Study& Evaluation Scheme of Bachelor of Science (Hons) in Agriculture

[Applicable for 2019-23]

Version 2019

[As per CBCS guidelines given by UGC]
[As per ICAR 5th Dean Recommendation]

Approved in BOS	Approved in BOF	Approved in Academic Council
11-06-2019	18-06-2019	13-07-2019 Vide Agenda No. 2.4

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Study &Evaluation Scheme

Study Summary

Name of the Faculty	Faculty of Agriculture Studies
Name of the School	Quantum School of Agriculture Studies
Name of the Department	Department of Agriculture Studies
Program Name	Bachelor of Science (Hons) in Agriculture
Duration	4 Years
Medium	English

Evaluation Scheme

Type of Papers	Internal Evaluation (%)	End Semester Evaluation (%)	Total (%)
Theory	40	60	100
Practical/ Dissertations/Project Report/ Viva-Voce	40	60	100
Internal Evaluation Components (Theory Papers)			
Sessional Examination I	50 Marks		
Sessional Examination II	50 Marks		
Assignment –I	25 Marks		
Assignment-II	25 Marks		
Attendance	50 Marks		
Internal Evaluation Components (Practical Papers)			
Quiz One	25 Marks		
Quiz Two	25 Marks		
Quiz Three	25 Marks		
Lab Records/ Mini Project	75 Marks		
Attendance	50 Marks		
End Semester Evaluation (Practical Papers)			
ESE Quiz	30 Marks		
ESE Practical Examination	50 Marks		
Viva- Voce	20 Marks		

Structure of Question Paper (ESE Theory Paper)

The question paper will consist of 5 questions, one from each unit. Student has to Attempt all questions. All questions carry 20 marks each. Parts a) and b) of question Q1 to Q5 will be compulsory and each part carries 2 marks. Parts c), d) and e) of Q1 to Q5 Carry 8 marks each and the student may attempt any 2 parts.

Important Note:

1.*The purpose of examination should be to assess the Course Outcomes (CO) that will ultimately lead to attainment of Programme Outcomes (PO). A question paper must assess the following aspects of learningplanned for specific course i.e. Remember, Understand, Apply, Analyze, Evaluate & Create (reference to Bloom's Taxonomy). The standard of question paper will be based onmapped BL level complexity of the unit of the syllabus, which is the basis of CO attainment model adopted in the university.*

2.Case Study is essential in every question paper (wherever it is being taught as a part of pedagogy)for evaluating higher-order learning. Not all the courses might have case teaching method used as pedagogy.

3. There shall be continuous evaluation of the student and there will be a provision of real time reporting on QUMS. All the assignments will evaluated through module available on ERP for time and access management of the class.

Program Structure – Bachelor of Science (Hons) in Agriculture

Introduction

Bachelor of Science (Hons) in Agriculture syllabus is broad and multidisciplinary consists of various courses in Agronomy, Horticulture, Plant Pathology, Entomology, Agricultural Economics, Extension Education, Genetics and Plant Breeding, Soil Science, Animal Husbandry apart from supporting courses in Basic Sciences, Humanities, and Agricultural Engineering.

Bachelor of Science (Hons) in Agriculture subjects are designed in such a way that students grasp all the knowledge related to agriculture and environmental science.Towards enhancing employability and entrepreneurial ability of the graduates the Quantum University increase the practical content in the courses wherever necessary. The total number of credit hours in 8 semesters including Student READY programme will be more than 170 for all the programmes.

In order to harness regional specialties and to meet region-specific needs the Quantum University modify the content of syllabus as per the regional demands and needsThe Quantum university offering the specializations like majoring in Animal Science, Plant Protection, Soil Science, Genetics and Breeding or Agricultural Engineering.

Bridge Courses: In Agriculture students from both the background Medical and Non-medical are eligible to apply. Therefore we have the provision of bridge courses to fulfill the gap between Biology and Mathematics. Bridge Course helps students to make a successful transition into their new academic programs by providing them with the necessary background knowledge about the topics that will be covered in their new courses. In addition, Bridge Courses can also help students to develop the skills and abilities that they need to succeed in their new academic programs

Rural Agricultural Work Experience (RAWE) and Agro-Industrial Attachment (AIA): This program will be undertaken by the students during the seventh semester for a total duration of 20 weeks with a weightage of 0+20 credit hours in two parts, namely, 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 would be attached with the agro-industries to get an experience of the industrial environment and working. Due weightage in terms of credit hours will be given depending upon the duration of stay of students in villages/agro-industries. 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.

Experiential Learning Programme (ELP)/ Hands On Training (HOT)

This program will be undertaken by the students preferably during the eighth 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, listed below, of 0+10 credit hours each.

- Production Technology Bio-agents and Bio-fertilizer
- Seed Production and Technology
- Mushroom Cultivation Technology
- Soil, Plant, Water and Seed Testing
- Poultry Production Technology
- Hybrid Seed Production Technologies
- Floriculture and Landscaping
- Food Processing
- Commercial Horticulture
- Agriculture Waste Management
- Organic Production Technology

- Commercial Sericulture

Curriculum (19-23) Version 2019

Quantum School of Agricultural Studies
Bachelor of Science (Hons) in Agriculture **– PC: 04-3-01**

BREAKUP OF COURSES

Sr. No	CATEGORY	CREDITS
1	Foundation Core (FC)	[1*]15/[2*]15/ [3*]16/[4*]14
2	Program Core (PC)	117
3	Program Electives (PE)	7
4	Open Electives (OE)	3
5	Project	21
6	Educational Tour	1
7	Value Added Programs (VAP)	27
8	General Proficiency (GP)	6
9	Disaster Management*	2*
	TOTAL NO. OF CREDITS	[1*]197/[2*]197/[3*]198/[4*]196

*Non-CGPA Audit Course

[1*] For 10+2 Agriculture Group, [2*]For 10+2 Biology Group, [3*]For 10+2 Math Group, [4*]For 10+2 Bio + Math Group

DOMAIN-WISE BREAKUP OF CATEGORY

Domain	FC	PC	PE	Sub Total	%
Engineering		3		3	1.51/1.51/1.5/1.52
Humanities	7	2		9	4.54/4.54/4.5/4.57
Management		8		8	4.04/4.04/4.02/4.07
Sciences	12/12/13/11	122	7	141/141/142/140	71.7/71.7/72.12/71.47
Open Elective				3	1.51/1.51/1.5/1.52
VAP				27	13.64/13.64/13.57/13.71
GP				6	3.03/3.03/3.02/3.05
Disaster Management*				2*	00
Grand Total	19/19/20/18	135	7	[1*]197/[2*]197/[3*]198/[4*]196	100

*Non-CGPA Audit Course

[1*] For 10+2 Agriculture Group, [2*]For 10+2 Biology Group, [3*]For 10+2 Math Group, [4*]For 10+2 Bio+ Math Group

SEMESTER-WISE BREAKUP OF CREDITS

Sr. No	CATEGORY	SEM 1	SEM 2	SEM 3	SEM 4	SEM 5	SEM 6	SEM 7	SEM 8	TOTAL
1	Foundation Core	9/9/ 10/8	3	3	-	-	-	-	-	1* 15/2* 15/ 3* 16/4* 14
2	Program Core	11	18	20	21	25	22	-	-	117
3	Program Electives	-	-	2	2	-	3	-	-	7
4	Open Electives	-	-	-	3			-	-	3
5	Project/RAWE	-	-	-	1	-	-	20	-	21
6	Educational Tour					0	1	-		1
7	VAPs/ELP/RAW E	1	2	2	2	-	-	-	20	27
8	GP	1	1	1	1	1	1	-	-	6
9	Disaster Management*	2*								2*
	TOTAL CREDITS	22/22/ 23/21	24	28	30	26	27	20	20	1*197/2*197/3* 198/4*196

*Non-CGPA Audit Course

1***For 10+2 Agriculture Group,** 2***For 10+2 Biology Group,** 3***For 10+2 Math Group,** 4***For 10+2 Bio + Math Group**

