to the students about green house technology Planning and design of greenhouses irrigation system Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation, Drying and dehydration and Material handling equipments.

Course Description:

- This course is designed to provide basic knowledge of engineering of green house technology designing and handling of various equipments used in agricultural sciences

Course Contents:

Unit-I **(10 Hours)**

Green house technology: Introduction, Types of Green Houses; Plant response to Green house environment, Planning and design of greenhouses, Design criteria of green house for cooling and heating purposes, Materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses,

Unit-II **(8 Hours)**

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

Unit-III **(8 Hours)**

Drying and dehydration; moisture measurement, EMC, drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, re-circulatory dryer and solar dryer)

Unit-IV **(4 Hours)**

Material handling equipment; conveyer and elevators, their principle, working and selection

Course Learning Outcomes (CLOs):

CLO-1: Develop an understanding about the green house technology.
CLO-2: Acquaint the students about important engineering properties of agricultural crops
CLO-3: Understand drying and dehydration techniques in different crops
CLO-4: Know about Material handling equipment and their working principles

.

Text books:

Green House Technology & Management by K. Radha Manohar (2000) C. Igathinathane B.S. Publications

Reference books:

Emerging Trends in PHT and Utilization of Plant Food by N Khetarpaul et al(2003) Agrotech Publishing Academy, Udaipur
Green House management by L R Taft (1997) Biotech Books, Delhi

Course Code: ATUG-603 **Course Name: Diseases of Field & Horticultural Crops-II**

Course Credit Hour: 3 Hr **Total Contact Hour:** 40 hours

Course Objective:

The overall objective of this course is to provide an environment for students to develop critical thinking on identification of diseases of field crops by studying Symptomology; Epidemiology; survival structures and management of diseases of field and horticultural crops

Course Description:

The course focuses on the study of diseases of field crops & Horticultural crops with special reference to Symptomology; Epidemiology; survival structures and management of diseases of field and horticultural crops. Students are also able to learn the hindi name of the diseases so that they can interact with the farmers and give remedies for their problems of crops

Course Contents:

Unit-1 **(10 hours)**

Symptoms, etiology, disease cycle and management of following diseases: Field Crops: Wheat: rusts, loose smut, karnal bunt, powdery mildew, alternaria blight, and ear cockle; Sugarcane: red rot, smut, wilt, grassy shoot, ratoon stunting and Pokkah Boeng;

Unit-2 **(10 hours)**

Sunflower: Sclerotinia stem rot and Alternaria blight; Mustard: Alternaria blight, white rust, downy mildew and Sclerotinia stem rot; Gram: wilt, grey mould and Ascochyta blight; Lentil: rust and wilt; Cotton: anthracnose, vascular wilt, and black arm; Pea: downy mildew, powdery mildew and rust

Unit 3 **(10 hours)**

Horticultural Crops: Mango: anthracnose, malformation, bacterial blight and powdery mildew; Citrus: canker and gummosis; Grape vine: downy mildew, Powdery mildew and anthracnose; Apple: scab, powdery mildew, fire blight and crown gall; Peach: leaf curl.

Unit-4 **(10 hours)**

Horticultural Crops: Ginger: soft rot; Colocasia: Phytophthora blight; Coconut: wilt and bud rot; Tea: blister blight; Coffee: rust Practical Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory. Field visit for the diagnosis of field problems. Collection and preservation of plant diseased specimens for Herbarium; Note: Students should submit 50 pressed and wellmounted specimens. Strawberry: leaf spot Potato: early and late blight, black scurf, leaf roll, and mosaic;

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

Course Learning Outcomes (CLOs):

On completion of the course the students will be

CO-1: To understand the symptomology; etiology; of diseases of field crops.
CO-2: To understand the symptomology; etiology; of diseases of Horticultural crops.
CO-3: The students do understand the management of diseases of field & Horticultural crops

Text Books:

1. R. S. Singh (2010). Plant Disease oxford & IBH Publications.

Reference Books:

8. G.N. Agrios (2006). Plant Pathology, Academic Press.

Course Code : ATUG- 604 **Course Name :** Post-harvest Management and Value Addition of Fruits and Vegetables

Course Credit Hour : 2hours **Total Contact Hour :** 32 h

Course Objective :

- The students are expected to gain knowledge on various management technologies on pre- harvest and post harvest of fruits and vegetables. Students are also expected to gain knowledge on conventional and modern packaging methods.

