

B. Sc. (Hons.) Agriculture

*Curriculum, Syllabus and
Academic Regulation as per
National Education Policy 2020
and the Fifth Deans' Committee
Recommendations*

*[Academic Session: 2021-22
Onwards]*



**MAHARAJA SUHEL DEV STATE UNIVERSITY,
AZAMGARH-276 128, U.P. (INDIA)**

This draft of the Curriculum, Syllabus and Academic Regulation for B. Sc. (Hons.) Agriculture is compiled by **Dr Sarvesh Kumar**, Asstt. Prof., S. D. J. P. G. College, Chandeshwar, Azamgarh / Convenor (Agricultural Economics), Maharaja Suhel Dev State University, Azamgarh and same is submitted to Registrar by Dr Santosh Kumar Singh, Dean, Faculty of Agriculture, Maharaja Suhel Dev State University, Azamgarh.



**Approved by
Convenors**

Board of Studies (Faculty of Agriculture)
Maharaja Suhel Dev State University, Azamgarh

Dr (Santosh Kumar Singh)
Convenor-Agronomy

Dr (Brajesh Kumar)
Convenor-Plant Pathology

Dr (Indrajeet)
Convenor-Entomology

Dr (Rajendra Prasad Kaushal)
Convenor-Agril. Statistics

Dr (Shailendra Vikram Singh)
Convenor-Horticulture

Er. (Jitendra Kumar)
Convenor-Agril. Engineering

Dr (Sarvesh Kumar)
Convenor-Agril. Economics

Dr (Vishnu Deo)
**Convenor-Animal
Husbandry & Dairying**

Dr (Ajeet Pratap Singh)
**Convenor-Genetics & Plant
Breeding**

Dr (Santosh Kumar Singh)
**Dean,
Faculty of Agriculture**

**NEW SYLLABUS AS NEP 2020
(NEW AND RESTRUCTURED)
UNDER GRADUATE CURRICULA & SYLLABUS
B.Sc. (Hons.) Agriculture
2020**

Semester System as per ICAR Vth Deans Committee Report

Name	Designation	Affiliation
Steering Committee		
Mrs. Monika S. Garg, (I.A.S.) Chairperson Steering Committee	Additional Chief Secretary	Dept. of Higher Education U.P., Lucknow
Prof. Poonam Tandan	Professor, Dept. of Physics	Lucknow University, U.P.
Prof. Hare Krishna	Professor, Dept. of Statistics	CCS University Meerut, U.P.
Dr. Dinesh C. Sharma	Associate Professor, Dept. of Zoology	K.M. Govt. Girls P.G. College Badalpur, G.B. Nagar, U.P.
Supervisory Committee-Science Faculty		
Dr. Vijay Kumar Singh	Associate Professor, Dept. of Zoology	Agra College, Agra
Dr. Santosh Singh	Dean, Dept. of Agriculture	Mahatma Gandhi Kashi Vidhyapeeth, Varanasi
Dr. Baby Tabussam	Associate Professor, Dept. of Zoology	Govt. Raza P.G. College Rampur, U.P.
Dr. Sanjay Jain	Associate Professor, Dept. of Statistics	St. John's College, Agra

Syllabus Developed by:

S.No.	Name	Designation	Department	College/University
1.	Dr. Santosh Singh	Dean	Agriculture	Mahatma Gandhi Kashi Vidhyapeeth, Varanasi
2.	Dr. Sant Bahadur Singh	Associate Professor	Agronomy	R.B.S. College, Agra
3.	Dr. Laxman Singh	Associate Professor	A.H. and Dairying	R.B.S. College, Agra

Discipline-wise Summary of Credit Hours

S. No.	Group	Credits
1	Agronomy	17
2	Genetics & Plant Breeding	16
3	Soil Science & Agricultural Chemistry	15
4	Entomology	11
5	Agricultural Economics	10
6	Agricultural Engineering	8
7	Plant Pathology	13
8	Horticulture	10
9	Agricultural Extension	9
10	Soil conservation	10
11	Statistics, Computer Application and I.P.R.	5
12	Animal Husbandry and Dairying	15
13	English	2
14	Remedial Courses*	05(Bio/Math); 05(Agriculture)
15	NSS/NCC/Physical Education & Yoga Practices**	2
16	Human Values and Ethics**	1
17	Educational Tour**	2
Total		141+5*+5**+6 Credits Electives# =157
RAWE		20
ELP		20
Grand Total		157+20+20=197

*Remedial courses; **Non-gradual courses

#**Elective Courses:** the student can select two elective courses out of the following during V and VI semesters.

***Remedial Courses:** the student must select the remedial courses during I semesters as prescribed below.

S. No.	Course Code	Courses	Credit Hours
Elective Courses for V Semester			
1	AGE-51	Agribusiness Management	3(2+1)
2	AGE-52	Agrochemicals	3(2+1)
3	AGE-53	Commercial Plant Breeding	3(1+2)
4	AGE-54	Landscaping	3(2+1)
5	AGE-55	Food Safety and Standards	3(2+1)
6	AGE-56	Biopesticides & Biofertilizers	3(2+1)
Elective Courses for VI Semester			
7	AGE-61	Protected Cultivation	3(2+1)
8	AGE-62	Hi-tech Horticulture	3(2+1)
9	AGE-63	Weed Management	3(2+1)
10	AGE-64	System Simulation and Agro-advisory	3(2+1)
11	AGE-65	Agricultural Journalism	3(2+1)
12	AGE-66	Composition Fishery cum Duck/ (and) Quail/ (and) Rabbit culture	3(2+1)

S. No	Course Code	Remedial Courses	Credit Hours
1	AG-109	Agricultural Heritage <i>(Compulsory for all students)</i>	1(1+0)
2	AG-110A	General Agriculture–I <i>(to be opted by 10+2: Science Students)</i>	2(2+0)
	AG-110B	Introductory Biology <i>(to be opted by 10+2 : Agriculture Students)</i>	2(1+1)
3	AG-111A	General Agriculture–II <i>(to be opted by 10+2: Science Students)</i>	2(2+0)
	AG-111B	Elementary Mathematics <i>(to be opted by 10+2: Agriculture Students)</i>	2(2+0)

[Distribution of Courses in I – SEMESTER]

S No.	Course Code	Title of the papers /Courses		Credit	Mid-Term		Practical		Final Exam. (Theory)		Total Marks	
					Maxi. Marks	Passing Marks	Maxi. Marks	Passing Marks	Maxi. Marks	Passing Marks	Maxi. Marks	Passing Marks
1	AG-101	Fundamentals of Agronomy		3(2+1)	20		30	33% of maximum marks assigned for practical exam. of each paper	50	33% of M.M. assigned for final exam. of each paper	100	50% of total marks assigned for each paper
2	AG-102	Fundamentals of Genetics		3(2+1)	20		30		50		100	
3	AG-103	Fundamentals of Soil Science		3(2+1)	20		30		50		100	
4	AG-104	Fundamentals of Horticulture		2(1+1)	20	--	30		50		100	
5	AG-105	Rural Sociology and Educational Psychology		2(1+1)	20		30		50		100	
6	AG-106	Introduction to Forestry		2(1+1)	20		30		50		100	
7	AG-107	Introductory Animal Husbandry		3(2+1)	20		30		50		100	
8	AG-108	Comprehension and Communication Skills in English		2(1+1)	20		30		50		100	
9		Remedial Courses										
9(a)	AG-109	Agricultural Heritage <i>(Compulsory for all students)</i>		1(1+0)	50		-		50		100	50% of total marks assigned for each paper
9(b)	AG-110A	General Agriculture–I <i>(to be opted by 10+2: Science Students)</i>		2(2+0)	50		-		50		100	
	AG-110B	Introductory Biology <i>(to be opted by 10+2: Agri. Students)</i>		2(1+1)	20	--	30	--	50	--	100	
9(c)	AG-111A	General Agriculture–II <i>(to be opted by 10+2: Science Students)</i>		2(2+0)	50		-		50		100	
	AG-111B	Elementary Mathematics <i>(to be opted by 10+2 Agriculture Student)</i>		2(2+0)	50		-		50		100	
10		Non-Gradial Courses										
	AG-112A	NSS	(Choose any ONE)	2(0+2)	--	--	100**	--	--	--	100	50 Marks
	AG-112B	NCC										
	AG-112C	Physical Education and Yoga Practices										
Total				27								

**Internal assessment by host institution. Assessment method for Non-gradial Courses (AG112A, AG112B & AG112C) is given below:

Particulars	Maximum Marks
Attendance & routine activities	60
Conduct	10
Participation in Camps	20
Viva-voce	10

[Distribution of Courses in II – SEMESTER]

S No.	Course Code	Title of the papers /Courses	Credit	Mid-Term		Practical		Final Exam. (Theory)		Total Marks		
				Maxi. Marks	Passing Marks	Maxi. Marks	Passing Marks	Maxi. Marks	Passing Marks	Max. Marks	Passing Marks	
1	AG-201	Fundamentals of Crop Physiology	3(2+1)	20	-	30	33% of maximum marks assigned for practical exam. of each paper	50	33% of M.M. assigned for final exam. of each paper	100	50% of total marks assigned for each paper	
2	AG-202	Fundamentals of Plant Biochemistry	3(2+1)	20		30		50		100		
3	AG-203	Fundamentals of Entomology-I (Insect Morphology and Taxonomy)	3(2+1)	20		30		50		100		
4	AG-204	Fundamentals of Agricultural Economics	2(2+0)	50		00		50		100		
5	AG-205	Principles of Organic Farming	2(1+1)	20		30		50		100		
6	AG-206	Fundamentals of Plant Pathology	4(3+1)	20		30		50		100		
7	AG-207	Production Technology for Vegetables and Spices	2(1+1)	20		30		50		100		
8	AG-208	Fundamentals of Agricultural Extension Education	3(2+1)	20		30		50		100		
9	AG-209	Dairy Processing and Safety Issues	3(2+1)	50		-		50		100		
10		Non-Gradiual Courses										
	AG-210	Human Values and Ethics	1(1+0)	50	--	--	--	50	--	100	50 Marks	
Total			26									

[Distribution of Courses in III – SEMESTER]

S No.	Course Code	Title of the papers /Courses	Credit	Mid-Term		Practical		Final Exam. (Theory)		Total Marks	
				Maxi. Marks	Passing Marks	Maxi. Marks	Passing Marks	Maxi. Marks	Passing Marks	Maxi. Marks	Passing Marks
1	AG-301	Crop Production Technology-I (Kharif Crops)	2(1+1)	20	--	30	33% of maximum marks assigned for practical exam., of each paper	50	33% of M.M. assigned for final exam. of each paper	100	50% of total marks assigned for each paper
2	AG-302	Practical Crop Production-I (Kharif Crops)	2(0+2)	--		100		--		100	
3	AG-303	Fundamentals of Plant Breeding	3(2+1)	20		30		50		100	
4	AG-304	Agricultural Microbiology	2(1+1)	20		30		50		100	
5	AG-305	Agricultural Finance and Co-operation	3(2+1)	20		30		50		100	
6	AG-306	Farm Machinery and Power	3(2+1)	20		30		50		100	
7	AG-307	Principles of Integrated Disease Management	3(2+1)	20		30		50		100	
8	AG-308	Environmental Studies and Disaster Management	2(1+1)	20		30		50		100	
9	AG-309	Statistical Methods	2(1+1)	20		30		50		100	
10	AG-310	Fundamentals of Soil and Water Conservation	2(1+1)	20		30		50		100	
11	AG-311	Dairy Science	3(2+1)	20		30		50		100	
12	AG-312	Fundamentals of Entomology-II (Insect Ecology and Concept of IPM)	2(1+1)	20		30		50		100	
Total			29								

[Distribution of Courses in IV– SEMESTER]

S No.	Course Code	Title of the papers /Courses	Credit	Mid-Term		Practical		Final Exam. (Theory)		Total Marks	
				Maxi. Marks	Passing Marks	Maxi. Marks	Passing Marks	Maxi. Marks	Passing Marks	Maxi. Marks	Passing Marks
1	AG-401	Crop Production Technology-II (Rabi Crops)	2(1+1)	20	--	30	33% of maximum marks assigned for practical exam. of each paper	50	33% of M.M. assigned for final exam. of each paper	100	50% of total marks assigned for each paper
2	AG-402	Practical Crop Production-II (Rabi Crops)	2(0+2)	--		100		--		100	
3	AG-403	Principles of Seed Technology	3(2+1)	20		30		50		100	
4	AG-404	Problematic Soils and their Management	2(1+1)	20		30		50		100	
5	AG-406	Renewable Energy and Green Technology	2(1+1)	20		30		50		100	
6	AG-407	Production Technology for Ornamental Crops, MAPs and Landscaping	2(1+1)	20		30		50		100	
7	AG-408	Entrepreneurship Development and Business Communication	2(1+1)	20		30		50		100	
8	AG-409	Introductory Agro-meteorology and Climate Change	2(1+1)	20		30		50		100	
9	AG-410	Agri-Informatics	2(1+1)	20		30		50		100	
10	AG-411	Poultry Production and Management	3(2+1)	20		30		50		100	
Total			22								

[Distribution of Courses in V– SEMESTER]