SEMESTER 1

Course Code	Category	Course Title	L	T	P	C	Version	Course Prerequisite
AG3101	FC	**For 10+2 Agriculture Group** Introductory Biology*	1	0	0	1	1.0	Nil
MA3103	FC	Elementary Mathematics*	1	0	0	1	1.0	Nil
AG3102	FC	**For 10+2 Biology Group** Agricultural Heritage*	2	0	0	2	1.0	Nil
MA3103	FC	Elementary Mathematics*	1	0	0	1	1.0	Nil
AG3101	FC	**For 10+2 Math Group** Introductory Biology*	1	0	0	1	1.0	Nil
AG3102	FC	Agricultural Heritage*	2	0	0	2	1.0	Nil
AG3102	FC	**For 10+2 Bio + Math Group** Agricultural Heritage*	2	0	0	2	1.0	Nil
AG3140	FC	**For 10+2 Agriculture Group** Introductory Biology Lab*	0	0	2	1	1.0	Nil
AG3140	FC	**For 10+2 Math Group** Introductory Biology Lab*	0	0	2	1	1.0	Nil
EG3103	FC	English Communication	2	0	0	2	1.0	Nil
CS3102	FC	Fundamentals of Computer Applications	2	0	0	2	1.0	Nil
AG3106	PC	Fundamentals of Agronomy	2	0	0	2	1.0	Nil
AG3108	PC	Introductory Agro-meteorology & Climate Change	2	0	0	2	1.0	Nil
AG3110	PC	Fundamentals of Horticulture	2	0	0	2	1.0	Nil
AG3109	PC	Rural Sociology and Educational Psychology	2	0	0	2	1.0	Nil
EG3141	FC	English Communication Lab	0	0	2	1	1.0	Nil
CS3141	FC	Fundamentals of Computer Application Lab	0	0	2	1	1.0	Nil
AG3141	PC	Fundamentals of Agronomy Lab	0	0	2	1	1.0	Nil
AG3143	PC	Introductory Agro-meteorology & Climate Change Lab	0	0	2	1	1.0	Nil

AG3144	PC	Fundamentals of Horticulture Lab	0	0	2	1	1.0	Nil
NSS3101	VP	Communication & Professional Skills -I	0	0	0	1		
GP3101	GP	General Proficiency	0	0	0	1		
CE3101		Disaster Management**	2	0	0	2	1.1	Nil
		TOTAL	**14/15 / 15/14**	**0**	**12 / 10 / 12 / 10**	**22/ 22/ 23/ 21**		

*REMEDIAL COURSES **Contact Hrs =[1*]24/[2*]24/[3*]25/[4*]23**

[1*] **For 10+2 Agriculture Group, [2*]For 10+2 Biology Group, [3*]For 10+2 Math Group, [4*]For 10+2 Bio + Math Group**

SEMESTER 2

Course Code	Category	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
MA3202	FC	Statistical Methods	2	0	0	2	1.0	Nil
AG3206	PC	Agricultural Microbiology	2	0	0	2	1.0	Nil
AG3207	PC	Fundamentals of Agricultural Extension Education	2	0	0	2	1.0	Nil
AG3209	PC	Fundamentals of Entomology	2	0	0	2	1.0	Nil
AG3210	PC	Production Technology of Vegetables and Spices	2	0	0	2	1.0	Nil
AG3213	PC	Fundamentals of Genetics	2	0	0	2	1.0	Nil
AG3214	PC	Fundamentals of Soil Science	2	0	0	2	1.0	Nil
MA3240	FC	Statistical Methods Lab	0	0	2	1	1.0	Nil
AG3240	PC	Agricultural Microbiology Lab	0	0	2	1	1.0	Nil
AG3241	PC	Fundamentals of Agricultural Extension Education Lab	0	0	2	1	1.0	Nil
AG3243	PC	Fundamentals of Entomology Lab	0	0	2	1	1.0	Nil
AG3244	PC	Production Technology for Vegetables and Spices Lab	0	0	2	1	1.0	Nil
AG3248	PC	Fundamentals of Genetics Lab	0	0	2	1	1.0	Nil
AG3247	PC	Fundamentals of Soil Science Lab	0	0	2	1	1.0	Nil
NSS3201	VP	National Service Scheme (NSS - II)	0	0	0	1		
VP3201	VP	Communication & Professional Skills -II	0	0	2	1		
GP3201	GP	General Proficiency	0	0	0	1		
		TOTAL	**14**	**0**	**16**	**24**		

SEMESTER 3

Course Code	Category	COURSE TITLE	L	T	P	C	Version	Course Prerequisite/ Corequisite
CY3205	FC	Environmental Studies	2	0	0	2	1.0	Nil
AG3306	PC	Crop Production Technology and Crop Improvement– I (*Kharif* crops)	2	0	0	2	1.1	Nil
AG3307	PC	Fundamentals of Plant Pathology	2	0	0	2	1.0	Nil
AG3309	PC	Agricultural Marketing Trade and Finance and Co-Operation	2	0	0	2	1.0	Nil
AG3310	PC	Farm Machinery and Power	2	0	0	2	1.0	Nil
AG3311	PC	Fundamentals of Crop Physiology	2	0	0	2	1.0	Nil
AG3312	PC	Fundamentals of Plant Biochemistry and Biotechnology	2	0	0	2	1.0	Nil
AG3313	PC	Introduction to Forestry	1	0	0	1	1.0	Nil
--	PE	Program Elective-1	1	0	0	1	1.0	Nil
CY3355	FC	Environmental Studies Lab	0	0	2	1	1.0	Nil
AG3340	PC	Crop Production Technology and Crop Improvement- I (*Kharif* crops) Lab	0	0	2	1	1.0	Nil
AG3341	PC	Fundamentals of Plant Pathology Lab	0	0	2	1	1.0	Nil
AG3343	PC	Agricultural Marketing Trade and Finance and Co-Operation Lab	0	0	2	1	1.0	Nil
AG3344	PC	Farm Machinery and Power Lab	0	0	2	1	1.0	Nil
AG3349	PC	Fundamentals of Crop Physiology Lab	0	0	2	1	1.0	Nil
AG3350	PC	Fundamentals of Plant Biochemistry and Biotechnology Lab	0	0	2	1	1.0	Nil
AG3351	PR	Introduction to Forestry Lab	0	0	2	1	1.0	Nil
--	PE	Program Elective Lab-1	0	0	2	1	1.0	Nil
NSS3301	VP	National Service Scheme (NSS-III)	0	0	0	1		

VP3301	VP	Communication & Professional Skills -III	0	0	2	1		
GP3301	GP	General Proficiency	0	0	0	1		
		TOTAL	**16**	**0**	**20**	**28**		

Contact Hrs = 36

SEMESTER 4

Course Code	Category	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
AG3406	PC	Crop Production Technology and Crop Improvement-II (*Rabi* crops)	2	0	0	2	1.1	Nil
AG3407	PC	Management of Beneficial Insects	2	0	0	2	1.0	Nil
AG3408	PC	Production Technology for Fruit and Plantation Crops	2	0	0	2	1.1	Nil
AG3409	PC	Manures, Fertilizers and Soil Fertility Management	2	0	0	2	1.0	Nil
AG3410	PC	Principles of Food Science and Nutrition	2	0	0	2	1.0	Nil
AG3412	PC	Fundamentals of Plant Breeding	2	0	0	2	1.0	Nil
AG3413	PC	Livestock and Poultry Management	3	0	0	3	1.0	Nil
--	PE	Program Elective-2	1	0	0	1	1.0	Nil
AG3440	PC	Crop Production Technology and Crop Improvement-II (*Rabi* crops) Lab	0	0	2	1	1.0	Nil
AG3441	PC	Management of Beneficial Insects Lab	0	0	2	1	1.0	Nil
AG3442	PC	Production Technology for Fruit and Plantation Crops Lab	0	0	2	1	1.0	Nil
AG3443	PC	Manures, Fertilizers and Soil Fertility Management Lab	0	0	2	1	1.0	Nil
AG3448	PC	Fundamentals of Plant Breeding Lab	0	0	2	1	1.0	Nil
AG3449	PC	Livestock and Poultry Management Lab	0	0	2	1	1.0	Nil
--	PE	Program Elective Lab-2	0	0	2	1	1.0	Nil
--	OE	Open Elective-I	3	0	0	3	1.0	Nil
AG3470		Project- Mushroom Cultivation	0	0	2	1	1.0	Nil
NSS3401	VP	National Service Scheme (NSS-IV)	0	0	0	1		
VP3401	VP	Employabilty Skills - I (Numerical Ablilties)	0	0	2	1		