Course Description :

- This course deals with overall post harvest management of fruits and vegetables from farm to fork.

Course Contents :

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

Course Learning Outcomes(CLOs) :

CLO-1 : Students will acquire knowledge on post harvest management tools and novel paclkaging techniques.
CLO-2: Students learn the pre and post harvest factors affecting the vagetables and fruits.
CLO-3: To Study the value addition and methods of preservation.
CLO-4: To gain the knowledge of Drying, Dehydration, canning, of fruits and vegetables
CLO-5: Students learn the Concept and methods of canning process.

Text books :

Post-Harvest Management and Processing of Fruits and Vegetables by N S Rathore (Author), G K Mathur (Author), S S Chasta (Author)

Fruit And Vegetable Preservation Principles And Practices Revised And Enlarged 3Ed (Pb 2019) Paperback – 1 January 2019

by Srivastava (Author)

Reference books :

Postharvest Management and Value Addition

by Ashwani K. Goel (Author), Rajinder Kumar (Author), Satwinder S. Mann (Author)

Online links for study & reference materials :

https://agrimoon.com/post-harvest-management-value-addition-of-fruits-vegetable-pdf

http://ecoursesonline.iasri.res.in/course/view.php?id=164

Course Code: ATUG-605 **Course Name:** Management of Beneficial Insects **Course Credit Hour:** 4Hr **Total Contact Hour:** 40 hr

Course Objective:

- The course entitled "Pest of Horticultural crops and their Management and beneficial insects" has been designed with a primary objective of imparting adequate knowledge to students, both in theory and practice, to diagnose a variety of horticultural crop problems related to insect and non insect pests, to comprehend their life histories and damages and to be able to recommend management strategies

.

Course Description:

- Detailed information has been provided on all major pests of crops as regards their taxonomic position, distribution, host range, life history, nature and symptoms of damage, seasonal abundance and their management. However, for minor pests their taxonomic position, nature and symptoms of damage and management have been covered with additional information wherever necessary. Major and minor pests have been differentiated by their text format.

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Course Contents:

UNIT I: Importance of beneficial Insects, Beekeeping, pollinating plant and their cycle, bee biology, species of honey bees, commercial methods of rearing, equipment used, seasonal management, bee enemies and diseases. Bee pasturage, bee foraging and communication. Division and uniting of honey bee boxes. Toxicity of pesticides to honey bees.

UNIT II: Types of silkworm, voltinism and biology of silkworm. Mulberry/castor cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Rearing and mounting larvae and harvesting of cocoons. Pest and diseases of silkworm and management. Rearing appliances of mulberry silkworm and methods of disinfection.

UNIT III: Species of lac insect, morphology, biology, and host plant, lac production – seed lac, button lac, shellac, lac- products. Enemies of lac insects.

UNIT IV: Identification of major parasitoids and predators commonly being used in biological control. Insect orders bearing predators and parasitoids used in pest control and their mass multiplication techniques.

Important species of pollinator, weed killers and scavengers with their importance

Course Learning Outcomes (CLOs):

CLO-1: identify the key pest insects of the major horticultural crops and small fruit crops;
CLO-2: understand the pest complexes of the agro-ecosystems; have a broad idea of chemical ecology and tritrophic interaction amongst host plants,.
CLO-3: pests and their natural enemies; plan a monitoring program for pest insects
CLO-4: link sustainable agriculture with pest control
CLO-5: how to improve economic values of plants while defending and improving the environment

Text books:

1. Beneficial insects - David V. Alford
2. Insect ecology and integrated pest management including beneficial insects. TANU ICAR

Reference books:

1. Ecological based Paste management
2. Encyclopedia of Paste management - David Pimentel,

Total Internal Assessment - 40%

Course Code: ATUG 606 **Course Name:** Crop Improvement II (Rabi Crop)
Course Credit Hour: 3hr **Total Contact Hour:** 30hr

Course Objectives:

- This subject aims to know about techniques, which is used to improve crop and study about hybrids and varieties for yield & how to improve it.
- To know about the Major breeding objectives, procedures and improvement strategies in kharif crops.