S No.	Course Code	Title of the papers /Courses	Credit	Mid-Term		Practical		Final Exam. (Theory)		Total Marks		
				Maxi. Marks	Passing Marks	Maxi. Marks	Passing Marks	Maxi. Marks	Passing Marks	Maxi. Marks	Passing Marks	
1	AG-501	Rainfed and Dryland Agriculture	2(1+1)	20	-	30	33% of maximum marks assigned for practical exam. of each paper	50	33% of maximum marks assigned for practical exam. of each paper	100	50% of total marks assigned for each paper	
2	AG-502	Crop Improvement-I (Kharif Crops)	2(1+1)	20		30		50		100		
3	AG-503	Pests of Field Crops & Stored Grains and their Management	3(2+1)	20		30		50		100		
4	AG-504	Agricultural Marketing, Trade and Prices	3(2+1)	20		30		50		100		
5	AG-505	Protected Cultivation and Secondary Agriculture	3(2+1)	20		30		50		100		
6	AG-506	Diseases of Field & Horticultural Crops and their Management-I	3(2+1)	20		30		50		100		
7	AG-507	Production Technology for Fruit and Plantation Crops	2(1+1)	20		30		50		100		
8	AG-508	Communication Skills and Personality Development	2(1+1)	20		30		50		100		
9	AG-509	Intellectual Property Rights	1(1+0)	50		00		50		100		
10	AG-510	Principles of Food Science and Nutrition	3(2+1)	20		30		50		100		
11	AG-511	Geo-informatics and Nanotechnology	2(1+1)	20		30		50		100		
12		Elective Courses (Elective-I)										
	AGE-51	Agri-business Management (Deptt. of Agri. Economics)	(Choose any ONE)	20	-	30	33% of maximum marks assigned for practical exam. of each paper	50	33% of maximum marks assigned for practical exam. of each paper	100	50% of total marks assigned for each paper	
	AGE-52	Agrochemicals (Deptt. of Soil Science)										3(2+1)
	AGE-53	Commercial Plant Breeding (Deptt. of G. & P. B.)										3(1+2)
	AGE-54	Landscaping (Deptt. of Horticulture)										3(2+1)
	AGE-55	Food Safety and Standards (Deptt. of A. H. & D.)										
	AGE-56	Biopesticides and Biofertilizers (Deptt. of Soil Science supported by Deptt. of Plant Pathology)										
Total			29									

[Distribution of Courses in VI– SEMESTER]

S No.	Course Code	Title of the papers /Courses	Credit	Mid-Term		Practical		Final Exam. (Theory)		Total Marks	
				Maxi. Marks	Passing Marks	Maxi. Marks	Passing Marks	Maxi. Marks	Passing Marks	Maxi. Marks	Passing Marks
1	AG-601	Farming System, Precision Farming and Sustainable Agriculture	2(1+1)	20	--	30	33% of maximum marks assigned for practical exam. of each paper	50	33% of maximum marks assigned for practical exam. of each paper	100	50% of total marks assigned for each paper
2	AG-602	Crop Improvement–II (Rabi Crops)	2(1+1)	20		30		50		100	
3	AG-603	Manures, Fertilizers and Soil Fertility Management	3(2+1)	20		30		50		100	
4	AG-604	Farm Management, Production and Resource Economics	2(1+1)	20		30		50		100	
5	AG-605	Diseases of Field & Horticultural Crops and their Management-II	3(2+1)	20		30		50		100	
6	AG-606	Post- harvest Management and Value Addition of Fruits and Vegetables	2(1+1)	20		30		50		100	
7	AG-607	Watershed and Wasteland Management	2(1+1)	20		30		50		100	
8	AG-608	Beneficial Insects and Pests of Horticultural Crops and their Management	3(2+1)	20		30		50		100	
9		Elective Courses (Elective-II)									
	AGE-61	Protected Cultivation (Deptt. of Agril. Engineering)	3(2+1)	20	--	30	33% of maximum marks assigned for practical exam. of each paper	50	33% of maximum marks assigned for practical exam. of each paper	100	50% of total marks assigned for each paper
	AGE-62	Hi-tech. Horticulture (Deptt. of Horticulture)									
	AGE-63	Weed Management (Deptt. of Agronomy)									
	AGE-64	System Simulation and Agro- advisory (Deptt. of Agril. Engineering)									
	AGE-65	Agricultural Journalism (Deptt. of Agril. Extension)									
	AGE-66	Composition Fishery-cum-Duck / (and) Quail/ (and) Rabbit culture (Deptt. of A. H. & D.)									
10		Non-Gradiual Course									
	AGT-99	Educational Tour	2(0+2)	--	--	100**	--	--	--	100	50 Marks
Total			24								

**Internal assessment by host institution. Assessment method for educational tour is given below:

Particular	Maximum Marks
Attendance and conduct	30
Pocket Note Book & report	40
Viva-voce	30

[Distribution of Courses in VII– SEMESTER]

Rural Awareness Works Experience (RAWE) and Agro-Industrial Attachment (AIA) : Rural Agriculture Work Experience enables the students to gain rural experience giving them confidence and enhancing on-farm problem solving abilities in real life situations especially in contact with farmers, growers, other stakeholders. This programme will be undertaken by the students during the VII semester for a total duration of 20 weeks with a weightage of 0+20 credit hours in two parts viz., RAWE and AIA. It will consist of general orientation and on campus training by different faculties followed by village attachment/unit attachment in University/ College/ KVK or a Research station. The students will also be attached with the agro-industries to get an experience of the industrial environment and working. At the end of RAWE/AIA, the students will be given one week for project report preparation, presentation and evaluation. The students would be required to record their observations in field and agro-industries on daily basis and will prepare their project report based on these observations.

S.No.	Activity	No. of weeks	Credit	Evaluation By	Total Marks	
					Maxi. Marks	Passing Marks
Component-I						
1	General orientation and on campus training by different faculties	1	1(0+1)	RAWE Committee in the leadership of Convener/ Programme Coordinator	100	50 Marks
2	Village & Unit attachment	13 (8+5)	13		900	450 Marks
2(a)	Village attachment	8	--	--	800	50% of total marks assigned for each activity
2(a)(i)	Survey of village	1	1(0+1)	Concerned Departmental Committee of RAWE	100	
2(a)(ii)	Agronomical Interventions	1	1(0+1)		100	
2(a)(iii)	Plant Protection Interventions	1	1(0+1)		100	
2(a)(iv)	Soil Improvement Interventions (Soil sampling and testing)	1	1(0+1)		100	
2(a)(v)	Fruit and Vegetable Production Interventions	1	1(0+1)		100	
2(a)(vi)	Food Processing and Storage Interventions	1	1(0+1)		100	
2(a)(vii)	Animal Production Interventions	1	1(0+1)		100	
2(a)(viii)	Extension and Transfer of Technology activities	1	1(0+1)		100	
2(b)	Unit attachment in Univ./ College, KVK/Research Station Attachment	5	5(0+5)		Based on feedback of Attachment Unit, RAWE Committee	
3	Plant Clinic	2	2		200	100 Marks
	Plant Insect Pests Clinic- <i>Entomology</i>	1	1(0+1)	Concerned Departmental Committee of RAWE	100	50% of Marks assigned for each activity
	Plant Diseases Clinic- <i>Plant Pathology</i>					
	Plant Nutrients Deficiency Clinic- <i>SSAC</i>	1	1(0+1)		100	
	Plant Weeds Clinic- <i>Agronomy</i>					
Component-II (Agro-Industrial Attachment)						
4	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 (Catalogued in table 1 given below)	3	3(0+3)	Based on feedback of Attachment Unit, RAWE Committee	100	50 Marks
5	Project Report Preparation, Presentation & Evaluation	1	1(0+1)	RAWE Committee	100	50 Marks
	Total - RAWE & AIA	20	20		1400	700 Marks

EVALUATION OF RAWE ACTIVITIES

College administration will form a committee for regulating the RAWE activities. Instituted Committee in the leadership of Convenor/ Programme Coordinator will prepare a schedule for various activities of RAWE in advance and make necessary arrangements for the students.

Table 1	
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

[Distribution of Courses in VIII– SEMESTER]

Experiential Learning Programme (ELP): Experiential Learning helps the student to develop competence, capability, capacity building, acquiring skills, expertise, and confidence to start their own enterprise and turn job creators instead of job seekers. This embraces the earning while learning concept. Experiential Learning is a major step forward for high quality professional competence, practical work experience in real life situation to graduates, production-oriented courses, production to consumption project working, facilitates producing job providers rather than job seekers and inculcates entrepreneurial orientation.

This programme will be undertaken by the students during the VIII semester for a total duration of 24 weeks with a weightage of 0+20 credit hours. The students will register for any of two modules, of (0+10 credit hours each) listed below:

Modules for Skill Development and Entrepreneurship

S. No.	Title of Module	Credits	Remarks
1.	Production Technology for Bio-agents and Bio-fertilizer	0+10	Choose any TWO Modules
2.	Seed Production and Technology	0+10	
3.	Mushroom Cultivation Technology	0+10	
4.	Soil, Plant, Water and Seed Testing	0+10	
5.	Commercial Beekeeping	0+10	
6.	Poultry Production Technology	0+10	
7.	Commercial Horticulture	0+10	
8.	Floriculture and Landscaping	0+10	
9.	Food Processing	0+10	
10.	Agriculture Waste Management	0+10	
11.	Organic Production Technology	0+10	
12.	Commercial Sericulture	0+10	

Evaluation of Experiential Learning Programme (ELP)

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

COURSE WISE DETAILED SYLLABUS

REMEDIAL COURSES

1. Agricultural Heritage 1(1+0) AG-109

Theory

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

2. General Agriculture-I 2(2+0) AG-110A

Theory

Agriculture of Intermediate standard including Agronomy, Soil Science, Horticulture, Plant Pathology

3. General Agriculture-II 2(2+0) AG-111A

Theory

Agriculture of Intermediate standard including Ag Engg. Animal Husbandry and economics

4. Introductory Biology 2(1+1) AG-110B

Theory

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

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

5. Elementary Mathematics 2(2+0) AG-111B

Theory

Straight lines: Distance Formula, Section Formula (internal and external division), Equation of co-ordinate axes, Equation of lines parallel to axes, Two point form of

equation of line, Normal form of equation of line, Point of intersection of two straight lines, Angles between two straight lines, Parallel lines. Circle: Equation of circle whose center and radius is known, general equation of a circle, Equation of circle passing through three given points, Equation of circle whose diameter is line joining two points (X_1, Y_1) & (X_2, Y_2) . Differential & Integral Calculus: Definition, limit and continuity of a function, Simple problems on limit and continuity, Differentiation of x^n , e^x , a^x , $\log x$ & $\sin x$, $\cos x$, $\tan x$, $\cot x$, $\sec x$ & $\operatorname{cosec} x$ from first principle, Derivatives of sum, difference, product and quotient of two functions, Differentiation of functions of functions (Simple problem based on it), Logarithmic differentiation (Simple problem based on it), Differentiation by substitution method (Simple problems based on it). Integration of simple functions, Integration by Parts: Integration of Product of two functions, Integration by substitution method. Determinants and Matrices: Introduction of determinants, Properties of determinants up to 3rd order and their evaluation, Definition of Matrices, type of Matrices and properties, Addition, Subtraction, Multiplication, Transpose and Inverse of a matrix up to 3rd order.

NON-GRADUAL COURSES

1. NSS/NCC/Physical Education & Yoga Practices 2(0+2) AG-112A/B/C

Course aims at evoking social consciousness among students through various activities viz., working together, constructive and creative social work, to be skillful in executing democratic leadership, developing skill in programme development to be able for self employment, reducing gap between educated and uneducated, increasing awareness and desire to help sections of society.

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

- Introduction and basic components of NSS: Orientation
- NSS programmes and activities
- Understanding youth
- Community mobilization
- Social harmony and national integration
- Volunteerism and shramdan
- Citizenship, constitution and human rights
- Family and society
- Importance and role of youth leadership
- Life competencies
- Youth development programmes
- Health, hygiene and sanitation
- Youth health. lifestyle, HIV AIDS and first aid

- Youth and yoga
- Vocational skill development
- Issues related environment
- Disaster management
- Entrepreneurship development
- Formulation of production oriented project
- Documentation and data reporting
- Resource mobilization
- Additional life skills
- Activities directed by the Central and State Government

All the activities related to the National Service Scheme course is distributed under four different courses viz., National Service Scheme I, National Service Scheme II, National Service Scheme III and National Service Scheme IV each having one creditload. The entire four courses should be offered continuously for two years. A student enrolled in NSS course should put in at least 60 hours of social work in different activities in a semester other than live regular one day camp in a year and one special camp for duration of 7 days at any semester break period in the two years.

Different activities will include orientation lectures and practical works. Activities directed by the Central and State Government have to be performed by all the volunteers of NSS as per direction.

SYLLABUS

Semester I

Course title: National Service Scheme I 2(0+2) AG-112A

Introduction and basic components of NSS

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

NSS programmes and activities

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

Understanding youth

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

Community mobilisation

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

Social harmony and national integration

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

Volunteerism and Shramdan

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

Citizenship, constitution and human rights

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

Family and society

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

Semester I

Course title: National Cadet Corps

2(0+2)

AC-112B

1. Aims. objectives. organization of NCC and NCC song. DG's cardinals of discipline. 2. Drill- aim, general words of command, attention, stands at ease, stand easy and turning. 3. Sizing, numbering. forming in three ranks, open and close order march and dressing. 4. Saluting at the halt, getting on parade, dismissing and falling out.
5. Marching, length of pace. and time of marching in quick/slow time and halt. Side pace, pace forward and to the rear.
6. Turning on the march and wheeling. Saluting on the march.
7. Marking time, forward march and halt.
8. Changing step, formation of squad and squad drill.
9. Command and control, organization, badges of rank, honours and awards 10. NationBuilding- cultural heritage, religions, traditions and customs of India. National integration.
11. Values and ethics, perception, communication, motivation, decision making, discipline and duties of good citizen.
12. Leadership traits, types of leadership. Character/personality development.
13. Civil defense organization, types of emergencies. fire fighting. protection.
14. Maintenance of essential services, disaster management, aid during development projects.

15. Basics of social service, weaker sections of society and their needs, NGO's and their contribution. contribution of youth towards social welfare and family planning.
16. Structure and function of human body, diet and exercise, hygiene and sanitation.
17. Preventable diseases including AIDS, safe blood donation, first aid, physical and mental health.
18. Adventure activities
19. Basic principles of ecology. environmental conservation, pollution and its control.
20. Precaution and general behaviour of girl cadets, prevention of untoward incidents, vulnerable parts of the body, self defense.

Semester I

Course title: Physical Education and Yoga Practices 2(0+2) AG-112C

1. Teaching of skills of Football - demonstration. practice of the skills, correction, involvement in game situation (For girls teaching of Tennikoit)
2. Teaching of different skills of Football - demonstration, practice of the skills, correction, involvement in game situation (For girls teaching of Tennikoit)
3. Teaching of advance skills of Football - involvement of all the skills in game situation with teaching of rules of the game
4. Teaching of skills of Basketball - demonstration, practice of the skills, correction of skills, involvement in game situation
5. Teaching of skills of Basketball - demonstration, practice of the skills, involvement in game situation
6. Teaching of skills of Basketball - involvement of all the skills in game situation with teaching of rule of the game
7. Teaching of skills of Kabaddi - demonstration, practice of the skills, correction of skills, involvement in game situation
8. Teaching of skills of Kabaddi - demonstration, practice of the skills, correction of skills, involvement in game situation
9. Teaching of advance skills of Kabaddi - involvement of all the skills in game situation with teaching of rule of the game
10. Teaching of skills of Ball Badminton - demonstration, practice of the skills, correction of skills, involvement in game situation
11. Teaching of skills of Ball Badminton - involvement of all the skills in game situation with teaching of rule of the game
12. Teaching of some of Asanas - demonstration, practice, correction and practice
- 13.