GP3401		General Proficiency	0	0	0	1		
		TOTAL	**19**	**0**	**18**	**30**		

Contact Hrs = 37

S.No.	Started for 1st Time	Department (Offering)	OPEN ELECTIVE -I	
			Name	Code
1	2018-19	Civil Engineering	Carbon Emmision & Control	CE3011
2	2018-19	Computer Science and Engineering	HTML5	CS3011
3	2018-19	Management + CSE	Mining and Anaysis of Big data	CS3021
4	2018-19	Agriculture	Ornamental Horticulture	AG3011
5	2018-19	Business & Management	Entrepreneurial Environment in India	BB3011
6	2018-19	Journalism	Media Concept and Process (Print and Electronic)	JM3011
7	2018-19	Hospitality & Tourism	Indian Cuisine	HM3011
8	2018-19	Management	SAP 1	MB3011
9	2018-19	English	French Beginner A1	EG3011
10	2018-19	Computer Science and Engineering	Microsoft Office Specialist (MSO-Word)	CS3031
11	2019-20	Computer Science and Engineering	Digital Marketing	CS3004
12	2019-20	Computer Science and Engineering	Introduction of IOT	CS3002

SEMESTER 5

Course Code	Category	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
EM3503	PC	Fundamentals of Agricultural Economics	2	0	0	2	1.0	--
AG3501	PC	Agri-Informatics	1	0	0	1	1.0	--
AG3502	PC	Farming System and Sustainable Agriculture	1	0	0	1	1.0	-
AG3504	PC	Intellectual Property Rights	1	0	0	1	1.0	-
AG3505	PC	Production Technology for Ornamental Crops, MAP and Landscaping	1	0	0	1	1.0	--
AG3506	PC	Soil and Water Conservation Engineering	1	0	0	1	1.0	-
AG3508	PC	Principles of Integrated Pests and Disease Management	2	0	0	2	1.0	--
AG3509	PC	Pests of Crops and Stored Grains and Their Management	2	0	0	2	1.0	--
AG3511	PC	Diseases of Field and Horticultural Crops and Their Management-I	2	0	0	2	1.0	--
AG3512	PC	Rainfed Agriculture and Watershed Management	1	0	0	1	1.0	--
AG3518	PC	Protected Cultivation and Secondary Agriculture	1	0	0	1	1.0	-
AG3540	PC	Agri-Informatics Lab	0	0	2	1	1.0	--
AG3541	PC	Principles of Integrated Pests and Disease Management Lab	0	0	2	1	1.0	--
AG3542	PC	Pests of Crops and Stored Grains and Their Management Lab	0	0	2	1	1.0	--
AG3544	PC	Diseases of Field and Horticultural Crops and Their Management-I Lab	0	0	2	1	1.0	-
AG3543	PC	Production Technology for Ornamental Crops, MAP and Landscaping Lab	0	0	2	1	1.0	--
AG3545	PC	Rainfed Agriculture and Watershed Management Lab	0	0	2	1	1.0	--
AG3546	PC	Protected Cultivation and Secondary Agriculture Lab	0	0	2	1	1.0	--
AG3547	PC	Soil and Water Conservation Engineering Lab	0	0	2	1	1.0	--
AG3548	PC	Practical Crop Production-I	0	0	4	2		-
GP3501	GP	General Proficiency	0	0	0	1		-
		TOTAL	**15**	**0**	**20**	**26**		

SEMESTER 6

Course Code	Category	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
AG3603	PC	Entrepreneurship Development and Business Communication	1	0	0	1	1	--
AG3613	PC	Geoinformatics and Nanotechnology and Precision Farming	1	0	0	1	1	--
AG3606	PC	Diseases of Field & Horticultural Crops and Their Management II	2	0	0	2	1	--
AG3607	PC	Post Harvest Management and Value Addition of Fruits and Vegetables	1	0	0	1	1	--
AG3608	PC	Problematic Soil and Their Management	2	0	0	2	1	--
AG3609	PC	Farm Management, Production & Resource Economics	1	0	0	1	1	-
AG3610	PC	Principles of Seed Technology	1	0	0	1	1	--
AG3611	PC	Renewable Energy and Green Technology	1	0	0	1	1	--
AG3612	PC	Principles of Organic Farming	1	0	0	1	1	-
--	PE	Program Elective III	2	0	0	2	1.0	
AG3640	PC	Post Harvest Management and Value Addition of Fruits and Vegetables Lab	0	0	2	1	1	--
AG3641	**PC**	Entrepreneurship Development and Business Communication Lab	**0**	**0**	**2**	**1**	**1**	-
AG3652	PC	Geoinformatics and Nanotechnology and Precision Farming Lab	0	0	2	1	1	--
AG3643	**PC**	Diseases of Field and Horticultural Crops and Their Management II Lab	**0**	**0**	**2**	**1**	**1**	--
AG3644	PC	Principles of Seed Technology Lab	0	0	4	2	1	--
AG3645	**PC**	Renewable Energy and Green Technology Lab	**0**	**0**	**2**	**1**	**1**	--
AG3646	PC	Farm Management, Production and Resource Economics Lab	0	0	2	1	1	--
AG3648	**PC**	Principles of Organic Farming Lab	**0**	**0**	**2**	**1**	**1**	--
AG3649	PC	Practical Crop ProductionII	0	0	4	2	1	-
--	PE	Program Elective III Lab	0	0	2	1	1.0	-
GP3601	GP	General Proficiency	0	0	0	1		-

		TOTAL	**13**	**0**	**24**	**26**		

Contact Hours = 37

SEMESTER 7

Course Code	COURSE TITLE	Parameters of Evaluation	L	T	P	C	Version	Course Prerequisite
AG3770	RAWE Component-I	1. Orientation and Survey of Village 2. Agronomical Interventions 3. Plant Protection Interventions 4. Soil Improvement Interventions (Soil sampling and testing) 5. Fruit/Vegetable production interventions 6. Food Processing/Storage interventions 7. Animal Production Interventions 8. Extension and Transfer of Technology activities	0	0	0	14	--	-
AG3771	RAWE Component-II	1. Plant Clinic 2. Agro-Industrial Attachment	0	0	0	6	--	-
		TOTAL				20	-	-

*Report making and Presentation has to be done during the beginning of 7th semester

Contact weeks: 20

S.N.	Rural Agriculture Work Experience and Agro-Industrial Attachment (RAWE & AIA)		
	Activities	**No. of Weeks**	**Credit Hours**
1	General Orientation and On Campus Training by Different Faculties	1	14
2	Village Attachment	8	
3	Unit Attachment in Univ./College/KVK/Research Station	5	
4	Plant Clinic	2	02
	*Agro-Industrial Attachment	3	04
	Project Report Preparation and Evaluation	1	
	Total Weeks for RAWE and AIA	**20**	**20**

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

Course Code	Category	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
AG3870	STUDENT READY: Experimental Learning programme/HOT Modules/VAP	ELP Module-I	0	0	0	10	1.0	-
	STUDENT READY: Experimental Learning programme/HOT Modules/VAP	ELP Module-II	0	0	0	10	1.0	-
		TOTAL				20		

SEMESTER 8

*Project done in Industry/Campus **Contact weeks: 20**

Modules for Skill Development and Entrepreneurship: A student has to register 20 credits opting for two modules of (10) credits each (total 20 credits) from the package of modules in thissemester.