Course Description:

- This course is designed to provide upper level undergraduate and students with a basic knowledge of plant breeding application their role in crop improvement in agriculture.

Course Contents:

Unit-I **(6 Hours)**

Origin, geographical distribution, economic importance, soil and climatic requirements,

varieties, cultural practices and yield of *Rabi* crops; cereals ‑wheat and barley

Unit-II **(10 Hours)**

Origin, geographical distribution, economic importance, soil and climatic requirements,

varieties,, pulses-chickpea, lentil, peas, oilseeds-rapeseed, mustard and sunflower;

Unit-III **(8 Hours)**

Origin, geographical distribution, economic importance, soil and climatic requirements,

varieties, sugar crops-sugarcane; medicinal and aromatic crops-mentha, lemon grass and citronella,

Unit-IV **(6 Hours)**

Origin, geographical distribution, economic importance, soil and climatic requirements,

varieties,Forage crops-berseem, lucerne and oat

Course Learning Outcomes (CLOs):

CLO-1: Develop an understanding of Centres of origin and crop diversity in crop.
CLO-2: Acquaint the students about seed increase systems, seed production in major field crops.
CLO-3: This subject is very helpful to know about different techniques like emasculation and hybridization techniques in different kharif crops.
CLO-4: Know about Ideotype breeding
.

Text books:

Allard, R.W. 1960. *Principles of Plant Breeding*. John W iley and Sons, New York.
Chopra, V.L. and Paroda, R.S. 1986. *Approaches for Incorporating Drought Salinity Resistance in Crop Plants*. Oxford and IBH, Publishing Co., New Delhi.

Reference books:

Kumar, N. 2006. *Breeding of Horticultural Crops – Principles and Practices.* New India Publishing Agency, New Delhi.
Phundan Singh, 1996. *Essentials of Plant Breeding* . Kalyani Publishers, New Delhi.
Poehlman, J.M. and Borthakur, D. 1995. *Breeding Asian Field Crops*. Oxford and IBH Publishing Co., New Delhi.

Course Code:ATUG-607 **Course Name: Practical crop production-II (Rabi crops)**
Course **Credit** **Hour:** 2 Hr

Total Contact Hour: 20 hours

Course Objective:

To get the practical experience of growing and managing Rabi crops in the field.

Course Description:

Students will learn about the preparation of field, seed treatment, nursery raising, sowing and other practices till storage and marketing of the produce. Students will understand the yield attributing characters of rabi crops and estimate yield.

Course Contents:

Unit-1 **(10 hours)**

Crop planning, raising field crops in multiple cropping systems: Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce

Unit

The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.

Course Learning Outcomes (CLOs):

On completion of the course the students will be

CO-1: Students will able to recognize the Rabi crops
CO-2: Students will be able to understand the cultural practices and yield of Rabi crops.

Text Books:

Lokesh Kumar Jain (2021). A Manual on Crop Production Technology (Kharif and Rabi). Bhavya Books. ISBN-13 : 978-9383992584.

S.P.S. Tomar, S.N. Khajanji and G.S. Tomar (2011). Science Of Crop Production PART-2 (Rabi Crops). Kushal Publications

Course Code : ATUG- 608 **Course Name : Principles of organic farming**

Course Credit Hour : 2hours **Total Contact Hour :** 32 h

Course Objective :

- Develop an understanding of the historical, biological and ecological basis for Organic farming including crop and livestock management.
- Understand the National Organic Program rules.
- Learn the basic principles of organic matter management to feed the soil food web through the use of cover crops, compost and other organic and mineral amendments.
- Learn the basic principles of managing biodiversity, crop rotations, non-crop competitors(weeds) and plant health for productive cropping systems with minimal off-farm resources.
- Understand the foundation of organic animal husbandry and the integration of crops and animals on the organic farm.
- Develop critical and creative thinking with a systems approach to agriculture using case studies as working examples of farming systems.
- Understand the social, economic, political and environmental context for current and future organic agriculture production and sales.
- Demonstrate ability to knowledgeable discuss principles and practices of organic agriculture.