Teaching of some more of Asanas - demonstration_ practice, correction and practice

14. Teaching of skills of Table Tennis - demonstration, practice of skills, correction and practice and involvement in game situation
15. Teaching of skills of Table Tennis - demonstration, practice of skills, correction and practice and involvement in game situation
16. Teaching of skills of Table Tennis - involvement of all the skills in game situation with teaching of rule of the game
17. Teaching - Meaning, Scope and importance of Physical Education
18. Teaching - Definition, Type of Tournaments
19. Teaching - Physical Fitness and Health Education
20. Construction and laying out of the track and field

(*The girls will have Tennikoit and Throw Ball).

1. Teaching of skills of Hockey - demonstration practice of the skills and correction.
2. Teaching of skills of Hockey - demonstration practice of the skills and correction. And involvement of skills in games situation
3. Teaching of advance skills of Hockey - demonstration practice of the skills and correction. Involvement of all the skills in games situation with teaching of rules of the game
4. Teaching of skills of Kho-Kho - demonstration practice of the skills and correction.
5. Teaching of skills of Kho-Kho - demonstration practice of the skills and correction. Involvement of the skills in games situation
6. Teaching of advance skills of Kho-Kho - demonstration practice of the skills and correction. Involvement of all the skills in games situation with teaching of rules of the game
7. Teaching of different track events - demonstration practice of the skills and correction.
8. Teaching of different track events - demonstration practice of the skills and correction.
9. Teaching of different track events - demonstration practice of the skills and correction with competition among them.
10. Teaching of different field events - demonstration practice of the skills and correction.
11. Teaching of different field events - demonstration practice of the skills and correction.
12. Teaching of different field events - demonstration practice of the skills and correction.

13. Teaching of different field events - demonstration practice of the skills and correction with - competition among them.
14. Teaching of different asanas - demonstration practice and correction.
15. Teaching of different asanas - demonstration practice and correction.
16. Teaching of different asanas - demonstration practice and correction,
17. Teaching of different asanas - demonstration practice and correction.
18. Teaching of weight training - demonstration practice and correction.
19. Teaching of circuit training - demonstration practice and correction.
20. Teaching of calisthenics - demonstration practice and correction.

Note:

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

Semester II

Human Values and Ethics 1(1+0) AG-210

Theory

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

Semester VI

Educational Tour 2(0+2) AGT-99

DEPARTMENT OF ENGLISH

Course Code	Course Title	Credit Hours
AG-108	Comprehension and Communication Skills in English	2(1+1)

ENGLISH

AG-108 Comprehension and Communication Skills in English 2(1+1)

Theory

War Minus Shooting- The sporting Spirit. A Dilemma- A layman looks at science Raymond B. Fosdick. You and Your English - Spoken English and broken English G.B. Shaw. Reading Comprehension, Vocabulary- Antonym, Synonym, Homophones, Homonyms. often confused words. Exercises to Help the students in the enrichment of vocabulary based on TOEFL and other competitive examinations. Functional grammar: Articles, Prepositions, Verb, Subject verb Agreement, Transformation, Synthesis. Direct and Indirect Narration. Written Skills: Paragraph writing, Precise writing, Reportwriting and Proposal writing. The Style: Importance of professional writing. Preparation of Curriculum Vitae and Job applications. Synopsis Writing. Interviews: kinds. Importance and process.

Practical

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

DEPARTMENT OF AGRONOMY

Course Code	Course Title	Credit Hours
AG-101	Fundamentals of Agronomy	3(2+1)
AG-205	Principles of Organic Farming	2(1+1)
AG-301	Crop Production Technology-I (<i>Kharif Crops</i>)	2(1+1)
AG-302	Practical Crop Production-I (<i>Kharif Crops</i>)	2(0+2)
AG-401	Crop Production Technology –II (<i>Rabi Crops</i>)	2(1+1)
AG-402	Practical Crop Production-II (<i>Rabi Crops</i>)	2(0+2)
AG-501	Rainfed and Dryland Agriculture	2(1+1)
AG-601	Farming System, Precision Farming and Sustainable Agriculture	2(1+1)
ELECTIVE COURSE		
AGE-63	Weed Management	3(2+1)
REMEDIAL COURSE		
AG-109	Agricultural Heritage	1(1+0)

Course wise Detailed Syllabus

1. **AG-101 Fundamentals of Agronomy** **3(2+1)**

Theory

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

Practical

Identification of crops, seeds, fertilizers, pesticides and tillage implements. Identification of weeds in crops, Methods of herbicide and fertilizer application. Study of yield contributing characters and yield estimation. Numerical exercises on fertilizer requirement, plant population. herbicides and water requirement, Study of soil moisture measuring devices, Measurement of irrigation water.

2. AG-301 Crop Production Technology-(Kharif Crops) 2(1+1)

Theory

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

Practical

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

3-Crop Production Technology-II (Rabi crops) 2(1+1) AG-401

Theory

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops; cereals - wheat, barley and oat, pulses-chickpea, lentil, peas. oilseeds-rape seed, mustard, linseed and sunflower; sugar crop-sugarcane; other crops-potato and tobacco. Forage crops-berseem, lucerne and oat.

Practical

Sowing methods of wheat and sugarcane, identification of weeds in rabi season crops. Numerical problems on seed requirement of rabi crop. Study of yield contributing characters of rabi season crops, study of important agronomic experiments of rabi crops at experimental farms. Study of rabi forage experiments, visit to research stations of related crops.

4. Farming System, Precision Farming and Sustainable Agriculture 2(1+1) AG-601

Theory

Farming System-scope, importance, and concept, Types and systems of farming system and factors affecting types of farming, Farming system components and their maintenance, Cropping system and pattern, multiple cropping system, Efficient cropping system and their evaluation, Sustainable agriculture-problems and its impact on agriculture. conservation agriculture strategies. HEIA, LELA and LEISA and its techniques for sustainability, Integrated farming system components of IFS and its advantages, farming system and environment.

Practical

- Tools for determining productions & efficiencies in cropping and farming systems.
- Indicators of sustainability of cropping & Farming systems
- Site specific development of IFS models for different agro-climatic zones.
- Visit of IFS models in different agro climatic zones of nearby state Universities/Institutes and farmer fields.

5- Practical Crop Production-1 (*Kharif Crops*) 2(0+2) AG-302

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.

6- Practical Crop Production-II (*Rabi Crops*) 2(0+2) AG-402

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.

7- Principles of Organic Farming 2(1+1) AG-205

Theory

Organic farming, principles and its scope in India; Initiatives taken by Government (central/state), NGOs and other organizations for promotion of organic agriculture. Organic 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: Certification process and standards of organic farming.

Practical

Visit of organic farms to study the various components and their utilization: Preparation of enrich compost, vermicompost, Indigenous technology knowledge (ITK) for nutrient, insect, pest disease and weed management; Cost of organic production system; Quality aspect, grading, packaging and handling.

8- Rainfed and Dryland Agriculture: 2(1+1) AG-501

Theory

Rainfed and dryland agriculture-Introduction types and history. Problems & prospects of rainfed agriculture in India. Soil and climatic conditions prevalent in rainfed areas. Drought: types, effect of water deficit on physical morphological characteristics of the plants. Mechanism of crop adoption under moisture deficit conditions. Efficient utilization of water through soil and crop management practices, management of crops in rainfed areas. Contingent crop planning for aberrant weather conditions. Precision agriculture; concepts and techniques: their issues and concerns for Indian agriculture.

Practical

Studies on climatic classifications, studies on rainfall pattern in rainfed areas of the country. Studies on cropping pattern of different dryland areas in the country and demarcation of dryland area on map of India. Interpretation of metrological data and scheduling of supplemental irrigations on the basis of evapo-transpiration demand of crops effective rainfall and its calculations. Visit to rainfed research stations/watersheds.

ELECTIVE COURSE

Weed Management 3(2+1) AGE-63

Theory

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

Practical

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

REMEDIAL COURSES

1. Agricultural Heritage 1(1+0) AG-109

Theory

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

DEPARTMENT OF GENETICS AND PLANT BREEDING

S. No.	Course Code	Course Title	Credit Hours
1	AG-102	Fundamentals of Genetics	3(2+1)
2	AG-201	Fundamentals of Crop Physiology	3(2+1)
3	AG-303	Fundamentals of Plant Breeding	3(2+1)
4	AG-403	Principles of Seed Technology	3(2+1)
5	AG-502	Crop Improvement-I (Kharif Crops)	2(1+1)
6	AG-602	Crop Improvement-II (Rabi Crops)	2(1+1)
ELECTIVE COURSE			
1	AGE-53	Commercial Plant Breeding	3(1+2)
REMEDIAL COURSE			
1	AG-110B	Introductory Biology	2(1+1)

Course wise Detailed Syllabus

1.Fundamentals of Genetics 3(2+1) AG-102

Theory

Pre and Post Mendelian concepts of heredity, Mendelian principles of heredity. Architecture of chromosome; special types of chromosomes. Chromosomal theory of inheritance; cell cycle and cell division - mitosis and meiosis. Chi-square test; Dominance relationships, epistatic interactions; 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 and numerical variations in chromosome and their implications, use of haploids, dihaploids and doubled haploids in Genetics. Mutation, classification, Methods of inducing mutations & CLB technique. mutagenic agents and induction of mutation. Qualitative & Quantitative traits. Polygenes and continuous variations, multiple factor hypothesis. Cytoplasmic inheritance. Genetic disorders. Nature, structure & replication of genetic material (DNA). Protein synthesis. Transcription and translational mechanism of genetic material. Gene concept: Gene structure, function and regulation.

Practical

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

2.Fundamentals of Crop Physiology 3(2+1) AG-201

Theory

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

Practical

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

3.Fundamentals of Plant Breeding 3(2+1) AG-303

Theory

Historical development, concept. nature and role of plant breeding, major achievements and future prospects; Genetics in relation to plant breeding, modes of reproduction and apomixes, self-incompatibility and male sterility-genetic consequences. Domestication, Acclimatization and Introduction: Centres of origin/diversity, components of Genetic variation; Heritability and genetic advance; Genetic basis and breeding methods in self-pollinated crops -mass and pure line selection, hybridization techniques and handling of segregating population; Multiline concept. Concepts of population genetics and Hardy Weinberg Law; Genetic basis and methods of breeding cross pollinated crops. modes of selection; Population improvement Schemes-Ear to row method, Modified Ear to Row. recurrent selection. Heterosis and inbreeding depression. development of inbred lines and hybrids, composite and synthetic varieties; Breeding methods in asexually propagated crops. clonal selection and hybridization: Maintenance of breeding records and data collection; Wide hybridization and pre-breeding; Polyploidy in relation to plant breeding. mutation breeding methods and uses; Breeding for important biotic and abiotic stresses; Biotechnological tools-DNA markers and marker assisted selection.

Practical

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

4.Principles of Seed Technology 3(2+1) AG-403

Theory

Seed and seed production technology: introduction, definition and importance. Deterioration causes of crop varieties and their control; Maintenance of genetic purity during seed production. Seed quality; Definition and Characters of good quality seed, different classes of seed. Foundation and certified seed production of important cereals, pulses, oilseeds, fodder and vegetables. Seed certification. phases of certification, procedure for seed certification, field inspection. Seed Act and Seed Act enforcement. Duty and powers of seed inspector, offences and penalties. Seeds Control Order 1983. Varietal identification through Grow Out Test. History and development of Seed Industry in India. Seed drying, processing and their steps, seed testing for quality assessment, seed treatment, its importance, method of application and seed packing. Seed storage; general principles, stages and factors affecting seed longevity during storage. Measures for pest and disease control during storage. Seed marketing, Private and public sectors and their production and marketing strategies.

Practical

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

5. Crop Improvement - I (Kharif Crops) 2(1+1) AG-502

Theory

Centers of origin. distribution of species. wild relatives in different cereals (Rice, Maize, Sorghum and Pearl millet); pulses (Pigeonpea, Urdbean and Mungbean); oilseeds (Groundnut); fiber (Cotton). Important concepts of breeding self pollinated and cross-pollinated. 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 and quality (physical, chemical, nutritional); Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeonpea.

Practical

Floral biology, emasculation and hybridization techniques in different crop species; viz., Rice, Maize, Sorghum, Pearl millet, Pigeonpea, Urdbean, Mungbean, Groundnut, Cotton crops. Maintenance breeding of different kharif crops. Study of field techniques for seed production and hybrid seeds production in Kharif crops; Estimation of heterosis. inbreeding depression and heritability; Layout of field experiments; Visit to seed production plots; Visit to AICRP plots of different field crops.

6. Crop Improvement - II (Rabi Crops) 2(1+1)

AG-602 Theory

Centers of origin, distribution of species, wild relatives in different crops: cereal (Wheat); pulses (Chickpea, Pea); oilseeds (Rapeseed and Mustard, Sunflower); cash crop (Sugarcane); vegetable crop (Potato, Tomato); Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional); Hybrid seed production technology of rabi crops. Ideotype concept and climate resilient crop varieties for future.

Practical

Floral biology, emasculation and hybridization techniques in different crop species namely Wheat, Chickpea, pea, Rapeseed Mustard, Sunflower, Tomato: Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods; Study of field techniques for seed production and hybrid seeds production in Rabi crops: Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments: Study of quality characters, study of donor parents for different characters; Visit to seed production plots; Visit to AICRP plots of different field crops.