S.N.	Title of the Module	Credits
1	Production Technology for Bio agents and Bio fertilizer	10
2	Seed Production and Technology	10
3	Mushroom Cultivation Technology	10
4	Soil, Plant, Water and Seed Technology	10
5	Commercial Beekeeping	10
6	Poultry Production Technology	10
7	Commercial Horticulture	10
8	Floriculture and Landscaping	10

9	Food Processing	10
10	Agriculture Waste Management	10
11	Organic Production Technology	10
12	Commercial Sericulture	10

List of Program Electives along with Labs

Elective	Course Code	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
I	AG3316	Food Safety and Standards	1	0	0	1	1.0	Nil
	AG3317	Agrochemicals	1	0	0	1	1.0	Nil
	AG3318	Commercial Plant Breeding	1	0	0	1	1.0	Nil
	AG3319	Landscaping	1	0	0	1	1.0	Nil
	AG3345	Food Safety and Standards Lab	0	0	2	1	1.0	Nil
	AG3346	Agrochemicals Lab	0	0	2	1	1.0	Nil
	AG3347	Commercial Plant Breeding Lab	0	0	2	1	1.0	Nil
	AG3348	Landscaping Lab	0	0	2	1	1.0	Nil
II	AG3416	Biopesticides and Biofertilizers	1	0	0	1	1.0	Nil
	AG3417	Agribusiness Management	1	0	0	1	1.0	Nil
	AG3418	Protected Cultivation	1	0	0	1	1.0	Nil
	AG3445	Biopesticides and Biofertilizers Lab	0	0	2	1	1.0	Nil

	AG3446	Agribusiness Management Lab	0	0	2	1	1.0	Nil
	AG3447	Protected Cultivation Lab	0	0	2	1	1.0	Nil
III	AG3516	Micro propagation Technologies	1	0	0	1	1.0	--
	AG3517	Hi-tech. Horticulture	1	0	0	1	1.0	--
	AG3518	Weed Management	1	0	0	1	1.0	--
	AG3547	Hi-tech. Horticulture Lab	0	0	2	1	1.0	--
	AG3550	Micro propagation Technologies Lab	0	0	2	1	1.0	--
	AG3551	Weed Management Lab	0	0	2	1	1.0	--

B. Choice Based Credit System (CBCS)

Choice Based Credit System (CBCS) is a versatile and flexible option for each student to achieve his target number of credits as specified by the UGC and adopted by our university.

The following is the course module designed for the Bachelor of Science (Hons) in Agricultural Studies program:

Core competency: Students will acquire core competency in Agricultural Studies and in allied subject areas.

Program/Discipline Specific Elective Course (DSEC):

Skilled communicator: The course curriculum incorporates basics and advanced training in order to make a graduate student capable of expressing the subject through technical writing as well as through oral presentation.

Critical thinker and problem solver: The course curriculum also includes components that can be helpful to graduate students to develop critical thinking ability by way of solving problems/numerical using basic &advance knowledge and concepts of Agricultural Studies.

Sense of inquiry: It is expected that the course curriculum will develop an inquisitive characteristic among the students through appropriate questions, planning and reporting experimental investigation.

Skilled project manager: The course curriculum has been designed in such a manner as to enabling a graduate student to become a skilled project manager by acquiring knowledge about mathematical project management, writing, planning, study of ethical standards and rules and regulations pertaining to scientific project operation.

Ethical awareness/reasoning:A graduate student requires understanding and developing ethical awareness/reasoning which the course curriculums adequately provide.

Lifelong learner: The course curriculum is designed to inculcate a habit of learning continuously through use of advanced ICT technique and other available techniques/books/journals for personal academic growth as well as for increasing employability opportunity.

Value Added Program (VAP): A value added audit course is a non-credit course which is basically meant to enhance general ability of students in areas like soft skills, quantitative aptitude and reasoning ability - required for the overall development of a student and at the same time crucial for industry/corporate demands and requirements. The student possessing these skills will definitely develop acumen to perform well during the recruitment process of any premier organization and will have the desired confidence to face the interview. Moreover, these skills are also essential in day-to-day life of the corporate world. The aim is to nurture every student for making effective communication, developing aptitude and a general reasoning ability for a better performance, as desired in corporate world. There shall be four courses of Aptitude in Semester I, II, III&IV semesters and two courses of Soft Skills in III&IV Semesters and will carry no credit, however, it will be compulsory for every student to pass these courses with minimum

45% marks to be eligible for the certificate. These marks will not be included in the calculation of CGPI. Students have to specifically be registered in the specific course of the respective semesters.

Skill Enhancement Course: This course may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge.

Generic/Open Elective Course (OEC): Open Elective is an interdisciplinary additional subject that is compulsory in a program. The score of Open Elective is counted in the overall aggregate marks under Choice Based Credit System (CBCS). Each Open Elective paper will be of 3 Credits in III, IV and VI semesters. Each student has to take Open/Generic Electives from department other than the parent department. Core / Discipline Specific Electives will not be offered as Open Electives.

Non CGPA Audit Course (NCAC): This is a compulsory course but audit that does not have any choice and will be of 3 credits. Each student of B.Sc. (H). Program has to compulsorily pass the Environmental Studies and Human values & professional Ethics and NSS.

C. Program Outcomes of Bachelor of Science (Hons) in Agricultural

PO-01	Agricultural knowledge	Imparting the knowledge of agriculture and allied sciences related subjects in the current scenario of Agriculture.
PO-02	Problem analysis	Develop the skills to manage agricultural farms, improve quality of farm produces and their commercial utilization.
PO-03	Development of Solutions	Design solutions for complex problems of the farming system with due consideration of public health and environmental safety.
PO-04	Conduct surveys and investigations	Explore knowledge and methods to synthesize and interpret available information to make viable conclusions.
PO-05	Modern tool usage	Select, and apply appropriate techniques, resources, and modern agriculture technologies and tools for agricultural activities with an understanding of the limitations.
PO-06	Society Role	Apply reasoning to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional practices in agriculture.

PO-07	Environment and sustainability	Understand the impact of the professional scientific solutions on societal and environmental issues, and impart knowledge and need for sustainable development.
PO-08	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the agricultural practices.
PO-09	Individual and Team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO-10	Communication	Communicate effectively through concise documents on complex agricultural problems and challenges in Agriculture.
PO-11	Project Management and Finance	Impart knowledge and understand all related methods in agriculture to apply it in one's work individually or in a team to manage projects and increase the profit from crop fields and livestock.
PO-12	Life-long learning	Recognize the need for, and have the preparation and ability to engage independently in life-long learning in the broadest context of agricultural and technological changes.

D. Program Specific Outcomes:

PSO1: Ability to analyze and apply agricultural knowledge for proposing solutions to real world problems through incubation of innovative ideas in the agricultural field.

PSO2: To understand modern management and production techniques to resolve the agricultural issues based on societal and environmental perspective

E. Program Educational Objectives (PEO's)

PEO1. To understand and be acquainted with several aspects in the field of agriculture to lead a successful career in industry or as an entrepreneur or to pursue higher education.

PEO2. To develop the ability to provide solutions for complex issues in agriculture using advance technologies with sustainability.

PEO3. To install lifelong learning approach constantly evolving technologies with innovative and ethical mindset.

F. Pedagogy & Unique practices adopted:

"Pedagogy is the method and practice of teaching, especially for teaching an academic subject or theoretical concept". In addition to conventional time-tested lecture method, the institute will emphasize on experiential learning:

Role Play & Simulation: Role- play and simulation are forms of experiential learning. Learners take on different roles, assuming a profile of a character or personality, and interact and participate in diverse and complex learning settings. Role-play and simulation function as learning tools for teams and groups or individuals as they "play" online or face-to-face. They alter the power ratios in teaching and learning relationships between students and educators, as students learn through their explorations and the viewpoints of the character or personality they are articulating in the environment. This student-centered space can enable learner-oriented assessment, where the design of the task is created for active student learning. Therefore, role-play& simulation exercises such as virtual share trading, marketing simulation etc. are being promoted for the practical-based experiential learning of our students.