Course Description :

- Principles and practices of organic farming; farms as ecological systems; the certification process and agencies; organic matter management to support the soil food web and nutrient availability; managing biodiversity, crop rotations, plant competition, ground cover, and plant health; integrating crops and animals; organic animal husbandry practices, crop systems studies, farmer and researcher panel discussions.

Course Contents :

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

Course Learning Outcomes(CLOs) :

On completion of this module, students should be able to:
CLO-1 : Summarise the aims and objectives of organic farming and identify the regulations governing organic farming in the India
CLO-2: Identify and explain the key principles and practices involved in maintaining soil fertility and plant productivity and health in organic farming systems.
CLO-3: Explain the role of livestock and forage production in organic farming systems and identify the key principles and practices underpinning the management, productivity, health and welfare of organic livestock .
CLO-4: Learn the role of the market and other factors influencing the physical and financial performance of organic farming and their implications for the adoption of organic farming and the conversion process
CLO-5: Understand the contribution of organic farming to food quality, environmental and social policy objectives and outline the policy measures which have a direct influence on the extent and adoption of organic farming in the European Union.

Text books :

Textbook on Principles of Organic Farming by L.L. Somani (Author)
Principles of Organic Farming S.R. Reddy

Reference books :
Principles Of Organic Farming (With Theory And Practicals)by Somasundaram, E
Principles Of Organic Farming by P L Maliwal

Online links for study & reference materials :
https://www.coabnau.in/uploads/1587019407_Principlesoforganicfarming.p

Course Code: ATUG-609 A **Course Name: AgroChemicals**
Course Credit Hour: 2hr **Total Contact Hour:** 20 hrs

Course Objectives:
Importance of Agrochemicals in Agriculture & its classification.

Course Description :
An introduction to agrochemicals, their type and role in agriculture, effect on environment, soil, human and animal health, merits and demerits of their uses in agriculture, management of agrochemicals for sustainable agriculture. Herbicides-Major classes

Course Outcomes (COs).
On completion of the course the students will be
CO – 1 Understanding the basics of different agrochemicals
CO – 2 Application of various methods and techniques of different agrochemicals
– 4 Analyzing various methodologies and techniques used for the development of ecological agriculture

Unit 1 **(4 Hours)**
An introduction to agrochemicals, their type and role in agriculture, effect on environment, soil, human and animal health, merits and demerits of their uses in agriculture, management of agrochemicals for sustainable agriculture. Herbicides-Major classes, properties and important herbicides. Fate of herbicides.Fungicides - Classification – Inorganic fungicides - characteristics, preparation and use of sulfur and copper, Mode of action-Bordeaux mixture and copper oxychloride.

Unit 2 **(4 Hours)**
Organic fungicides- Mode of action- Dithiocarbamates-characteristics, preparation and use of Zineb and

maneb.Systemic fungicides- Benomyl, carboxin, oxycarboxin, Metalaxyl, Carbendazim, characteristics and use. Introduction and classification of insecticides: inorganic and organic insecticides Organochlorine, Organophosphates, Carbamates, Synthetic pyrethroids Neonicotinoids,

Unit 3 **(4 Hours)**

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.

Unit 4 **(4 Hours)**

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 potassiumchloride, potassium sulphate and potassium nitrate.

Unit 5 **(4 Hours)**

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.

Text Books:

1. Roy, N.K. 2002. Chemistry of Pesticides. CBS Publishers, New Delhi

Reference Books:

1. Integrated Pest Management. G.S.Dhaliwal and Ramesh Arora. Kalyani Publisher
2. Organic Farming for Sustainable Agriculture- S.C. Panda. Kalyani publishers.