ELECTIVE COURSE(S)

AGE-53 Commercial Plant Breeding

3(1+2)

Theory

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

Practical

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

REMEDIAL COURSE(S)

Introductory Biology 2(1+1) AG-110B

Theory

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

Practical

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

DEPARTMENT OF ENTOMOLOGY

S. No.	Course Code	Course Title	Credit
1	AG-203	Fundamentals of Entomology-I (Insect Morphology and Taxonomy)	3(2+1)
2	AG-312	Fundamentals of Entomology-II (Insect Ecology and concept of IPM)	2(1+1)
3	AG-503	Pests of Field Crops & Stored Grains and their Management	3(2+1)
4	AG-608	Beneficial Insects and Pest of Horticultural Crops and their Management	3(2+1)

Course wise Detailed Syllabus

1. Fundamentals of Entomology-I (Insect Morphology and Taxonomy)

Theory:

History of Entomology in India. Major points related to dominance of Insecta in Animal kingdom. Classification of phylum Arthropoda upto classes. Relationship of class Insecta with other classes of Arthropoda. Morphology: Structure and functions of insect cuticle and moulting. Body segmentation. Structure of Head, thorax and abdomen. Structure and modifications of insect antennae, mouth parts, legs, wing venation, modifications and wing coupling apparatus. Structure of male and female genital organs. Metamorphosis and diapause in insects. Types of larvae and pupae. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretary (Endocrine) and reproductive systems in insects. Types of reproduction in insects. Major sensory organs like simple and compound eyes and chemoreceptors. Systematics: Taxonomy--importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order. Classification of class Insecta upto Orders, basic groups of present day insects with special emphasis to orders and families of Agricultural importance like Orthoptera: Acrididae. Dictyoptera: Mantidae, Odonata; Isoptera: Termitidae; Thysanoptera: Thripidae; Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae. Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidac, Alcurodidac, Pseudococcidae; Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papiloinidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidac, Bruchidae, Scarabaeidae; Hymenoptera: Tenthridinidae, Apidae. Trichogrammatidae, ichneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae, Muscidae, Tephritidae.

Practical

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

2. Fundamentals of Entomology-II (Insect Ecology & concept of IPM) 2(1+1)AG-312

Theory

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.

IPM: Categories of pests. Concept & Philosophy of IPM, History of IPM in India and abroad, Practices, scope and limitations of IPM. Classification of insecticides, toxicity of insecticides and formulations of insecticides. Chemical control- importance, hazards and limitations. Recent methods of pest control, repellents, anti feed ants, hormones, pheromones, attractants, gamma radiation. Insecticides Act 1968- Important provisions, list of banned Insecticides in India. Plant protection equipment and application technique of pesticides. Symptoms of poisoning, first aid and antidotes. Survey, surveillance and forecasting of insect pests. Safety issues of pesticides uses.

Practical

Sampling techniques for estimation of insect population and damage. Insecticides and their formulations. Pesticide appliances and their maintenance.

3. Pests of field crops & Stored grains and their management 3(2+1) AG-503

Theory

General account on nature and type of damage by following insect pests arthropods pests. Scientific name, order, family, host range, distribution, biology and bionomics. Nature of damage, and management of major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests(mites) of various field crops. 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. Different types of grain storage structure used in Uttar Pradesh. Storage structure - Indigenous to modern. Precautions during the use of Chemical Insecticides in store grains.

Paddy: *Leptocorisa varicroms*, *Hieroglyphus Spp.*, *Nilaparvata lugens*, *Nephotetix, spp.*, *Mythimna separata*, *Orseolia oryzae*

Jowar Maize: *Atherigona soccata*

Sugarcane: *Scirpophaga spp*, *Pyrilla perpusilla*, *Chilo infuscatellus*, *Aleurolobus barodensis*, *Emmalocera depressella*

Cotton: *Pectinaphora gossypiella*, *Earias Spp*, *Sylepta derogata*, *Dysdercus Spp*, *Bemisia tabaci*, *Amrasca bigutulla*

Oilseeds: *Lipaphis erysimi*, *Athalia proxima*, *Bagrada Cruciferarum*, *Dasyneura*

Pulses: *Helicoverpa armigera*, *Agrotis Spp.*, *Etiella zinckenella*, *Clavigralla gibbosa*, *Exelastis atomosa*, *Melanagromyza obtusa*

Pests of Stored Grains: *Sitophilus oryzae*, *Trogoderma granarium*, *Sitotroga cerealella*, *Callosobruchus chinensis*.

Polyphagous pests: *Odontotermes obesus*, *Holotrichia consanguinea*, *Spilosoma obliqua*, *Spodoptera litura*, *Amsacta Spp*

Practical

Identification of different types of damage. Identification and study of life cycle and seasonal history of various insect pests attacking field crops and their produce. 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 go down. Identification of rodents and rodent control operations in godowns. Identification of birds and bird control operations in godowns. Determination of moisture content of grain. Methods of grain sampling under storage condition. Visit to Indian Storage Management and Research Institute, Hapur and Quality Laboratory. Department of Food. Delhi. Visit to nearest FCI godowns.

4. Beneficial Insects and pests of Horticultural crops and their management 3(2+1) AG-608

Theory

Types of silk worm, voltinism and biology of silk worm. Mulberry cultivation, mulberry varieties, methods of harvesting and preservation of leaves. Rearing of mulberry silkworm, rearing appliances, mounting and harvesting of cocoons. Pests and diseases of silkworm, management, and methods of disinfection. Importance of beneficial insects. bee keeping, pollinating plants and their cycle, bee biology, commercial methods of rearing, equipment used and seasonal management. Bee pasturage. bee foraging and communication. Insect pests and diseases of honeybee. Species of lac insect, morphology, biology. Host plant and lac production. Processing of lac - seed lac, button lac. shellac and lac- products. Identification of major parasitoids and predators commonly used in biological control. Important species of pollinator, weed killers, scavenger with their importance. Scientific name, order, family, host range, distribution, biology and bionomics. Nature of damage, and management of-

Tomato - *Helicoverpa armigera*, *Bemisia tabaci*, *Thrips tabaci*, *Liriomyza trifolii*

Brinjal - *Leucinodes orbonalis*, *Henosepilachna vigintioctopunctata*

Chilli - *Scirtothrips dorsalis*, *Polyphagotarsonemus latus*.

Cucurbits - *Bactrocera cucurbitae*, *Aulacophora foveicollis*.

Cole crops - *Plutella xylostella*, *Pieris brassicae*

Potato - *Phthorimaea operculella*.

Fruits - *Bactrocera rufomaculata*, *Amritodus atkinsoni*, *Drosicha mangiferae*,

Virachola isocrstes, *Diaphorina citri*, *Papilio demoleus*, *Cosmopolites sordidus*.

Practical

Identification of different types of damage. Identification and study of life cycle and seasonal history of various insect pests attacking horticultural crops - vegetable crops, fruit crops, plantation gardens, narcotics, spices & condiments. Visit to orchards and gardens. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Types of silkworm, voltinism and biology and rearing of silkworm and equipment. Honeybee species and castes of bees. Beekeeping appliances and seasonal management. Bee enemies and diseases. Bee pasturage, bee foraging and communication. Species of lac insect, host plant identification. Identification of other important pollinators, weed killers and scavengers. Visit to research and training institutions devoted to sericulture, beekeeping., lac culture and natural enemies.

DEPARTMENT OF AGRICULTURAL ECONOMICS

Course Code	Course Title	Credit Hours
	Compulsory Courses	
AG-204	Fundamentals of Agricultural Economics	2(2+0)
AG-305	Agricultural Finance and Co-operation	3(2+1)
AG-504	Agricultural Marketing, Trade and Prices	3(2+1)
AG-604	Farm Management, Production and Resource Economics	2(1+1)
	Elective Course	
AGE-51	Agri-business Management	3(2+1)

Course wise Detailed Syllabus

1. Fundamentals of Agricultural Economics 2(2+0) AG-204

Theory

Economics: meaning, scope and subject matter, definitions, activities, approaches to economic analysis; micro and macro-economics, positive and normative analysis. Nature of economic theory: rationality assumption, concept of equilibrium. Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare. Agricultural economics: meaning, definition, characteristics of agriculture, importance and its role in economic development. Agricultural planning and development in the country, Demand: meaning, law of demand, demand schedule and demand curve, determinants, utility theory: law of diminishing marginal utility, equi-marginal utility principle. Consumer's equilibrium and derivation of demand curve, concept of consumer surplus. Elasticity of demand: concept and measurement of price elasticity, income elasticity and cross elasticity. Production: process, creation of utility, factors of production, input-output relationship. Supply: Stock v/s supply, law of supply, supply schedule, supply curve, determinants of supply, elasticity of supply. Basic features of perfectly competitive and imperfect markets, Concepts of rent, wage, interest and profit; National Income: meaning and importance, concepts of national income accounting. Population: importance, natural and socio-economic determinants. Money: meaning and functions of money, classification of money, money supply, inflation and deflation. Tax: meaning, direct and indirect taxes, agricultural taxation, VAT, Economic systems: important features of capitalistic, socialistic and mixed economies.

2. Agricultural Finance and Co-operation 3(2+1) AG-305

Theory

Agricultural Finance: meaning, scope and significance, credit needs and its role in Indian agriculture. Agricultural credit: meaning, definition, need, classification. Credit analysis; 3R's, 3C's and 7P's of credit. Sources of agricultural finance: institutional and non-institutional sources, commercial banks, social control and nationalization of commercial banks, RRBs. Micro financing including KCC, SHGs, Lead bank scheme, Crop Insurance Scheme, Scale of finance and unit cost, Cost of credit. An introduction to higher financing institutions – RBI, NABARD, Insurance and Credit Guarantee Corporation of India, Recent development in agricultural credit, Preparation and analysis of financial statements - Balance Sheet and Income Statement, Basic guidelines for preparation of project reports- Bank norms - SWOT analysis,

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

Practical

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

3. Agricultural Marketing, Trade and Prices 3(2+1) AG-504

Theory

Agricultural Marketing: concepts and definitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation. classification and characteristics of agricultural markets; 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; Marketing process: concentration, dispersion and equalization; Marketing functions: exchange functions - buying and selling; physical functions - storage, transportation and processing; facilitating functions - packaging, branding, grading, quality control and labeling (AGMARK); Types and importance of agencies/functionaries involved in agricultural marketing; Meaning and definition of marketing channel; number of channel levels; marketing channels for different farm products; Meaning, definition and types of market integration; marketing efficiency; marketing costs, margins and price spread, factors affecting costs of marketing, reasons for higher marketing costs of farm commodities; ways of reducing marketing costs; Role of Government in agricultural marketing: Public Sector Institutions- CWC, SWC, FCI, CACP & DMI - their objectives and functions; Farmer Producer Organization(FPO); cooperative marketing in India; Meaning and functions of price, administered prices, need for agricultural price policy; Concept of International Trade and its need, present status and prospects of international trade in agri-commodities; GATT and WTO; Agreement on Agriculture (AoA).

Practical

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

4. Farm Management, Production and Resource Economics 2(1+1) AG-604

Theory

Meaning and concept of farm management, objectives and relationship with other sciences, Meaning and definition of farms, its types and characteristics, Type and systems of farming, factors affecting types of farming, Principles of farm management: concept of production function and its type, law of diminishing marginal returns, returns to scale, factor product, factor-factor and product-product relationship, law of equi-marginal or principles of opportunity cost and law of comparative advantage. Meaning and concept of cost, types of costs and their interrelationship, importance of cost in managing farm business and estimation of gross farm income, net farm income, family labor income and farm business income. Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises. Importance of farm records and accounts in managing a farm, farm inventory, balance sheet, profit and loss accounts. Meaning, need and importance of farm planning and budgeting, partial and complete budgeting, steps in farm planning. Linear programming: meaning, assumptions, prerequisites, advantages. Concept of risk and uncertainty occurs in agriculture production, nature and sources of risks, Concepts of resource economics, unique properties of natural resources, Positive and negative externalities in agriculture.

Practical

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

ELECTIVE COURSE(S)

1. Agri-business Management 3(2+1) AGE-51

Theory

Transformation of agriculture into agribusiness, various stakeholders and components of agribusiness systems, Importance of agribusiness in the Indian economy and New Agricultural Policy, Distinctive features of Agribusiness Management: Importance and needs of agro-based industries, Classification of industries and types of agro-based industries, Institutional arrangement: procedures to set up agro-based industries, Constraints in establishing agro-based industries. Agri-value chain: Understanding primary and support activities and their linkages, Business environment: PEST & SWOT analysis. Management functions: Roles & activities,

Organization culture, Planning: meaning, definition, types of plans. Purpose or mission, goals or objectives, Strategies, policies procedures, rules, programs and budget. Components of a business plan, Steps in planning and implementation, Organization staffing, directing and motivation, Ordering, leading, supervision, communications, Control, Capital Management and Financial management of Agribusiness, Financial statements and their importance, Marketing Management: Segmentation, targeting & positioning, Marketing mix and marketing strategies, Product Life Cycle (PLC), Sales & Distribution Management, Pricing policy, various pricing methods, Project Management definition, project cycle, identification, formulation, appraisal, implementation, monitoring and evaluation, Project Appraisal and evaluation techniques.

Practical

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

DEPARTMENT OF STATISTICS, COMPUTER APPLICATION AND IPR

Course Code	Course Title	Credit Hours
Compulsory Courses		
AG-309	Statistical Methods	2(1+1)
AG-410	Agri-informatics	2(1+1)
AG-509	Intellectual Property Rights	1(1+0)
Remedial Course(s)		
AG- 111B	Elementary Mathematics	2(2+0)

1. Statistical Methods 2(1+1) AG-309

Theory

Introduction to Statistics: Definitions, Aims, Limitations and its Applications in Agriculture, Classification and Tabulation, Diagrammatic and Graphical Representation of Data, Measures of Central Tendency: Mean, Median, Mode; Measures of Dispersion: Range, Mean Deviation, Standard Deviation, Variance, Coefficient of Variation and Standard Error of Mean(S.E.); Definition and Types of Correlation, Scatter Diagram, Karl Pearson's Coefficient of Correlation, Regression, Two Lines of Regression, Regression Coefficient and its Properties, Relationship between Correlation Coefficient and Regression Coefficient. Test of Significance: Introduction to Test of Significance, Concept of Random Sample and Statistic, Test of Significance based on Z, t, F and Chi-Square (χ^2) Statistics, Chi-Square (χ^2) test of Goodness of Fit, Test of Independence of Attributes in 2x2 Contingency Table. Introduction to Analysis of Variance, Analysis of One Way and Two Way Classification, Introduction to Sampling Methods, Simple Random Sampling with and without replacement, Use of Random Number Tables for selection of Random Sample.