Video Based Learning (VBL)&Learning through Movies (LTM): These days technology has taken a front seat and classrooms are well equipped with equipment and gadgets. Video-based learning has become an indispensable part of learning. Similarly, students can learn various concepts through movies. In fact, many teachers give examples from movies during their discourses. Making students learn few important theoretical concepts through VBL & LTM is a good idea and method. The learning becomes really interesting and easy as videos add life to concepts and make the learning engaging and effective. Therefore, our institute is promoting VBL& LTM, wherever possible.

Field/Live Projects: The students, who take up experiential projects in companies, where senior executives with a stake in teaching guide them, drive the learning. All students are encouraged to do some live project other their regular classes.

Industrial Visits: Industrial visit are essential to give students hand-on exposure and experience of how things and processes work in industries. Our institute organizes such visits to enhance students' exposure to practical learning and work out for a report of such a visit relating to their specific topic, course or even domain.

MOOCs: Students may earn credits by passing MOOCs as decided by the college. Graduate level programs may award Honors degree provided students earn pre-requisite credits through MOOCs. University allows students to undertake additional subjects/course(s) (In-house offered by the university through collaborative efforts or courses in the open domain by various internationally recognized universities) and to earn additional credits on successful completion of the same. Each course will be approved in advance by the University following the standard procedure of approval and will be granted credits as per the approval. Keeping this in mind, University proposed and allowed a maximum of two credits to be allocated for each MOOC courses. In the pilot phase it is proposed that a student undertaking and successfully completing a MOOC course through only NPTEL could be given 2 credits for each MOOC course.

For smooth functioning and monitoring of the scheme the following shall be the guidelines for MOOC courses, Add-on courses carried out by the College from time to time.

a) It will necessary for every student to take at least one MOOC Course throughout the programme.

b) There shall be a MOOC co-ordination committee in the College with a faculty at the level of Professor heading the committee and all Heads of the Department being members of the Committee.

c) The Committee will list out courses to be offered during the semester, which could be requested by the department or the students and after deliberating on all courses finalize a list of courses to be offered with 2 credits defined for each course and the mode of credit consideration of the student. The complete process shall be obtained by the College before end of June and end of December for Odd and Even semester respectively of the year in which the course is being offered. In case of MOOC course, the approval will be valid only for the semester on offer.

d) Students will register for the course and the details of the students enrolling under the course along with the approval of the Vice Chancellor will be forwarded to the Examination department within fifteen days of start of the semester by the Coordinator MOOC through the Principal of the College.

e) After completion of MOOC course, Student will submit the photo copy of Completion certificate of MOOC Course to the Examination cell as proof.

f) Marks will be considered which is mentioned on Completion certificate of MOOC Course.

g) College will consider the credits only in case a student fails to secure minimum required credits then the additional subject(s) shall be counted for calculating the minimum credits required for the award of degree.

Special Guest Lectures (SGL) &Extra Mural Lectures (EML): Some topics/concepts need extra attention and efforts as they either may be high in difficulty level or requires experts from specific industry/domain to make things/concepts clear for a better understanding from the perspective of the industry. Hence, to cater to the

present needs of industry we organize such lectures, as part of lecture-series and invite prominent personalities from academia and industry from time to time to deliver their vital inputs and insights.

Student Development Programs (SDP): Harnessing and developing the right talent for the right industry an overall development of a student is required. Apart from the curriculum teaching various student development programs (training programs) relating to soft skills, interview skills, SAP, Advanced excel training etc. that may be required as per the need of the student and industry trends, are conducted across the whole program. Participation in such programs is solicited through volunteering and consensus.

Industry Focused programmes: Establishing collaborations with various industry partners to deliver the programme on sharing basis. The specific courses are to be delivered by industry experts to provide practice-based insight to the students.

Special assistance program for slow learners & fast learners: write the note how would you identify slow learners, develop the mechanism to correcting knowledge gap. Terms of advance topics what learning challenging it will be provided to the fast learners.

Induction program: Every year 3 weeks induction program is organized for 1st year students and senior students to make them familiarize with the entire academic environment of university including Curriculum, Classrooms, Labs, Faculty/ Staff members, Academic calendar and various activities.

Mentoring scheme: There is Mentor-Mentee system. One mentor lecture is provided per week in a class. Students can discuss their problems with mentor who is necessarily a teaching faculty. In this way, student's problems or issues can be identified and resolved.

Competitive exam preparation: Students are provided with one class in every week for GATE/ Competitive exams preparation.

Extra-curricular Activities: organizing& participation in extracurricular activities will be mandatory to help students develop confidence & face audience boldly. It brings out their leadership qualities along with planning & organizing skills. Students undertake various cultural, sports and other competitive activities within and outside then campus. This helps them build their wholesome personality.

Career & Personal Counseling: - Identifies the problem of student as early as possible and gives time to discuss their problems individually as well as with the parents. Counseling enables the students to focus on behavior and feelings with a goal to facilitate positive change. Its major role lies in giving: Advice, Help, Support, Tips, Assistance, and Guidance.

Participation in Flip Classes, Project based Learning(A2 Assignment), Workshops, Seminars & writing & Presenting Papers: Departments plan to organize the Flip Classes, Project based Learning(A2 Assignment), workshops, Seminars & Guest lecturers time to time on their respective topics as per academic calendar. Students must have to attend these programs. This participation would be count in the marks of general Discipline & General Proficiency which is the part of course scheme as non-credit course.

Formation of Student Clubs, Membership & Organizing & Participating events: Every department has the departmental clubs with the specific club's name. The entire student's activity would be performed by the club. One faculty would be the coordinator of the student clubs & students would be the members with different responsibility.

Capability Enhancement & Development Schemes: The Institute has these schemes to enhance the capability and holistic development of the students. Following measures/ initiatives are taken up from time to time for the same:

Career Counseling, Soft skill development, Remedial Coaching, Bridge Course, Language Lab, Yoga and Meditation, Personal Counseling

Library Visit & Utilization of QLRC: Students may visit the library from morning10 AM to evening 8 PM. Library created its resources Database and provided Online Public Access Catalogue (OPAC) through which users can be accessed from any of the computer connected in the LAN can know the status of the book. Now we are in process to move from OPAC to KOHA.

Detailed Syllabus (Semester wise /course wise)

SEMESTER 1 Year -1

AG3101	Title :- Introductory Biology	L T P C 1 0 0 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	This course aims to learn about the basic concepts of biology and its role in agriculture	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit 1	Introduction	2
Introduction to the living world, diversity and characteristics of life, origin of life, Evolution and Eugenics.		
Unit 2	Taxonomy	2
Binomial nomenclature.		
Unit 3	Cell	2
Cell and cell division.		
Unit 4	Flower and Seed	3
Morphology of flowing plants. Seed and seed germination.		
Unit 5	Plant systematic	3
Classification Plant systematic- viz; Brassicaceae, Fabaceae and Poaceae. Role of animals in agriculture.		
Text Books	1. K.N. Bhatia, M.P. Tyagi. Trueman's Elementary Biology. Mittal Books. 2. Mariëlle Hoefnagels. Biology : The Essentials. Attonbitus Pluo.	
Reference Books	1.Paul R.Ehrlich.Introductory Biology. 2. George Gaylord Simpson.Life: An Introduction to Biology. Harcourt CollegePub	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome For AG3101

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will be learning how life has originated and evolved.	2	Emp
CO2	Students will be learning on classification of living things.	2	Emp
CO3	Students will be gaining knowledge on how a cell looks like and how do they divide.	3	S
CO4	Students will be learning about seed germination and flowering plants.	3	Ent
CO5	Students will be learning about plant systematic and animals in agriculture..	2	Emp

CO-PO Mapping for AG3101

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	1	1	1	1	1	1	1	1	1	1	2	1	1
CO 2	3	1	1	1	1	1	1	1	1	1	1	2	1	1
CO 3	3	1	1	1	1	1	1	1	1	1	1	2	1	1
CO 4	3	1	1	1	1	1	1	1	1	1	1	2	1	1
CO 5	3	1	1	1	1	1	1	1	1	1	1	1	1	1
Avg	2.8	1	1	1	1	1	1	1	1	1	1	1.8	1	1