Course Code: ATUG-609 B **Course Name: Landscaping**

Course Credit Hour: 2hr **Total Contact Hour:** 20 hrs

Course Objectives:

Importance of Landscaping & its classification.

Course Description:

Importance and scope of landscaping. Principles of landscaping, Styles and types, traces, terrace garden, vertical gardening, garden components. Trees: selection, propagation, planting schemes, canopy management, shrubs and herbaceous Annuals: selection, propagation, planting scheme, Other garden plants

Course Contents:

Unit1:

Importance and scope of landscaping. Principles of landscaping, Styles and types, traces, terrace garden, vertical gardening, garden components, adornments, lawn making, rockery, water garden, walk-paths, bridges, other constructed features etc. gardens for special purposes.

Unit 2 **(4 Hours)**

Trees: selection, propagation, planting schemes, canopy management, shrubs and herbaceous perennials: selection, propagation, planting schemes, architecture. Climber and creepers: importance, selection, propagation, planting,

Unit 3 **(4 Hours)**

Trees: selection, propagation, planting schemes, canopy management, shrubs and herbaceous Annuals: selection, propagation, planting scheme, Other garden plants: palms, ferns, grasses and cacti succulents. Pot plants: selection, arrangement, management.

Unit 4 **(4 Hours)**

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,

Unit 5 **(4 Hours)**

Landscaping of river banks, hospitals, play grounds, airports, industries, institutions. Bonsai: principles and management, lawn: establishment and maintenance. CAD application.

Course Outcomes (COs)

CO-1: Understanding the Basic Concepts and Principles of Landscaping

CO-2: Understanding and analyzing the beneficial trees, climbers and creepers used in different landscapes.

Co-3: Analyzing the propagation, planting and canopy management in horticulture crops

Text Books:

1. BasicHorticulture-Jitendra Singh. Kalyani Publisher

Reference Books:

1.Basics of Horticulture by K.V. Peter. New India Publishing Agency, New Delhi

2. Principles of Horticulture by C.R. Adams, M.P. Early. Routledge

3. Terminology of Horticulture by Neeraj Pratap Singh.International Book Distributing Co (IBDC Publishers

Course Code: ATUG-609 C **Course Name: Agricultural Journalism**

Course Credit Hour: 2hr **Total Contact Hour:** 20 hrs

Course Objectives:

Importance; Definition; Application of Agricultural Journalism.

Course Description:

Agricultural Journalism: The nature and scope of agricultural journalism characteristics and training of the agricultural journalist. Newspapers and magazines as communication media: Characteristics; kinds and functions of newspapers and magazines, characteristics of newspaper and magazine readers

Course Content

Unit 1 **(4 Hours)**

Agricultural Journalism: The nature and scope of agricultural journalism characteristics and training of the agricultural journalist, how agricultural journalism is similar to and different from other types of journalism.

Unit 2 **(4 Hours)**

Newspapers and magazines as communication media: Characteristics; kinds and functions of newspapers and magazines, characteristics of newspaper and magazine readers. Form and content of newspapers and magazines: Style and language of newspapers and magazines, parts of newspapers and magazines.

Unit 3 **(4 Hours)**

The agricultural story: Types of agricultural stories, subject matter of the agricultural story, structure of the agricultural story. Gathering agricultural information:

Unit 4 **(4 Hours)**

Sources of agricultural information, interviews, coverage of events, abstracting from research and scientific materials, wire services, other agricultural news sources.

Unit 5 **(4 Hours)**

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.

The Course Outcomes (COs).

On completion of the course the students will be able

CO – 1	Understanding the agriculture journalism, newspaper and magazine as communication media.
CO – 2	Demonstrating the writing of agriculture stories using photographs and artwork.

Text Books

1.Mass Communication and Journalism in India, D.S.Mehta, Allied Publishers Private Limited

Reference Books:

1.Style in Journalism, P.V.L.Narasimha Rao, Readworth Publication

2.Agricultural Extension: Worldwide InnovationsR. SaravananNew India Publishing

3.Agricultural Extension Systems: Issues and ApproachesB.S. Hansra (ed.)Concept Publishing Company.