Practical

Diagrammatic and Graphical representation of data, Measures of Central Tendency: Computation of Arithmetic mean, Median and Mode for Ungrouped and Grouped data. Measures of Dispersion: Computation of Mean deviation, Standard deviation, Variance and Coefficient of Variation for Ungrouped and Grouped data. Calculation of Correlation Coefficient and Determination of Regression Line, Calculation based on t, Z, F test, Chi Square (χ^2) test of Goodness of Fit, Chi-Square(χ^2) test of Independence of Attributes in 2x2 contingency table, Analysis of Variance for One Way and Two Way Classification.

2. Agri-informatics 2(1+1) AG-410

Theory

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

e-Agriculture, concepts and applications, Use of ICT in Agriculture, Computer controlled devices (automated systems) for Agri-input management, Smartphone Apps in Agriculture for farm advises, market price, Post-harvest management etc; Geospatial technology for generating valuable agri information, Decision support systems, concepts, components and applications in Agriculture, Agriculture Expert System, Soil Information Systems etc for supporting Farm decisions.

Practical

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

3. Intellectual Property Rights 1(1+0) AG-509

Theory

Introduction and meaning of intellectual property, brief introduction to GATT, WTO, TRIPS and WIPO, Types of Intellectual Property and legislations covering IPR in India: Patents, Copyrights, Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets, Patents Act 1970 and Patent system in India, Origin and history including a brief introduction to UPOV for protection of plant varieties, Protection of plant varieties under UPOV and PPV&FR Act of India, Plant breeder's rights, Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights.

REMEDIAL COURSE

5. Elementary Mathematics 2(2+0) AG-111B

Theory

Straight lines: Distance Formula, Section Formula (internal and external division), Equation of co-ordinate axes, Equation of lines parallel to axes, Two point form of equation of line, Normal form of equation of line, Point of intersection of two straight lines, Angles between two straight lines, Parallel lines. Circle: Equation of circle whose center and radius is known, general equation of a circle, Equation of circle passing through three given points, Equation of circle whose diameters is line joining two points (X_1, Y_1) & (X_2, Y_2) . Differential & Integral Calculus: Definition, limit and continuity of a function, Simple problems on limit and continuity, Differentiation of x^n , e^x , a^x , $\log x$ & $\sin x$, $\cos x$, $\tan x$, $\cot x$, $\sec x$ & $\operatorname{cosec} x$ from first principle, Derivatives of sum, difference, product and quotient of two functions, Differentiation of functions of functions (Simple problem based on it), Logarithmic differentiation (Simple problem based on it), Differentiation by substitution method (Simple problems based on it). Integration of simple functions, Integration by Parts: Integration of Product of two functions, Integration by substitution method. Determinants and Matrices: Introduction of determinants, Properties of determinants up to 3rd order and their evaluation, Definition of Matrices, type of Matrices and properties, Addition, Subtraction, Multiplication, Transpose and Inverse of a matrix up to 3rd order.

AGRICULTURAL ENGINEERING

Course Code	Course Title	Credit Hours
AG-306	Farm Machinery and Power	3(2+1)
AG-406	Renewable Energy and Green Technology	2(1+1)
AG-505	Protected Cultivation and Secondary Agriculture	3(2+1)
Elective Course(s)		
AGE 61	Protected Cultivation	3(2+1)
AGE 64	System Simulation and Agro-advisory	3(2+1)

1. Farm Machinery and Power 2(1+1) AG-306

Theory

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

Practical

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

2. Renewable Energy and Green Technology 2(1+1) AG-406

Theory

Classification of energy sources, contribution of these of sources in agricultural sector,

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

Practical

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

3. Protected Cultivation and Secondary Agriculture 3 (2+1) AG-505

Theory

Green house technology: Introduction, Types of Green Houses: Plant response to Green house environment, Planning and design of greenhouses. Design criteria of green house for cooling and heating purposes. Green house equipments, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying. Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals. pulses and oilseed, their application in PHT equipment design and operation. Drying and dehydration; moisture measurement, EMC, drying theory, various drying method. commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer. recirculatory dryer and solar dryer). Material handling equipment: conveyer and elevators, their principle, working and selection.

Practical

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

ELECTIVE COURSE(S)

1. Protected Cultivation 3(2+1) AGE-61

Theory

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

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

Practical

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

2.System Simulation and Agro advisory 3(2+1) AGE-64

Theory

System Approach for representing soil-plant-atmospheric continuum, system boundaries, Crop models, concepts & techniques, types of crop models, data requirements. relational diagrams. Evaluation of crop responses to weather elements; Elementary crop growth models; calibration, validation, verification and sensitivity analysis. Potential and achievable crop production- concept and modelling techniques for their estimation. Crop production in moisture and nutrients limited conditions; components of soil water and nutrients balance. Weather forecasting, types, methods, tools & techniques, forecast verification: Value added weather forecast, ITK for weather forecast and its validity; Crop-Weather Calendars; Preparation of agro-advisory bulletin based on weather forecast. Use of crop simulation model for preparation of Agro-advisory and its effective dissemination.

Practical

Preparation of crop weather calendars. Preparation of ago-advisories based on weather forecast using various approaches and synoptic charts. Working with statistical and simulation models for crop growth. Potential & achievable production: yield forecasting, insect& disease forecasting models. Simulation with. limitations of water and nutrient management options. Sensitivity analysis of varying weather and crop management practices. Use of statistical approaches in data analysis and preparation of historical, past and present meteorological datafor medium range weather forecast. Feedback from farmers about the agro advisory.

DEPARTMENT OF SOIL CONSERVATION

Course Code	Course Title	Credit Hours
AG-106	Introduction to Forestry	2(1+1)
AG-308	Environmental Studies and Disaster Management	2(1+1)
AG-310	Fundamental of Soil and Water Conservation	2(1+1)
AG-409	Introductory Agro-meteorology & Climate Change	2(1+1)
AG-607	Watershed and Wasteland Management	2(1+1)

Course wise Detailed Syllabus

1. Introduction to Forestry (New) 2(1+1) AG-106

Theory

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, 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; 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.

Practical

Identification of tree-species. Diameter measurements using calipers and tape. Volume measurement of logs using various formulae. Nursery lay out, seed sowing, vegetative propagation techniques. Forest plantations and their management. Visits of nearby forest based industries.

2. Environmental Studies and Disaster Management 2(1+1) AG-308

Theory

Multidisciplinary nature of environmental studies Definition, scope and importance. Natural Resources: Renewable and non-renewable resources. Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation. case studies. Timber extraction, mining. dams and their effects on forest and tribal people. b) Water resources: Use and over utilization of surface and ground water. floods. drought. conflicts over water, dams benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture. Fertilizer pesticide problems, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources. Case studies. f) Land resources: Land as a resource, land degradation, man-induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem. Producers, consumers and decomposers, Energy flow in the ecosystem. Ecological succession, Food chains. food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries), Biodiversity and its conservation: - Introduction, definition, genetic, species & ecosystem diversity and biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global. National and local levels. India as a mega-diversity nation. Hotspots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Environmental Pollution: definition, cause, effects and control measures of: a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution 1. Thermal pollution g. Nuclear hazards. Solid Waste Management: causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Social Issues and the Environment: Water conservation, rain water harvesting, watershed management. Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, dies, Wasteland reclamation, Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness. Human Population and the Environment: population growth, variation among nations, population explosion, Family Welfare Programme. Environment and human health: Human Rights, Value Education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health.

Disaster Management: Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions,

Heat and cold waves, Climatic change: global warming, ozone depletion. Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters. building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste, water pollution. Disaster Management-Effect to migrate natural disaster at national and global levels. International strategy for disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of N(it)s, community - based organizations and media. Central, state, district and local administration.

Practical

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

3. Fundamental of Soil and Water Conservation 3(2+1) AG-310

Theory

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

Practical

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

4. Introductory Agro-meteorology & Climate Change 2(1+1) AG-409

Theory

Meaning and scope of agricultural meteorology; Earth atmosphere- its composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze; Nature and properties of solar radiation. solar constant, depletion of solar radiation, short wave. longwave and thermal radiation, net radiation, albedo: Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature, Energy balance of earth; Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog. mist, frost, cloud; Precipitation. process of precipitation types of precipitation such as rain. snow. sleet, and hail, cloud formation and classification: Artificial rainmaking. Monsoon-mechanism and importance in Indian agriculture, Weather hazards - drought, floods, frost, tropical

cyclones and extreme weather conditions such as heat-wave and cold-wave. Agriculture and weather relations; Modifications of crop microclimate, climatic normals for crop and livestock production. Weather forecasting types of weather forecast and their uses. Climate change. climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture.

Practical

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

5. Watershed and wasteland Management 2(1+1) AG-607

Theory

Watershed management - Concept need, principles & components of watershed management integrated watershed management. Factors effecting watershed management runoff & soil loss management in a watershed socio-economic concept of watershed. Peoples participation in watershed management Policy approaches & management plan, problems of watershed management. Wasteland management - Definition, concept & types of degraded & wasteland. Distribution & extent of watershed in India & Uttar Pradesh. factors responsible for land degradation, characteristics of different types of degradation & wasteland. Problems of degraded land in Uttar Pradesh. Appropriate techniques for management of different types of degraded & wasteland.

Practical

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

DEPARTMENT OF PLANT PATHOLOGY

Course Code	Course Title	Credit Hours
AG-206	Fundamentals of Plant Pathology	4(3+1)
AG-307	Principles of Integrated Disease Management	3(2+1)
AG-506	Diseases of Field & Horticultural Crops and their Management-I	3(2+1)
AG-605	Diseases of Field & Horticultural Crops and their Management-II	3(2+1)

Course wise Detailed Syllabus

1. Fundamentals of Plant Pathology 4(3+1) AG-206

Theory

Introduction: Importance of plant diseases, scope and objective of Plant Pathology. History of

Plant Pathology with special reference to Indian work. Terms and concept in Plant Pathology. Pathogenesis. diseases triangle and tetrahedron and classification of plant diseases. Important Plant pathogenic organism fungi. bacteria. fastidious vesicular bacteria. Phytoplasmas, Spiroplasmas, viruses. viroids, algae. protozoa, phanerogamic parasite and nematodes with example of diseases caused by them. Diseases due to abiotic causes.

Fungi: general character, definition of fungus, somatic structures, type of fungus 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. Study the life cycle of following genera *Phytophthora*, *Albugo*, *Erysiphae*, *Puccinia*, *Mucor*, *Alternaria*, *Colletotrichum*, *Ustilago* and *Fusarium*.

Bacteria and mollicutes: general morphological characters, basic methods reproduction.

Viruses: nature of properties, structure and transmission. Study of phanerogamic plant parasites.

Nematodes: General morphological characters and importance of plant nematodes (*Heterodera*, *Meloidogyne*, *Anguina*).

Epidemiology: Factors affecting disease development.

Practical

Acquaintance with various laboratory equipments and microscopy. Collection and preservation of disease specimen. Preparation of media, isolation and koch's postulates. General study of different structure of fungi, study of symptoms of various plant diseases.

Study of representative fungal genera. Staining and identification of plant pathogenic bacteria. Study of phanerogamic plant parasites. Identification of plant parasitic nematodes.

2. Principles of Integrated Disease Management 3(2+1) AG-307

Theory

Categories of diseases, IDM: Introduction, history, importance, concepts, principles and tools of IDM. Economic importance of diseases and Methods of detection and diagnosis of 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. Survey surveillance and forecasting of diseases. Safety issues in fungicide uses. Political, social and legal implication of IDM.

Practical

Methods of diagnosis and detection of plant diseases, Methods of plant disease measurement, Assessment of crop yield losses, calculations based on economics of IDM, Identification of biocontrol agents, different predators and natural enemies. Identification and nature of damage of important diseases and their management. Plan & assess preventive strategies (IDM module) and decision making, crop monitoring attacked by diseases Farmersfields visit.

3. Diseases of Field and Horticultural Crops & their Management-I 3(2+1) AG-506

Theory

Symptoms, etiology, disease cycle and management of major diseases of following crops: Field Crops: Rice: Blast, Brown spot, Bacterial Blight. Sheath blight, false smut, Khaira and tungro; Maize: downy mildew.; Sorghum: smuts; Bajra: downy mildew and ergot; Groundnut: early and late leaf spots; Pigeonpea: wilt and sterility mosaic; Green gram: Cercospora leaf spot, web blight and yellow mosaic; Tobacco: Mosaic. Horticultural Crops: Guava: wilt and anthracnose; Banana: Panama wilt, and bunchy top; Papaya: foot rot and leaf curl. Cruciferous vegetable: Alternaria leaf spot and black rot; Brinjal: sclerotinia and little leaf; Tomato: late blight, leaf curl; Okra: Yellow Vein Mosaic; Beans: Anthracnose and bacterial blight; ginger: soft rot; Colocasia: Phytophthora blight.

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 10 pressed and well-mounted specimens.

4. Diseases of Field and Horticultural Crops & their Management-II 3(2+1) AG-605 Theory

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

Field Crops: Wheat: Rusts, loose smut and ear cockle. Sugarcane: red rot, smut and grassy shoot. Sunflower: Sclerotinia stem rot and Alternaria blight. Mustard: Alternaria blight, white rust; Gram: wilt and Ascochyta blight; Lentil: Rust and wilt; Cotton: Vascular wilt and black arm; Pea: Downy mildew, powdery mildew and rust. Horticultural Crops: Mango: Anthracnose, malformation; Citrus: canker; Grape vine: Downy mildew powdery mildew; Apple: scab and Fire blight; Peach: leaf curl; Cucurbits: downy mildew, powdery mildew; Onion and garlic: purple blotch and stem phylium blight; Chilli: anthracnose and leaf curl; Turmeric: leaf spot; Coriander; stem gall; Marigold: Botrytis blight; Rose: dieback. powdery mildew; Potato: Early and late blight, Common scab.

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 10 pressed and well- mounted specimens.