AG3102	Title : Agricultural Heritage	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To study about globally Important Ingenious Agricultural Heritage Systems.	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit 1	Introduction to Agricultural Heritage	4
Introduction of Indian agricultural heritage; Ancient agricultural practices, Relevance of heritage to present day agriculture.		
Unit 2	Status of Indian agriculture and farmer	5
Past and present status of agriculture and farmers in society; Journey of Indian agriculture and its development from past to modern era.		
Unit 3	Crop voyage and indigenous traditional knowledge	5
Plant production and protection through indigenous traditional knowledge; Crop voyage in India and world.		
Unit 4	Agricultural Scope and Crop significance	5
Agriculture scope; Importance of agriculture and agricultural resources available in India; Crop significance and classifications.		
Unit 5	Agriculture Setup and scenario of agriculture in India	5
National agriculture setup in India; Current scenario of Indian agriculture; Indian agricultural concerns and future prospects.		
Text Books	1.D. Kumari M.Veeral. A Text Book On Agricultural Heritage of India. 2. Y.L. Nene, S.L. Choudhary and S.L.Choudhary. Agricultural Heritage of India. VedicBooks.	
Reference Books	1. Dr. S. Jeyaraman, Dr. A. Arokiaraj, Dr.M.L. Manoharan.Agricultural Heritage of India. TNAU. 2. John Broad. A Common Agricultural Heritage? Revising French and British Rural Divergence. Agricultural History.	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for AG3102

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will be introduced with the basic knowledge about the agricultural and its different components	2	Emp
CO2	Students will be able to know about plant protection and its managements	2	Emp
CO3	Students will be able to know about the concepts of modern agriculture	3	Emp
CO4	Student will gain knowledge about the current scenario of Indian agriculture	2	Emp
CO5	Students will be aware of indigenous traditional knowledge in agriculture	2	Emp

CO-PO Mapping for AG3102

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO2
CO 1	3	2	2	2	1	2	0	0	3	1	2	1	2	1
CO 2	3	2	2	2	2	3	3	0	1	2	3	1	1	2
CO 3	2	3	3	2	3	2	2	1	2	2	1	2	2	2
CO 4	2	2	2	2	2	2	0	2	1	1	2	1	2	1
CO 5	3	1	3	1	3	3	0	2	2	1	2	2	3	1
Avg	2.6	2	2.4	1.8	2.2	2.4	1	1	1.8	1.4	2	1.4	2	1.4

MA3103	**Title: Elementary Mathematics**	**L T P C** **1 0 01**
Version No.	**1.0**	
Course Prerequisites	Nil	
Objectives	To impart the knowledge of Basics of Mathematics.	
Unit No.	**Unit Title**	**No. of hours (per Unit)**
Unit I	**Binomial Theorem and Exponential Series**	2
Binomial Theorem for positive integral index only. Exponential Series.		
Unit II	**Logarithm**	2
Uses of Natural and common Logarithms.		
Unit III	**Differential calculus**	2
Elementary Idea of Limits and Differentiation (Without differentiation by first principles).		
Unit IV	**Differentiation**	3
Differentiation of algebraic, trigonometric, logarithmic and exponential functions only.		
Unit V	**Implicit and explicit functions**	3
Differentiation of products, quotients, functions of functions, implicit and explicit functions.		
Text Books	1. Shantinarayan. Differential Calculus.	
Reference Books	2. Dorofeev. Elementary Mathematics. G. CBS Publishers	
Mode of Evaluation	Internal and External Examination	
Recommendation by Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for MA3103

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will able to use the binomial theorem to solve the algebraic problems	3	Emp
CO2	Students will able to use logarithm in mathematical calculations	3	S
CO3	Students will understand the concept of limits	2	Emp
CO4	Students will able to use basics rule of differentiation	2	Emp
CO5	Students will able to find derivative of implicit functions	2	Emp

CO-PO Mapping for MA3103

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO2
CO 1	1	3	3	1	1	1	1	1	2	1	1	2	1	2
CO 2	1	3	3	1	1	1	1	1	2	1	1	2	1	2
CO 3	1	3	3	1	1	1	1	1	2	1	1	2	1	2
CO 4	1	3	3	1	1	1	1	1	2	1	1	2	1	2
CO 5	1	3	3	1	1	1	1	1	2	1	1	2	1	2
Avg	1	3	3	1	1	1	1	1	2	1	1	2	1	2

EG3103	Title: English Communication	L T PC 2 0 02
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To impart basic English communication skills to the student- Writing, speaking, reading and listening.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Fundamentals of Communication	5
Communication Process; Definition, Importance; Forms of Communication, Channels of Communication; Barriers to Communication: Qualities of a Good Communicator.		
Unit II	Types of Communication	5
Verbal and Non-verbal Communication: Audio-Visual Communication; Effective speaking; Types of Non-verbal communication- Kinesics, Proxemics, Chronemics, Paralanguage.		
Unit III	Listening Skills	4
Definition and Importance; Types of Listening Skills; Intelligent Listening; Barriers to Liatening and overcoming Barriers; SWOT Analysis.		
Unit IV	Writing Skills	5
Use of Grammar; Business Correspondence; Presentations; Report Writing, Project; Notice and Circulars.		
Unit V	Use of Communication Skills	5
Basics of Phonetics; Presentation Skills- Dos & Don'ts; Extempore, Debate, Role Play, Interview, Group Discussion.		
Suggested Reference Books	1.P K Agrawal and A K Mishra. Business Communication, Sahitya Bahwan Publication. 2.Vinod Mishra and Narendra Sukla. Business Communication, SBPD Publishing House. 3.N Gupta and P Mahajan. Business Communication, Sahitya Bahwan Publication. 4..Ruby Gupta. Basic Technical Communication.	
Mode of Evaluation	Internal and External Examination	
Recommendation by Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for EG3103

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will be able to discuss the concept of communication skills	2	Emp
CO2	Students will be able to increase self awareness about English language.	2	Emp
CO3	Students will be able to develop public speaking abilities.	3	Emp
CO4	Students will be able to present each and everything in correct manner.	3	Emp
CO5	Students will be able to discuss the concept of barriers to communication.	3	Emp

CO-PO Mapping for EG3103

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	1	2	2	2	2	2	1	1	1	3	3	2	3	3
CO 2	1	1	1	2	1	2	2	1	1	1	3	3	2	2
CO 3	2	2	2	2	2	3	3	1	1	2	3	1	1	2
CO 4	2	1	2	2	2	3	3	2	2	2	2	1	1	1
CO 5	1	1	1	1	1	2	2	2	1	2	3	3	2	1
Avg	1.4	1.4	1.6	1.8	1.6	2.4	2.2	1.4	1.2	2	2.8	2	1.8	1.8

CS3102	Title: Fundamentals of Computer Applications	L T PC 2 0 02
Version No.	1.0	
Course Prerequisites	Nil	
Objective	This subjects aims to make student handy with the computers basics and programming.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Architecture of Computer	4
What is Computer: Brief History and Evolution Chain, Concept of Hardware, The Inside Computer [Hard Drives (HD), Solid State Drives (SSD), Concept of CPU, Concept Of RAM		
Unit II	Arithmetic of Computer	4
Number System [Decimal, Binary, Octal, Hexadecimal], Conversions, Binary Arithmetic [Addition, Subtraction, Multiplication, Division, 1s Compliment, 2s Compliment		
Unit III	Algorithms & Flow Chart	4
Algorithm [What is Algorithm? Algorithm Writing Examples] Flow Chart [What is Flow Chart? Flow Chart Symbols, How to make Flow Chart? Types of Flow Chart, Flow Chart Examples]		
Unit IV	Basics of DOS	6
Disk Operating System: Dos Commands Internal - DIR, MD, CD, RD, COPY, DEL, REN, VOL, DATE, TIME, CLS, PATH, TYPE. External- CHKDSK, XCOPY, PRINT,DISKCOPY, DISCOMP, DOSKEY, TREE, MOVE, LABEL, APPEND, FORMAT, SORT, FDISK, BACKUP, EDIT, MODE, ATTRIB HELP,SYS.		
Unit V	Windows Concepts	6
Hardware requirements of Windows, Windows, Windows concepts, Calculator, Notepad, Paint, Windows Explorer: Creating folders and other explorer facilities. Entertainment, CD Player, DVD Player, Media Player, Sound Recorder, Volume Control.		
Text Books	1. P.K. Sinha. Computer Fundamentals.	
Reference Books	2. Anita Goel. Computer Fundamentals. “Pearson “ Google Windows help.	
Mode of Evaluation	Internal and External Examination	
Recommended by Board of Studied on	11-06-2019	
Date of Approval by the Academic Council	13-07-2019	