B.Sc. (Hons.) Agriculture

VII- Semester

S.NO	Course Code	Subject name	Sessional Exam			Evaluation Scheme				Credit
						External Exam	PRACTICAL		Subject Total	
			CA	TA	Total		INTERNAL	EXTERNAL		
1	ATUG-701	Rural Agricultural Work Experience (RAWE)					150	150	300	0+14
2	ATUG-702	Agro-industrial Attachment (AIA)					75	75	150	0+6

Sr. No.	Activities	No. of weeks	Credit Hours
1	General orientation & On campus training by different faculties	1	14
2	Village attachment	8	
3	Unit attachment in Univ./ College. KVK/ Research Station Attachment	5	
4	Plant clinic	2	02
5	Agro-Industrial Attachment	3	04
6	Project Report Preparation, Presentation and Evaluation	1	
	Total weeks for RAWE & AIA	20	20
	Total Marks = 450		

- **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**.**

RAWE Component-I

Village Attachment Training Programme

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

RAWE Component –II

Agro Industrial Attachment

- Students shall be placed in Agro-and Cottage industries and Commodities Boards for 03 weeks.

- Industries include Seed/Sapling production, Pesticides-insecticides, Post-harvest-processing-value addition, Agri-finance institutions, etc.

Activities and Tasks during Agro-Industrial Attachment Programme

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

B.Sc. (Hons.) Agriculture VIII SEMESTER

S.NO	Course Code	Subject name	Sessional Exam			Evaluation Scheme				Credit
						External Exam	PRACTICAL		Subject Total	
			CA	TA	Total		INTERNAL	EXTERNAL		
1	ATUG-801 A	Production Technology for Bioagents and Biofertilizer					150	150	300	10
	ATUG-801 B	Seed Production and Technology								
	ATUG-801 C	Mushroom Cultivation Technology								
	ATUG-801 D	Soil, Plant, Water and Seed Testing								
	ATUG-801 E	Commercial Beekeeping								
	ATUG-801 F	Poultry Production Technology								
		A student has to choose 1 course from the above								
2	ATUG-802 A	Commercial Horticulture					150	150	300	10
	ATUG-802 B	Floriculture and Landscaping								
	ATUG-802 C	Food Processing								
	ATUG-802 D	Agriculture Waste Management								
	ATUG-802 E	Organic Production Technology								
	ATUG-802 F	Commercial Sericulture								
		A student has to choose 1 course from the above								

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.**

Course Code : **801** **Course Name : Mushroom technology**
Course Credit Hour : 3hr **Total Contact Hour : 40** hr

Course Objective :

- Enable the students to identify edible and poisonous mushrooms
- Provide hands on training for the preparation of bed for mushroom cultivation and spawn production
- Give the students exposure to the experiences of experts and functioning mushroom farms
- Help the students to learn a means of self employment and income generation

Course Description :

- The course introduces methods of growing edible mushrooms, including culture maintenance, basic mushroom substrate preparation, composting, spawn generation techniques, inoculation methods, harvesting, and pests and pest management of mushrooms. Students will understand the principles of mushroom cultivation, acquire the practical knowledge to grow several species of fungi, and will have the confidence to approach the mushroom industry for potential employment opportunities. The history of mushroom production and recent trends in the diversification of edible mushrooms will be discussed. Every step in small-scale and industrial commercialization of edible mushrooms, from spawn production to mushroom harvest, will be covered. Lessons and reading material include an overview of the importance of fungi in nutrient recycling and symbiotic associations with plants. Construction of growth chambers and greenhouses will be presented for the small grower with little capital. Small business opportunities and marketing mushrooms will also be included. Students will learn the unique vocabulary used in the industry and will be able to communicate with growers upon successful completion of the course. Three independent papers on various aspects of growing mushrooms will be required in the course. The objectives of the course are to introduce students to basic mycology as it relates to growing mushrooms, give students practical knowledge to begin growing mushrooms at home or with industry, and provide a foundation for starting a small business in mushroom cultivation.