DEPARTMENT OF HORTICULTURE

Course Code	Course Title	Credit Hours
AG-104	Fundamentals of Horticulture	2(1+1)
AG-207	Production Technology for Vegetable and Spices	2(1+1)
AG-407	Production Technology for Ornamental crops, MAPs and Landscaping	2(1+1)
AG-507	Production Technology for Fruit and Plantation Crops	2(1+1)
AG-606	Post-harvest management and value Addition of fruits and vegetables	2(1+1)
ELECTIVE COURSE(S)		
AGE-54	Landscaping	3(2+1)
AGE-62	Hi-Tech Horticulture	3(2+1)

1. Fundamentals of Horticulture 2(1+1) AG-104

Theory

Horticulture-Its definition and branches, importance and scope; horticultural and botanical classification; climate and soil for horticultural crops; Plant propagation-methods and propagating structures; principles of orchard establishment; Principles and methods of training and pruning, juvenility and flower bud differentiation; unfruitfulness; pollination, pollinizers and pollinators; fertilization and parthenocarpy; use of plant bioregulators in horticulture, irrigation and fertilizers applications-method and quality.

Practical

Identification of garden tools. Identification of horticultural crops. Preparation of seed bed/nursery bed. Practice of sexual and asexual methods of propagation Layout and planting or orchard plants. Training and pruning of fruit trees transplanting and care of vegetable seedlings making of herbaceous and shrubbery borders. Preparation of potting mixture potting and repotting. Fertilizer application in different crops. Visits to commercial nurseries/orchard

2. Production Technology for Vegetable and Spices 2 (1+1)

Theory

Importance of vegetables & spices in human nutrition and national economy, vegetable gardening. Brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders of important vegetables and spices (Tomato, Brinjal, Chilli, Capsicum, Cucumber, Melons, Gourds, Pumpkin); Cole crops such as Cabbage, Cauliflower; Bulb crops such as Onion, Garlic; Root crops such as Carrot, Radish; Okra; Leafy vegetables such as Amaranth, Palak; Spices such as Black pepper, Fenugreek, Fennel & Cumin. .

Practical

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

3. Production Technology for Ornamental Crops, MAPS and Landscaping 2(1+1) AG-407

Theory

Importance and scope of ornamental crops. medicinal and aromatic plants and landscaping. Principles of landscaping. Landscape uses of trees, shrubs and climbers. Style of gardening and lawn making and maintenance. Production technology of important cut flowers like rose, Gerbera, carnation, liliium and orchids under protected conditions and gladiolus, marigold and jasmine under open conditions. Production technology of important medicinal plants like- Isabgol, Ashwagandha, Asparagus, Aloe and aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, geranium, vetiver, Processing and value edition in ornamental

Practical

Identification of Ornamental plants. Identification of Medicinal and Aromatic Plants. Nursery bed preparation and seed sowing. Training and pruning of Ornamental plants. Planning and layout of garden. Bed preparation and planting of MAP. Protected structures - care and maintenance. Intercultural operations in flowers and MAP. Harvesting and post harvest handling of cut and loose flowers extraction of essentials oils.

4. Production Technology for Fruit and Plantation Crops 2(1+1) AG-507

Theory

Importance and scope of fruit and plantation crop industry in India; High density planting; Use of rootstocks; Production technologies for the cultivation of major fruits-mango, banana, citrcus, grape, guava, Litchi, papaya, apple, pear, peach and; minor fruits-pineapple, pomegranate, jackfruit, strawberry. nut crops; plantation crops-coconut, arecanut, cashew, tea, coffee & rubber

Practical

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

5. Post-harvest Management and Value Addition of Fruits and Vegetables 2(1+1) AG-606

Theory

Importance of post harvest technology of fruits, vegetables and ornamental crops. Extent and possible causes of post harvest losses; Pre- harvest factors affecting postharvest quality, maturity and self life of fruits, vegetables and ornamental crops. Ripening and changes occurring during ripening; Respiration and factors affecting respiration rate; role of ethylene; post harvest disease and disorders; heat, chilling and freezing injury; harvesting and field handling; Storage (ZECC, cold storage, CA, MA, and hypobaric); Value addition concept; Principles and methods of preservation; Intermediate moisture food- Jam, jelly, marmalade, preserve, candy - Concepts and Standards; Fermented and non-fermented beverages. Tomato products-Concepts and Standards, Drying/Dehydration of fruits and vegetables - Concept and methods, osmotic drying. Canning - Concepts and Standards, packaging of products.

Practical

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

ELECTIVE COURSES

Landscaping 3(2+1) AGE-54

Theory

Importance and scope of landscaping. Principles of landscaping, garden styles and types. terrace gardening, vertical gardening. garden components, adornments, lawn making. rockery. water garden. walk-paths, bridges, other constructed features etc. gardens for special purposes. Trees: selection. propagation. planting schemes, canopy management, shrubs and herbaceous perennials: selection. propagation, planting schemes, architecture. Climber and creepers: importance, selection, propagation, planting, Annuals: selection, propagation, planting scheme. Other garden plants: palms, ferns, grasses and cacti succulents. Pot plants: selection. arrangement, management. Bio-aesthetic planning: definition. need, planning: landscaping of urban and rural areas, Peri- urban landscaping, Landscaping of schools, public places like bus station, railway station, townships, river banks, hospitals, play grounds, airports. industries, institutions. Bonsai: principles and management, lawn: establishment and maintenance. CAD application.

Practical

Identification of trees, shrubs, annuals, pot plants; Propagation of trees, shrubs and annuals, care and maintenance of plants. potting and repotting, identification of tools and implements used in landscape design, training and pruning of plants for special effects, lawn

establishment and maintenance, layout of formal gardens, informal gardens, special type of gardens (sunken garden, terrace garden, rock garden) and designing of conservatory and lathe house. Use of computer software, visit to important gardens/ parks/ institutes.

ELECTIVE COURSE(S)

Hi-tech. Horticulture 3(2+1) AGE-62

Theory

Introduction & importance; Nursery management and mechanization; micro propagation of horticultural crops; Modern field preparation and planting methods. Protected cultivation: advantages, controlled conditions, method and techniques, Micro irrigation systems and its components; EC, pH based fertilizer scheduling, canopy management, high density orcharding. Components of precision farming: Remote sensing. Geographical Information System (GIS), Differential Geo- positioning System (DGPS), Variable Rate applicator (VRA), application of precision farming in horticultural crops (fruits, vegetables and ornamental crops); mechanized harvesting of produce.

Practical

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

DEPARTMENT OF AGRICULTURAL EXTENSION

Course Code	Course Title	Credit Hours
AG-105	Rural Sociology & Educational Psychology	2(1+1)
AG-208	Fundamentals of Agricultural Extension Education	3(2+1)
AG-408	Entrepreneurship Development and Business Communication	2(1+1)
AG-508	Communication Skills and Personality Development	2(1+1)
ELECTIVE COURSE(S)		
AGE-65	Agricultural Journalism	3(2+1)
NON-GRADIAL COURSE		
AG-210	Human Values and Ethics	1(1+0)

1. Rural Sociology and Educational Psychology (AG-105) 2(1+1)

Theory

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

Practical

Conducting socio-economic survey of an assigned village, social composition, occupational distribution, leadership and working of rural institutions, study of Self- Help Groups methods of assessment of personality, sociometric matrices.

2. Fundamentals of Agricultural Extension Education (AG-208) 3(2+1)

Theory

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

trends in agriculture extension: privatization extension, cyber extension/ e extension, ICT, 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. transfer of technology: concept and models, capacity building of extension personnel; extension teaching methods: meaning, classification, individual, group and mass contact methods, Audio-visual aids.

Practical

To get acquainted with university extension system. Group discussion-exercise; handling and use of audio visual equipments and digital camera and LCD projector; preparation and use of A-V aids, preparation of extension literature – leaflet, booklet, folder, pamphlet news stories and success stories; Presentation skills exercise; micro teaching exercise; A visit to village to understand the problems being encountered by the villagers/ farmers; exposure to mass media: visit to community radio and television studio for understanding the process of programme production.

3. Entrepreneurship Development and Business Communication (AG-408) 2 (1+1)

Theory

Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs; SWOT Analysis & achievement motivation, Government policy and programs and institutions for entrepreneurship development. Developing Managerial skills, Business Leadership Skills (Communication, direction and motivation Skills), Problem solving skill, Supply chain management and Total quality management, Project Planning Formulation and report preparation;. extension administration: meaning and concept, principles and functions. Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programmes.

Practical

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

4. Communication Skills and Personality Development (AG-508) 2 (1+1)

Theory

Communication Skills: Structural and functional grammar; communication: meaning, definition and process; Principles and Functions of Communication, types of communication-verbal, non-verbal, formal, informal communication, models and barriers to communication, diffusion and adoption of innovation: concept and meaning, process and stages of adoption, adopter categories. listening and note taking, writing skills, oral presentation skills; field diary and lab

record; indexing, footnote and bibliographic procedures; individual and group presentations, impromptu presentation, public speaking; Group discussion. Organizing seminars and conferences.

Practical Listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures; individual and group presentations. script writing, writing for print and electronic media, developing script for radio and television.

4. Entrepreneurship Development and Business Communication(AG-408) 2 (1+1)

Theory

Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs; SWOT Analysis & achievement motivation, Government policy and programs and institutions for entrepreneurship development. Developing Managerial skills, Business Leadership Skills (Communication, direction and motivation Skills), Problem solving skill, Supply chain management and Total quality management, Project Planning Formulation and report preparation;. extension administration: meaning and concept, principles and functions. Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programmes.

Practical

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

ELECTIVE COURSE

5. Agricultural Journalism (AGE-65) 3(2+1)

Theory

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. The agricultural story: Types of agricultural stories, subject matter of the agricultural story, structure of the agricultural story. Gathering agricultural information: Sources of agricultural information, interviews, coverage of events, abstracting from research and scientific materials. Writing the story: Organizing the material, treatment of the story, writing the news lead and the body, readability measures.

Practical Practice in interviewing. Covering agricultural events. Abstracting stories from research and scientific materials. Writing different types of agricultural stories. Electing pictures and art work for the agricultural story. Practice in editing, copy reading, headline and title writing, proof reading, lay outting. Visit to a publishing office.

DEPARTMENT OF AGRICULTURAL CHEMISTRY & SOIL SCIENCE

Course Code	Course Title	Credit Hours
AG-103	Fundamentals of Soil Science	3(2+1)
AG-202	Fundamentals of Plant Biochemistry	3(2+1)
AG-304	Agricultural Microbiology	2(1+1)
AG-404	Problematic Soils and their Management	2(1+1)
AG-511	Geo-Informatics, Nano-Technology	2(1+1)
AG-603	Manures, Fertilizers and Soil Fertility Management	3(2+1)
ELECTIVE COURSE(S)		
AGE-52	Biopesticides** and Biofertilizers	3(2+1)
AGE-56	Agrochemicals	3(2+1)

***supported by Department of Plant Pathology*

1. Fundamentals of Soil Science 3(2+1) AG-103

Theory

Soil as a natural body, Pedological and edaphological concepts of soil; Soil genesis: soil forming rocks and minerals; weathering, processes and factors of soil formation; Soil Profile, components of soil; Soil physical properties: soil-texture, structure, density and porosity, soil colour, consistence and plasticity; Elementary knowledge of soil taxonomy. Classification of 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. Soil reaction-pH. EC, soil acidity and alkalinity, buffering, effect of pH on nutrient availability; soil colloids - inorganic and organic; silicate clays: constitution and properties; sources of charge; ion exchange, cation exchange capacity. base saturation; soil organic matter: composition, properties and its influence on soil properties; humic substances - nature and properties. Soil pollution-behaviour of pesticides 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 method. Determination of soil pH and electrical conductivity. Study of soil map. Estimation of organic matter content of soil. Estimation of CO₃ and HCO₃ in soil water.

2. Fundamentals of Plant Biochemistry 3(2+1) AG-202

Theory

Biochemistry-introduction, scope and Importance in agriculture. Carbohydrate: Importance and classification of Monosaccharides, Disaccharides and Polysaccharides. Lipid: Importance and classification; Structures and properties of fatty acids; lipids. Proteins: Importance of proteins and classification; Structures. Amino acid-definition, classification and important function. Structural organization of proteins. Enzymes: General properties; Classification; Mechanism of action; classification of vitamin structure role and its deficiency symptoms. Introduction to allosteric enzymes. Nucleic acids: Importance and classification; Structure of Nucleotides. Metabolism of carbohydrates: Glycolysis.

Practical

Qualitative tests of carbohydrates and amino acids. Quantitative estimation of glucose/proteins. Titration methods for estimation of amino acids/lipids, Paper chromatography Monosaccharides. Estimation of Ca, CaO and CaCO₃ in HCl extract. Estimation of reducing and non reducing in cane sugar and jaggery.

3. Agricultural Microbiology 2(1+1)AG-304

Theory

Introduction of Microbial world: Prokaryotic and eukaryotic microbes. Bacteria: cell structure, chemoautotrophy, photo autotrophy, growth. Role of microbes in soil fertility and crop production: Carbon, Nitrogen, Phosphorus and Sulphur cycles. Biological nitrogen fixation symbiotic, associative and a symbiotic. Azolla, blue green algae and mycorrhiza. Rhizosphere and phyllosphere. Microbes in human welfare: biofertilizers, biopesticides, biofuel production and biodegradation. Microbial degradation of organic matter in soil. Cellulose decomposing microbes for compost preparation & vermi compost. Soil organisms: macro and micro organisms, their beneficial and harmful effects.

Practical

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

4. Problematic Soils and their Management (New) 2(1+1) AG-404

Theory

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

Practical

Determination of pH & Ec in soil and water. Lime and gypsum requirement in soil, ESP and SAR in Soils. Application of remote sensing and GIS in delineating problematic soil in LIP. Visit problematic soil in U.P.

5. Geo-informatics and Nano-technology 2(1+1) AG-511

Theory

Geo-informatics- definition concepts, tool and techniques; their use in Precision Agriculture. Crop discrimination and yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies: Spatial data and their management in GIS; Remote sensing concepts and application in agriculture; Image processing and interpretation; Global positioning system (GPS), components and its functions; Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects, nano-particles, nano- pesticides, nano-fertilizers, nano-sensors. Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.