Course Outcome for CS3102

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will be introduced to the basic knowledge of computer hardware	2	Emp
CO2	Students will be introduced to the number system including the conversions and arithmatic calculations	3	S
CO3	Students will be able to know about algorithm and flowchart	3	Emp, S
CO4	Students will be able to understand about various DOS Internal and External commands	2	Emp, S
CO5	Students will learn about various windows concepts	3	Emp

CO-PO Mapping for CS3102

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO2
CO 1	1	2	1	1	1	1	1	1	1	1	2	3	2	2
CO 2	1	2	1	1	1	1	1	1	1	1	2	3	2	2
CO 3	1	2	1	1	1	1	1	1	1	1	2	3	2	2
CO 4	1	2	1	1	1	1	1	1	1	1	2	3	2	2
CO 5	1	2	1	1	1	1	1	1	1	1	2	3	2	2
Avg	1	2	1	1	1	1	1	1	1	1	2	3	2	2

AG3106	Title : Fundamentals of Agronomy	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	This course aims to learn the basic principles of agriculture and crop production in the field level.	
Unit Nos.	Unit Title	Number of hours (per Unit)
UNIT I	Introduction	4
Definition and scope of Agronomy, Classification of Crops on Different basis.		
UNIT II	Principles of Crop Production	5
General principles of Crop production: Climate, soil, preparation, seed and sowing, post sowing-tillage, water management, nutrition, plant protection measures, harvesting, threshing and storage, crop density and geometry.		
UNIT III	Requirements of Crop Production	5
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, logging.		
UNIT IV	Weed Management	5
Weeds- importance, classification, crop weed competition, concepts of weed management principles and methods, herbicides- classification, selectivity and resistance, allelopathy.		
UNIT V	Plant Growth And Development	5
Growth and development of crops, factors affecting growth and development, plant ideotypes, crop rotation and its principles, adaptation and distribution of crops, crop management technologies in problematic areas, harvesting and threshing of crops.		
Text Book	1. S.R.Reddy. Principles of Agronomy. Kalyani Publishers, New Delhi. 2. Chandra De Gopal. Fundamentals of Agronomy. Mittal Books.	
Reference Books	1. T. Yellamanda Reddy & G.H. Sankara Reddy. Principles of Agronomy. JainBook Mart. 2. Jamie Hanks. Principles of Agronomy. Delhi BookStore.	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for AG3106

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will understand meaning and scope of Agronomy and classification of Crops.	2	Emp
CO2	Students will learn about general principles of crop production, crop density and geometry.	2	Emp
CO3	Students will gain knowledge about nutrient management, irrigation methods and management.	2	Emp
CO4	Students will able to understand weed and herbicide classification, weed management principles and methods.	2	Emp
CO5	Students will learn about growth and development of crops, ideotypes, crop rotation, adaptation and distribution of crops and crop management in problematic areas.	2	Emp

CO-PO Mapping for AG3106

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO2
CO 1	2	1	1	1	1	1	1	1	2	1	1	1	1	1
CO 2	3	2	2	2	2	2	1	1`	2	2	2	1	1	2
CO 3	3	2	2	2	3	2	2	1	2	2	2	2	1	2
CO 4	3	3	3	2	3	2	2	1	2	2	2	2	2	2
CO 5	3	2	2	2	3	2	2	2	2	2	2	2	2	2
Avg	2.8	2	2	1.8	2.4	1.8	1.6	1.25	2	1.8	1.8	1.6	1.4	1.8

AG3108	Title : Introductory Agro-Meteorology & Climate Change	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	This course aims to learn the basic concepts of Agro meteorology and its applications in agriculture and knowledge about climate change.	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit I	Introduction and Earth atmosphere	4
Meaning and scope of agricultural meteorology; Earth atmosphere- its composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height.		
Unit II	Wind and solar radiation	5
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.		
Unit III	Atmospheric temperature and concepts of saturation	6
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.		
Unit IV	Cloud formation	3
Cloud formation and classification; Artificial rainmaking. Monsoon- mechanism and importance in Indian agriculture.		
Unit V	Climate change	6
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.		
Text Books	1.H.S.Maviand GraemeJ.Tupper.Agrometeorology – Principles and applications of climate studies in agriculture. International Book Publishing Co.,Lucknow. 2.Pattersen, S. Introduction to Meteorology. Mc. Graw Hill Book Co. Inc.,New York	
Reference Books	1.B S Chouhan, H K Sumeriya, L L Somani, Prof. U S Sharma. Introductory Agrometeorology And Climate Change. GrandFlare. 2.G.S.L.H.V. Prasada Rao. Agricultural Meteorology. PHI Publishers.	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for AG3108

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	By the end of this course students would have obtained knowledge on atmospheric gases and its layers.	2	Emp
CO2	Students would have gained knowledge on wind, cyclone, anticyclone and solar radiation.	2	Emp
CO3	Students would have gained knowledge on atmospheric temperature and concepts of saturation.	2	Emp
CO4	Students would have gained knowledge on cloud formation and artificial cloud making	2	Emp
CO5	Students would have gained knowledge on climate change	2	Emp

CO-PO Mapping for AG3108

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	0	0	0	0	1	0	0	0	2	0	2	3	0
CO 2	3	1	1	2	2	2	2	2	2	2	0	2	2	2
CO 3	3	1	1	1	2	2	2	2	2	2	1	2	2	2
CO 4	3	2	2	2	2	2	2	2	2	2	2	2	3	2
CO 5	3	2	2	2	2	2	2	2	2	2	2	2	3	2
Avg	3	1.2	1.2	1.4	1.6	1.8	1.6	1.6	1.6	2	1	2	2.6	1.6

AG3110	Title: Fundamentals of Horticulture	L T PC 1 0 0 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Production of vegetables in and around household make a substantial, though rarely appreciated contribution to the food security of the poorest segments of the society. To provide complete set of production technology including quality of seedlings and potted plants of summer and winter vegetables	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit 1	Introduction	4
Horticulture - Its definition and branches, importance of horticulture and scope.		
Unit 2	Propagation Methods	6
Horticultural and botanical classification; climate and soil for horticultural crops. Plant propagation-methods and propagating structures.		
Unit 3	Seed dormancy	6
Seed dormancy, Seed germination, principles of orchard establishment; Principles and methods of training and pruning, juvenility and flower bud differentiation; unfruitfulness.		
Unit 4	Pollination and Bio-regulator	4
Pollination- pollinizers and pollinators; fertilization and parthenocarpy, medicinal and aromatic plants; importance of plant bio-regulators in horticulture.		
Unit 5	Irrigation Methods	4
Irrigation – methods, Fertilizer application in horticultural crops.		
Text Books	1. Jitendra Singh. Fundamentals of Horticulture. 2017.Kalyani Publishers. 2. Chadha, K.L Handbook of Horticulture. 2001. ICAR, New Delhi.	
Reference Books	1. Jitendra Singh. Basic Horticulture. 2012. Kalyani Publishers. New Delhi. **2.** V.M.Prasad, S.B.Lal., P.K.Karahana. Fundamental of Horticulture.2015. Rays Books Ltd	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council on	13-07-2019	