Course Contents :

Module 1: Introduction to mushrooms (2 hours) Mushrooms -Taxonomical rank -History and Scope of mushroom cultivation - Edible and Poisonous Mushrooms-Vegetative characters

Module 2: Common edible mushrooms (2 Hours) Button mushroom (Agaricus bisporus), Milky mushroom (Calocybe indica), Oyster mushroom (Pleurotus sajorcaju) and paddy straw mushroom (Volvariella volvcea).

Module 3: Principles of mushroom cultivation (8 Hours) Structure and construction of mushroom house. Sterilization of substrates. Spawn production - culture media preparation- production of pure culture, mother spawn, and multiplication of spawn. Composting technology, mushroom bed preparation. Spawning, spawn running, harvesting. Cultivation of oyster and paddy straw mushroom.Problems in cultivation - diseases, pests and nematodes, weed moulds and their management strategies.

Module 4:Health benefits of mushrooms(2 Hours) Nutritional and medicinal values of mushrooms. Therapeutic aspects- antitumor effect

Module 5:Post harvest technology: (4 Hours) Preservation of mushrooms - freezing, dry freezing, drying, canning, quality assurance and entrepreneurship.Value added products of mushrooms.

Module 6: Training/ Workshop/ Field visit(12 Hours) Sterilization and sanitation of mushroom house, instruments and substrates Preparation of mother culture, media preparation, inoculation, incubationand spawn production Cultivation of oyster mushroom using paddy straw/agricultural wastes

Course Learning Outcomes(CLOs) :

CLO-1 : By successfully completing the course, students will be able to: .

CLO-2: Identify edible types of mushroom .

CLO-3: Gain the knowledge of cultivation of different types of edible mushrooms and spawn production. CLO-4: Manage the diseases and pests of mushrooms.
CLO-5: Learn a means of self-employment and income generation.

Text books :
Mushroom Cultivation Technology by Joy Sarkar Krishnendu Acharya, Anirban Roy
Mushroom Cultivation and its Diseases by Dr. Ravinder Singh Rana

Reference books :
MUSHROOM CULTURE TECHNOLOGY (Dr. Parimal Mandal, Sri Zerald Tiru, Dr. Sanjoy Sadhukhan, Dr. Arka Pratim Chakraborty, Dr. Ayon Pal, Mrs. Monalisha Pal Sarkar,)

Online links for study & reference materials :
https://agrimoon.com/wp-content/uploads/Mashroom-culture.pdf
https://nios.ac.in/media/documents/vocational/mushroom_production_(revised)(618)/Lesson-01.pdf

Course Code: 802 **Course Name**: **Seed Production Technology**
Course Credit Hour: 5hr **Total Contact Hour:** 60hr

Course Objectives:
- To impart knowledge to the students on the Agronomical management, Genetic management, seed testing, packing and seed marketing

Course Description:
- This course provides a stair-step introduction of genetical, agronomical, processing, handling, packaging, storage and marketing of seed.

Course Contents:

Definition of seed, planting value of seed, seed production system in India, Classes of seed, Seed legislation, Seed certification, 4Inw to become a seedproducer, Agronomical principles of seed production, Genetical principles of seed production, Principles of hybrid seed production of field crops, Seed healthmanagement, harvesting, threshing and drying of seed, Seed Processing, Value addition, Seed priming, Seed packaging and transportation, Seed demand planning cost of seed production, coat benefit ratio, Seed multiplication ratio, seed marketing etc., Seed storage, Maintenance breeding and roguing practices.

Course Learning Outcomes (CLOs):
CLO-1: Understand the basic concepts of the classification of field crops
CLO-2: Apply the agronomical and genetical principles of seed production
CLO-3: Acquaint with the seed handling and marketing
CLO-4: Learning about hybrid seed production in modules

Text books:
Khare D.and M S Bhale (2000) Seed Technology. Scientifir FubliMra (India)
Thomson I.R. An Introduction to Seed Technolngy Leonard Hill

Reference books:

Seed science and Technology (1985) ISTA

5eed Technology by Mukesh Kumar