Practical

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

6. Manures, Fertilizers and Soil Fertility Management 3(2+1) AG-603

Theory

Introduction and importance of organic manures, properties and methods of preparation of bulky and concentrated manures. Green/leaf manuring. Fertilizer recommendation approaches. Integrated nutrient management. Chemical fertilizers: classification, composition and properties of major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, Complex fertilizers, nano fertilizers Soil amendments. Fertilizer Storage, Fertilizer Control Order. History of soil fertility and plant nutrition, criteria of essentiality, role, deficiency and toxicity symptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants. Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients. Soil fertility evaluation. Soil testing. Critical levels of different nutrients in soil. Forms of nutrients in soil, plant analysis. rapid plant tissue tests. Indicator plants. Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions.

Practical

Estimation of soil organic carbon, Estimation of available N available P, available K; available S available Ca and Mg and available Zn in soils. Estimation of N, P & K in plants. manures and fertilizers. Elementary idea of determination micro nutrients.

ELECTIVE COURSES

1. Biopesticides & Biofertilizers 3(2+1) AGE-52

Theory

History and concept of biopesticides. Importance, scope and potential of biopesticide. Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and biorationals. Botanicals and their uses. Mass production technology of bio-pesticides. Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes. Methods of application of biopesticides. Methods of quality control and Techniques of biopesticides. Impediments and limitation in production and use of biopesticide. Biofertilizers Introduction, status and scope. Structure and characteristic features of bacterial biofertilizers-Azospirillum, Azotobacter, Pseudomonas, Rhizobium and Frankia; Cyanobacterial biofertilizers- Anabaena, Nostoc, Hapalosiphon and fungal biofertilizers- AM mycorrhiza and ectomycorrhiza. Nitrogen fixation -Free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilization and phosphate mobilization, K solubilization. Production technology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertilizers. FCC) specifications and quality control of biofertilizers. Application technology for seeds, seedlings, tubers, sets etc. Biofertilizers -Storage, shelf life, quality control and marketing. Factors influencing the efficacy of biofertilizers.

Practical

Isolation and purification of important biopesticides: Trichoderma, Pseudomonas, Bacillus, Metarhizium etc. and its production. Identification of important botanicals. Visit to biopesticide laboratory in nearby area. Field visit to explore naturally infected cadavers. Identification of entomopathogenic entities in field condition. Quality control of biopesticides. Isolation and purification of Azospirillum, Azotobacter, Rhizobium. P-solubilizers and cyanobacteria. Mass multiplication and inoculum production of biofertilizers. Isolation of AM fungi -Wet sieving method and sucrose gradient method. Mass production of AM inoculant

2. Agrochemicals 3(2+1) AGE-56

Theory

An introduction to agrochemicals, their type and role in agriculture, effect on environment, soil, human and animal health. merits and demerits of their uses in agriculture management of agrochemicals for sustainable agriculture. Herbicides-Major classes, properties and important herbicides. Fate of herbicides. Fungicides-Classification-Inorganic fungicides- characteristics, preparation and use of sulfur and copper, Mode of action-Bordeaux mixture and copper oxychloride. Organic fungicides- Mode of action- Dithiocarbamates- characteristics, preparation and use of Zineb and maneb. Systemic fungicides- Benomyl, carboxin, oxycarboxin, Metalaxyl, Carbendazim. characteristics and use. Introduction and classification of insecticides: inorganic and organic insecticides Organochlorine, Organophosphates, Carbamates, Synthetic pyrethroids Neonicotinoids. Hiorationals. 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. Fertilizers and their importance. Nitrogenous fertilizers: Feed stocks and Manufacturing of ammonium sulphate. ammonium nitrate, ammonium chloride, urea. Slow release N- fertilizers. Phosphatic fertilizers: feedstock and manufacturing of single superphosphate. Preparation of bone meal and basic slag. Potassic fertilizers: Natural sources of potash, manufacturing of potassium chloride, potassium sulphate and potassium nitrate. Mixed and complex fertilizers: Sources and compatibility-preparation of major, secondary and micronutrient mixtures. Complex fertilizers: Manufacturing of ammonium phosphates, nitrophosphates and NPK complexes. Fertilizer control order. Fertilizer logistics and marketing. Plant bio-pesticides forecological agriculture, Bio-insect repellent.

Practical

Sampling of fertilizers and pesticides. Pesticides application technology to study about various pesticides appliances. Quick tests for identification of common fertilizers. Identification of anion and cation in fertilizer. Calculation of doses of insecticides to be used. To study and identify various formulations of insecticide available in market Estimation of nitrogen in Urea. Estimation of water soluble P₂O₅ and citrate soluble P₂O₅ in single super phosphate. Estimation of potassium in-Murrite of Potash/ Sulphate of Potash by flame photometer. Determination of copper content in copper oxychloride. Determination of sulphur content in sulphur fungicide. Determination of thiram. Determination of ziram content.

DEPARTMENT OF ANIMAL HUSBANDRY AND DAIRY SCIENCE

Course Code	Course Title	Credit Hours
AG-107	Introductory Animal husbandry	3(2+1)
AG-209	Dairy Processing and Safety Issues	3(2+1)
AG-311	Dairy Science	3(2+1)
AG-411	Poultry production and management	3(2+1)
AG-510	Principles of Food Science and Nutrition	3(2+1)
ELECTIVE COURSE(S)		
AGE-55	Food Safety and Standards	3(2+1)
AGE-66	Composition Fishery cum Duck/ (and) Quail/(and) Rabbit culture	3(2+1)

Course wise Detailed Syllabus

Introductory Animal husbandry 3(2+1) AG-107

Theory

GENERAL: Importance of livestock in Agriculture and Economy. Dairying under specialized and mixed farming. Livestock and milk production statistics.

DAIRY CATTLE AND BUFFALOES MANAGEMENT: Cattle and buffalo Breeds. Mendelian rules and its importance in livestock improvement and variations. Male and female reproductive organs. Digestive tract Breeding methods & systems, Artificial inseminations, Semen collection and semen preservations. Mechanism of gametogenesis and oestrus cycle Care and Management of pregnant and milch cow, Raising of calves, Management of heifers and bulls. Ration and its kind. Maintenance of livestock records, Milking methods and principles, Clean milk production, Feeds and feeding, Conservation of fodder, Housing for dairy animals.

PIG MANAGEMENT: Importance, Important breeds, Raising of piglets up to age of slaughter, General aspects of breeding, Care of sow and boar.

SHEEP AND GOAT MANAGEMENT: Importance, Important breeds, Raising of kids and lambs, Breeding, Feeding of goats and sheep.

HEALTH MANAGEMENT: Principle of Major and contagious Disease Common animal diseases of cattle, buffalo, goat, sheep and swine viz. Anthrax. BQ, HS, Brucellosis, Mastitis, Milk fever. Retained of placenta, Tympany of rumen Swine fever and Enterotoximea, Vaccination schedule, Immunity.

Practical

Study of external body parts, Study of phenotypic and physiological difference between cow and buffaloes. Estimation of body weight by measurements, Identification of animals. Castration,

Dehorning, Estimation of cost of milk production, Problems on computation of ration, casting and throwing, Grooming, Scheme of fodder production round the year, Recording temperature, pulse rate and respiration rate of animals.

2. Dairy Processing and Safety Issues 3(2+1) AG-209

Theory

GENERAL : Definition of food, Constituents of foods : Water, Carbohydrate, Fat, Protein, Vitamins and Minerals with reference to milk, Detailed composition of milk and colostrum.

FOOD PROCESSING : Pasteurization, Sterilization, Bactofugation, Uperization, Stassanization. Kinds of Pasteurization and Homogenization of milk. Cooling and chilling of milk, Toned, double toned and flavoured milk. Manufacturing of common dairy product viz. Cream, Butter, Ghee, Dahi, Yoghurt, Shrikhand & Ice-cream. Manufacturing of Khoa, Paneer, Chhena, Cheddar cheese and. Mozzarella cheese (Pizza cheese).

FOOD SAFETY : Definition, Importance, Scope, Hazards and risks. Food safety management, HACCP, ISO Series, TQM-Concept and need for quality component of TQM. Basic water tests.

Practical

1. Demonstration of Cream separation.
2. Preparation of indigenous dairy products viz. Dahi, Chhena, Khoa, Paneer, Cream, Ghee, shrikhand.
3. Water quality analysis.
4. Problem on neutralization of milk and cream.
5. Problem on over run.
6. Calculation of Ice cream mix.

3. DAIRY SCIENCE 3(2+1) AG-311

Theory

GENERAL : Concept of Dairying, Dairying in India, Dairy development in different five year plans. Dairy production statistics. Cleaning and sanitization of dairy equipment.

Dairy cooperatives, Functioning of dairy cooperatives societies, Functioning of Arland Pattern, White revolution, Objectives and achievements of operation flood. Milk and its secretion, Transportation and milk distribution, pricing policy of milk. platform tests, Filtration. Straining and Clarification of milk. Standardization, Milk adulteration and its detection. Legal standards of milk. Factors affecting the quality and quantity of milk, Nutritive value of milk and milk product. Physico-chemical properties of milk.

Basic principles of refrigeration and cold storage of milk and milk product.

Common adulterants of ghee, khoa and their detection.

Practical

1. Sampling of milk.
2. C.O.B. Test

3. M.B.R. Test
4. Sediment test.
5. Problems on Standardization.
6. Detection of adulterants viz. water, starch, sucrose, urea, detergent and refined oil
7. Problems on adulteration.
8. Hansa Test.
9. Detection of preservatives.
10. Alcohol test.
11. Acidity of milk.

4. Poultry Production and Management 3(2+1) AG-411

Theory

GENERAL : Importance of poultry industry in India, Poultry production and marketing statistics of eggs and chicken. Historical development in poultry birds potential.

BREEDING : Male and female reproductive system of chicken, Breeds and strains of broilers and layers of chicken. duck and quails, General aspects of breeding for better egg production and body weight gain. Selection and culling, Artificial insemination.

GENERAL MANAGEMENT : Establishment of poultry farm. Housing and equipment, incubation and hatching of eggs, Broiler and layer management. Lighting schedule for poultry.

FEEDS AND FEEDING : Digestion, Digestive system of chicken. Feed ingredients, Availability of CP and ME in ingredients. Feed processing. Formulation of feed viz. Starter. Grower, Layer, Finisher and Breeder ration, FCR, CP ratio, Nutritional deficiency conditions.

HEALTH MANAGEMENT : Vaccination schedule for poultry, Common poultry diseases, i.e. Ranikhet, Marex, Chicken pox, Gumboro, Infectious bronchitis and CRD. Control of internal and external parasites.

POULTRY PRODUCTS : Preservation and storage of eggs, Grading of eggs, AGMARK standard of egg. Egg powder, Slaughtering and processing of chicken, Marketing of poultry products.

Practical

Neat and clean diagram of hen showing external body parts. structure of egg, Formulation of ration viz. Broiler starter ration, Broiler finisher ration. Chick starter ration, Grower ration, Layer ration and Breeder ration. Vaccination schedule for broiler and layers. Debeaking, Candling of eggs. Dissection of bird fir showing internal body parts.

5. Principles of Food Science and Nutrition 3(2+1) AG-510

Theory

GENERAL: Definition of food and food science. Composition of food, Foods of animal origin, Function, Classification, Requirement, Availability and source of Carbohydrate, Fat, Proteins Mineral, Vitamins and Water. Functions and Nutritional deficiency disease of minerals and vitamins. Flavours and colours used in food. Food microbiology with special reference to milk, Physico Chemical properties of milk.

Composition and processing of egg, meat, Milk chicken, feed additives, antibiotics, enzymes and hormones. Role of food microbiology in nutritions.

Practical

1. Sampling of milk.
2. Specific gravity of milk by lactometer.
3. Water quality test.
4. Study of Nutritional deficient conditions.
5. Study of Nutritional disorders.
6. Quality parameters for egg, meat and chicken.
7. Fat test by Gerber's method.
8. T.S. & S.N.F. percentage by Richmond's scale and formula.

ELECTIVE COURSE(S)

1. Food Safety and Standards 3(2+1) AGE-55

Theory

Food Safety - Definition. Importance, Scope and Factors affecting Food Safety. Hazards and Risks, Types of hazards - Biological, Chemical, Physical hazards. Management of hazards - Need. Control of parameters. Temperature control. Food storage. Product design. Hygiene and Sanitation in Food Service Establishments- Introduction. Sources of contamination and their control. Waste Disposal. Pest and Rodent Control. Personnel Hygiene.

Food Safety Measures: Food Safety Management Tools-Basic concepts. PRPs, OMPs, SSOPs etc. HACCP. ISO series. TQM - concept and need for quality. components of TOM. Kaizen. Risk Analysis. Accreditation and Auditing. Water Analysis, Surface Sanitation and Personal Hygiene. Food laws and Standards-Indian Food Regulatory Regime, FSSAI. Global Scenario CAC. Other laws and standards related to food. Recent concerns- New and Emerging Pathogens. Packaging, Product labeling and Nutritional labeling. Genetically modified

foods/transgenics. Organic foods. Newer approaches to food safety. Recent Outbreaks. Indian and International Standards for food products.

Practical

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

ELECTIVE COURSE(S)

2. Composition Fishery cum Duck/ (and) Quail/(and) Rabbit culture 3(2+1) AGE-66

Theory

Fishery:

Definition, common characteristics and position of fish in Animal Kingdom, fishery statistics preparation and management of fish pond, physical and chemical condition of water for fishery, feeds and feeding of fishes, breeding of fish, diseases and enemies of fishes, use of Duck/quality feeds on fish feeds

Duckry:

Definition, common features and advantages, breeds, incubation and hatching feeding of ducks, care and managements of ducking, grower, layer/broiler ducks. Characteristics of duck eggs, common diseases and vaccination schedule, duckry statistics. Quail: Definition, common features of quail farming, advantages, breeds, incubation and hatching, feeding of quails. care and managements of quail chick, grower/layer/broilers. Quail product technology, common diseases and vaccination schedule.

Rabbitry:

Introduction, scope and advantages of rabbit farming, breeds, breeding, housing, care and management of young and adult rabbit. feeds and feeding for rabbits, common problems of rabbitry including vaccination schedule, fur and meat production technology.

Practical

1. Fishery units, visit, Demonstration and report formulation.
2. Different type of fishes, deep water, middle water, and surface water.
3. Evaluation of Duck Egg (candling) and Grading.
4. Vaccination schedule for duck and Quail.
5. Preparation Ration for Duck, Quail. Rabbit and Fish.
6. Preparation of different products from eggs.

ACADAMIC REGULATION

UNDER-GRADUATE PROGRAMME

(As per the recommendations of the Fifth Deans' Committee Report)

1. Degree Nomenclature:

- B.Sc. (Hons.) Agriculture

2. System of Education:

- Formal education with Credit Based Semester System

3. Programme Duration

- Minimum: 8 Semesters (4 academic years)
- Maximum: 14 Semesters (7 academic years)

4. Minimum eligibility requirement for admission:

- Pass in 10+2 examination [Agriculture or Science (Mathematics/Biology)]

5. Mode of Admission:

- Entrance examination at 10+2

6. Reservation of seats:

Reservation of seats shall be governed by the rules of State Government of Uttar Pradesh.

7. Semester Duration:

The minimum duration of 110 working days, consisting of 95 instructional days and 15 examination days.

8. Credit Definition:

Credit means the unit of work load per week for a particular course in theory and/ or practical. One credit of theory means one class of one clock hour duration and one credit practical means one class of minimum two clock hours of laboratory work per week. However, for many courses where field work is required, one credit requires 3 clock hours of field work per week.

9. Medium of Instructions:

English and Hindi or in both.

10. Attendance: 80 per cent. (Relaxation in minimum attendance requirement should be given only in case of indoor hospitalization).

Record of class attendance: Each Instructor shall maintain a record of the student's attendance in each course taught by him in each semester.

Minimum class attendance: Each student shall be regular in attending classes and shall be required to have a minimum of 80% attendance in each course in each semester, failing which he/she shall not be awarded grade in that course, unless withdrawal from the course is permitted.

The percentage of attendance of a student in course in a semester shall be computed on the basis of the total number of lectures, practical and tutorials attended by him/her and those actually held between the date of commencement of instruction and the date of closing instruction, irrespective of the date of his/her registration and/or the duration of leave duly granted to him/her.

The Dean/Principal/Director may on the recommendation(s) of the Instructor/Advisor concerned, though the Head of the Department, condone shortage in attendance up to 5% in a course(s) in exceptional circumstances and allow students with an attendance of 75% or more to appear at the final examination. However, on the recommendation of the Dean, the Vice Chancellor may grant a condonation to the extent of 5% and allow students with an attendance of 70% or more to appear at the final examination. In a very exceptional case, if a student fails to secure even 70% attendance, his case can be referred to the Academic Council through Dean for condonation to the extent of further 5% and allow students with an attendance of 65% or more.

Notes:

- 1: In computation of percentage of attendance, fractions of 0.5 or above shall be counted as 1.*
- 2. If student is called upon to repeat a course but/she has already put in required attendance in that course on a previous occasion, above requirements of attendance will not apply in his/her case.*

11. Advisement:

- (a) Student freshly admitted as well as continuing students shall present themselves in the beginning of each semester on dates notified by the Registrar for advisement and shall be assigned in groups to staff. Advisors/Course Instructors are nominated by the Dean Agriculture/Principal.
- (b) The Advisor shall help the UG student in planning the programme of their studies and the choice of courses. He shall also guide the student in determining the credit load, which he can safely and conveniently carry in each semester and shall advise him regarding adding of or withdrawal from the course during a semester. Each Advisor shall maintain a close contact with his student and keep himself informed of their progress. Problem cases needing special measures shall bring to the notice of the Dean by the Advisor.

12. Registration:

Following advisement as prescribed above, registration of candidates selected for admission and also of continuing students shall be completed on schedule date(s) notified earlier by Registrar/ Dean / Principal for each semester.

Mode of Registration:

Registration shall consist of the following steps:

- Payment of the college and university fee and other dues.
- Enrolment of the students in various courses with individual instructors at particular place, date and time.

Registration of fresh students:

Registration for the first Semester of the year of a UG degree programme is part of admission procedure and shall be governed by the admission rules. Admission of new students so fallen vacant shall be offered to the candidates in the waiting list.

Registration of continuing students:

Registration of continuing students in the subsequent semesters shall be held in a similar way on the date time notified by the Registrar/ Dean/ Principal.

13. Examination and Evaluation System

A. Examination

- **Theory** – Paper setting and evaluation of answer books will be incorporated through inside and outside university examiners as per guidelines of University.
- **Practical** – The practical examination of the course / courses will be conducted by both internal and external examiners as per rules of university.
- **Sessional (Mid-term) Examinations**- The mid-term examination will be conducted by Course Instructor /Instructors on college / university expenses but answer books will be supplied by the Registrar or Controller of Examinations of the university.

B. Marks Distribution

a. Courses with Theory and Practical

- Mid-term Examination- 20% of the total marks
- Practical Examination- 30% of the total marks
- Final Theory Examination- 50% of the total marks

b. Courses with only Theory

- Mid-term Examination- 50% of the total marks
- Final Theory Examination- 50% of the total marks

c. Courses with only Practical

- Practical Examination - 100%.

Note:

- *Paper to be set by external/Internal examiner shall ensure the coverage of the entire prescribed syllabus both in Hindi and English.*
- *If needed moderation can be done for final theory exam papers.*
- *Syllabus of the concerned course shall be sent to the examiner, who shall prepare the question papers.*
- *For practical, it is recommended that examination shall be conducted by External Examiner nominated by university and internal examiner nominated by Principal of the Colleges.*

C. The ratios between External and Internal Examiner shall be appointed as per university rules and regulations for paper setting / evaluation of answer book / practical examinations.

REGISTRATION OR FILLING OF UNIVERSITY EXAMINATION FORM FOR SEMESTER EXAMINATION

- It shall be mandatory to submit the complete examination form before each and every semester examination. The first and last date will be decided by university and shall be properly advertised by the Registrar / Controller of Examinations. The fee or fees applicable according to university's rules and regulations.
- It is also advised to the students those who will interest to clear the repeated course/ courses shall also be submitted their repeated course/ courses in the examination form with additional fees whenever applicable. (Course of ODD semester in consecutive ODD SEMESTER, similarly course of EVEN SEMESTER in consecutive EVEN SEMESTER)

Evaluation and Grading:

Degree	Percentage of Marks Obtained	Conversion into Points
All	100	10 Points
	90 to <100	9 to <10
	80 to <90	8 to <9
	70 to <80	7 to <8
	60 to <70	6 to <7
	50 to <60	5 to <6
	<50 (Fail)	<5
	Eg. 80.76	8.076
	43.60	4.360
	72.50 (but shortage in attendance)	Fail (1 point)

OGPA	Division
5.000 – 5.999	Pass
6.000 – 6.999	II division
7.000 – 7.999	I division
8.000 and above	I division with distinction

GPA = Total points scored / Total credits (for 1 semester)

CGPA = Σ Total points scored / Course credits

OGPA = Σ Total points scored (after excluding failure points) / Course credits

% of Marks = OGPA x 100/10

FINAL EXAMINATION:

Final examinations shall be held on the dates, which shall be notified by the Registrar either in the University calendar or at the beginning of each academic year or otherwise. If a student fails to appear in the final examination of semester, he will not be allowed for registration in the next semester. Such student will repeat the semester when it runs. However, this rule is not applicable for that student who has been permitted for makeup examination by the competent authority.

PREPARATION OF EXAMINATION SCHEDULE:

The Mid-term and Final examination schedule shall be prepared and notified by the Registrar/ Examinations Controller of the university at least fifteen days before the commencement of the mid –term examination and communicate to the Dean/Director/Principal of concerning colleges.

SUPPLY OF EXAMINATION MATERIAL

- Examination materials such as examination papers, answer books, twine, drawing papers, log tables, graph papers etc. will be supplied by the Registrar/ Examinations Controller of the University for Final Theory Examinations.
- Practical Examination Answer Book and Mid – Tern Examination Answer Book will be supplied by the Registrar/ examination controller of the University.
- Every student shall be required to bring examination materials such as set squares, scales, pen, pencils, highlighters etc. as he shall not be permitted to borrow any of these materials from fellow students in the examination hall.

MAKE-UP EXAMINATION:

In case a student is seriously ill either in the campus and produces a medical certificate from CMO of district hospital or is hospitalized elsewhere and is unable to attend his examinations, the Registrar may permit him to appear in more than one make-up examination but not more than two make-up examinations during any one Semester.

MID TERM AND FINAL EXAMINATION:

Notification of Mid Term Examination:

Normally no make-up examination shall be permissible in lieu of the missed mid-term or final examination except as permitted by Dean/Registrar of the university.

- If a student fails to appear in any mid-term examination for reasons beyond his/her control, he/she must file an application on the day on which the examination is missed.
- As far as possible, make-up examination shall be discouraged, only in extremely genuine cases like hospitalization; a student can be permitted by the Dean/Registrar to appear at the make-up examination in the mid-term examinations.
- Dean/Registrar is empowered to allow a student for make-up only in mid-term examination, if he/she fulfills the requirements.

Note: The Student can be permitted to appear at the make-up examination only in extremely genuine cases on the following grounds:

Case – I - If he/she is seriously ill.

Case – II - If he/she has taken leave on account of the death of his mother, brother, sister, spouse, child or Grandparent.

Case – III - Any other genuine cause with which the Dean/Registrar is satisfied. Such cases should be reported to the Registrar.

Case – IV - Only one make-up examination will be permissible during a semester but not more than two.

About The Application for Makeup Examination

- The application for make-up examination must be supported by medical certificate either from the CMO or from the hospital concerned and should be routed through Advisor/Principal.
- No application for make-up examination shall be considered if received after one week from the expiry of the last date of mid-term examination.
- Make-up examination must be completed within one week from the date of grant of permission by the Dean. It will be the responsibility of the student to get in touch with his/her teacher and have a date fixed for the make-up examination after necessary permission is granted.
- Result of make-up examination will count along with the previous performance of the student during the term for awarding the final grade in course concerned.

14. Rules & Regulations About passing of semester / promotion of semester / repetition of course / repetition of semester

1. The candidates are required to pass separately in theory and practical examinations except remedial and non-gradual courses.
2. To pass in a course/paper, the students are required to secure minimum 33 per cent marks (rounded off upper side) in theory and practical separately together with a minimum 50 per cent of maximum marks assigned to each paper (rounded off upper side). However, to pass in remedial and non-gradual courses, students are required to secure minimum 50 per cent of maximum marks assigned to these courses.
3. To attain the final degree a student has to pass all the courses of each semester.
4. The minimum Semester Grade Point Average (G.P.A.) and Overall Grade Point Average (O.G.P.A.) for passing / promotion of a particular semester as well as degree course should not less than 5.00.
5. If a student fails in more than four Courses/papers in a particular semester, he/she will not be promoted in the next semester. However, if he / she has failed in four papers in a semester but secured at least Grade Point Average (G.P.A.) of 5.00, then he/ she will be promoted from that semester to the next semester.

6. If a student fails in course(s), he/she will get four opportunities to pass the course(s) in consecutive years of that semester (course of ODD semester in consecutive ODD SEMESTER similarly course of EVEN SEMESTER in consecutive EVEN SEMESTER).
7. In special case or cases Vice-Chancellor will have to right to allow the separate examination schedule to clear the repeated course/courses for individual or group of individuals.

Note:

In the case of National calamities or Pandemic disorder the semester promotion will be done according to norms of Central Government / State Government/ Maharaja Suhel Dev State University, Azamgarh, U.P. (INDIA)

Restriction for students going out on educational tours and extra-curricular activities:

The educational tours and extra curricula activities may be organized in such a way not to disturb the academic programme particularly the final examination. As far as possible such programmes should be organized during semester break.

15. RULES AND REGULATIONS ABOUT IMPROVEMENT OF GPA / OGPA:

- Students can be improved their GPA /OGPA through improvement examination in consecutive semesters (course of ODD semester in consecutive ODD SEMESTER, similarly course of EVEN SEMESTER in consecutive EVEN SEMESTER).
- The number of course(s) in each semester shall be decided by competent committee of university.
- It shall be mandatory to fill up the course / courses offered by student in semester examination form for improvement examination with appropriate fees decided by university.
- If students passed in Mid-Term and Practical Examination, then Improvement / Carry forward examination not allowed for Mid-Term and Practical.

16. SCRUTINY:

- Scrutiny means totaling of marks and evaluation of questions left unmarked.
- If any student desires scrutiny in any course, he shall be permitted to do so with a prescribed scrutiny fee per course.

- He/she shall have to file an application on the prescribed form which can be obtained from the office of the Registrar within a period of 7 days from the date of registration in the semester, failing which no such applications shall be entertained.
- After having the approval of the Registrar, he/she will present the form to the Controller of examinations.
- The answer book shall be scrutinized by the examiner concerned in collaboration with Dean faculty of Agriculture.
- The result of scrutiny shall be intimated to the controller of examination /Registrar as soon as possible but in no case later than three weeks from the date of registration.
- The result of the scrutiny by the examiner shall be final.

17. USE OF UNFAIR MEANS (UFM): as per university norms.

18. REPETITIONS OF COURSES:

- If a student secures 'F' grade, he/she shall be repeat the course whenever the university offers it. The repeated course/courses shall be clear in next consecutive semester/ semesters. (Repeated course(s) of odd semester in odd / of even semester in even semester examination).
- In case a student obtains 'F' grade in a course and repeats it, the grade secured by the student on repeating the course shall be reflected in the grade report.
- To clear the repeated course, student shall submit their repeated course / courses (carry over papers) in the examination form with payment of prescribed additional fee as per Improvement Examination rules of University.
- Just after announcement of results, the Register will communicate to the students, who have obtained 'F' grade in their report card / marksheet as carry over.

Note:

The syllabus of B. Sc. (Hons.) Agriculture and its Regulation have been made based on Common Minimum Syllabus for B. Sc (Hons.) Agriculture developed in accordance with National Education Policy 2020 and the Fifth Deans' Committee Recommendations. By the U.P. Government order no-1065/sattar-3-2021-16(26)/2011 dated 20 April, 2021 the structure of Common Minimum Syllabus for B. Sc (Hons.) Agriculture is indestructible. If any ambiguity is found in the above said curriculum, syllabus and Regulation, the provisions of the Common Minimum Syllabus, recommendations of the Fifth Deans' Committee and regulations of the university will be considered final.