Course Outcome for AG3110

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will be introduced with the basic knowledge about the Horticultural and its different components	3	Emp, S
CO2	Students will be able to know about the management of Plant propagation and its managements	3	Emp, S, Ent
CO3	Students will be able to know about the concepts of micro irrigation and horticulture crops	3	Emp
CO4	Student will gain knowledge about the components of precision farming	3	Emp, S, Ent
CO5	Students will be aware of the remote sensing and Geographical Information System	3	Emp, S

CO-PO Mapping for AG3110

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO2
CO 1	3	2	2	2	1	2	0	0	3	1	2	1	2	1
CO 2	3	2	2	2	2	3	3	0	1	2	3	1	1	2
CO 3	2	3	3	2	3	2	2	1	2	2	1	2	2	2
CO 4	2	2	2	2	2	2	0	2	1	1	2	1	2	1
CO 5	3	1	3	1	3	3	0	2	2	1	2	2	3	1
Avg	2.6	2	2.4	1.8	2.2	2.4	1	1	1.8	1.4	2	1.4	2	1.4

AG3109	Title : Rural Sociology and Educational Psychology	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	This course aims to learn the basic concepts of rural sociology and psychology and behavior.	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit I	Introduction to sociology	4
Sociology and Rural sociology: Definition and scope, its significance in agriculture extension.		
Unit II	Social ecology and its concept	5
Social Ecology, Rural society, Social Groups, Social Stratification,		
Unit III	Culture concept and social institution	4
Culture concept, Social Institution, Social Change & Development.		
Unit IV	Psychology	5
Educational psychology: Meaning & its importance in agriculture extension.		
Unit V	Behavior and its concepts	6
Behavior: Cognitive, affective, psychomotor domain, Personality, Learning, Motivation, Theories of Motivation, Intelligence.		
Text Books	1. Chitambar, J.B. Introductory rural sociology. John Wilex and Sons NewYork. 2. Desai, A.R. Rural sociology in India. Bombay, Popular Prakashan, 5th Rev.Ed.	
Reference Books	1. Doshi, S.L. Rural sociology. Rawat Publishers,Delhi. 2. Jayapalan, N. Rural sociology. Altanic Publishers New Delhi. 3. Sharma, K.L. Rural society in India. Rawat Publishers.Delhi.	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for AG3109

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will gain the skills required for entrepreneurship development among the students for self-employment	2	Emp,S
CO2	Imparting managerial training among the young students to build entrepreneurial skills	3	Emp,Ent
CO3	Imparting skills necessary to prepare a model village plan	3	Emp, S
CO4	Students will be gaining knowledge on learning techniques for establishing and managing micro project for the upliftment of rural people	3	Emp, Ent
CO5	Students will gain knowledge on preparation of detailed project report (DPR) for availing loans and grants	3	Emp, Ent

CO-PO Mapping for AG3109

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO2
CO 1	3	2	2	3	2	1	1	1	3	2	2	1	3	2
CO 2	2	3	3	3	2	2	1	1	3	2	2	2	2	3
CO 3	2	3	3	2	0	1	1	0	2	1	2	1	1	2
CO 4	3	1	2	2	3	1	1	2	3	1	2	2	1	2
CO 5	2	1	3	2	2	1	1	1	2	2	1	2	1	3
Avg	2.4	2	2.6	2.4	1.8	1.2	1	1	2.6	1.6	1.8	1.6	1.6	2.4

AG3140	Title: Introductory Biology Lab	L T P C 0 0 21
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Students will have a basic understanding of an introductory level biology experience	

List of Experiments

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

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	11-06-2019
Date of approval by the Academic Council	13-07-2019

Course OutcomefFor AG3140

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will learn about morphology of flowering plants	2	Emp
CO2	Students will learn about the root, stem and leaf structures and their modifications.	2	Emp
CO3	Students will learn about Inflorescence, flower and fruits.	2	Emp
CO4	Students will learn about cell and tissues and cell division	2	Emp
CO5	Students will learn about preparation of slides	3	Emp

CO-PO Mapping for AG3140

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	3	3	1	1	1	1	3	3	2	3	2	2
CO 2	3	2	2	3	1	1	1	1	3	3	2	3	3	2
CO 3	3	2	2	3	1	1	1	1	3	3	2	3	3	2
CO 4	1	2	1	1	1	1	1	1	1	1	2	3	2	2
CO 5	1	2	1	1	1	1	1	1	1	1	2	3	2	2
Avg	2.2	2	1.8	2.2	1	1	1	1	2.2	2.2	2	3	2.4	2

EG3141	Title: English Communication Lab	L T P C 0 0 21
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To enable students to enhance English language skills and to practice soft skills	

List of Experiments

1. Grammar-tenses practice
2. Listening comprehension exercises
3. Responding in everyday life situations
4. Common conversation skills Requesting- Responding to Requests, Congratulating, Expressing, sympathy and condolences. Expressing Disappointment
5. Asking Questions-Polite responses
6. Apologizing-,Forgiving
7. Giving Instructions, Getting and Giving Permission
8. Group discussion
9. Public speaking
10. Mother tongue influence and correction

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	11-06-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome for EG3141

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will be able to develop public speaking abilities.	3	Emp, Ent
CO2	Students would learn Listening comprehension exercises	2	Emp
CO3	Students will be able to speak up over each & every topic.	3	Emp, Ent
CO4	Students will be able to increase self-awareness about English language.	2	Emp
CO5	Students will learn professional communication.	3	Emp, Ent

CO-PO Mapping for EG3141

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO2
CO 1	2	2	2	1	2	2	2	1	2	1	2	1	2	2
CO 2	1	1	1	2	2	2	3	3	3	2	2	2	1	2
CO 3	1	2	2	2	1	2	1	2	1	1	2	2	2	2
CO 4	1	2	1	1	1	1	1	1	1	1	2	3	2	2
CO 5	1	2	1	1	1	1	1	1	1	1	2	3	2	2
Avg	1.2	1.8	1.4	1.4	1.4	1.6	1.6	1.6	1.6	1.2	2	2.2	1.8	2

CS3141	Title: Fundamentals of Computer Applications Lab	L T P C 0 0 21
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	This subjects aims to make student handy with the computers basics and programming.	

List of Experiments

1. Dos Commands Internal - DIR, MD, CD,RD,
2. Dos Commands Internal COPY, DEL,REN
3. Dos Commands Internal VOL, DATE,TIME
4. Dos Commands Internal CLS, PATH,TYPE
5. Dos Commands External- CHKDSK, XCOPY,PRINT,
6. Dos Commands External- DISKCOPY, DISCOMP,DOSKEY
7. Dos Commands External- TREE, MOVE, LABEL,APPEND
8. Dos Commands External- FORMAT, SORT,FDISK
9. Dos Commands External- BACKUP, EDIT,MODE
10. Dos Commands External- ATTRIB HELP,SYS
11. Windows Explorer: Creating folders and other explorer facilities

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	11-06-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome for CS3141

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will be able to understand the history of operating system of MS DOS	2	Emp
CO2	Students will be able to understand the history of operating system of MS WINDOWS	2	Emp
CO3	Students will be able to understand about internal commands of MS DOS	2	Emp
CO4	Students will be able to understand about external commands of MS DOS	2	Emp
CO5	Students will learn about Windows Explorer: Creating folders and other explorer facilities	3	Emp

CO-PO Mapping for CS3141

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	1	2	1	1	1	1	1	1	1	1	2	3	2	2
CO 2	1	2	1	1	1	1	1	1	1	1	2	3	2	2
CO 3	1	2	1	1	1	1	1	1	1	1	2	3	2	2
CO 4	1	2	1	1	1	1	1	1	1	1	2	3	2	2
CO 5	1	2	1	1	1	1	1	1	1	1	2	3	2	2
Avg	1	2	1	1	1	1	1	1	1	1	2	3	2	2

AG3141	Title: Fundamentals of Agronomy Lab	L T P C 0 0 21
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	This course aims to learn the basic principles of agriculture and crop production in the field level.	
List of Experiments		
(Perform any Seven) 1. Identification of crops, seeds, fertilizers, pesticides and tillage implements. 2. Study of agro climatic zones of India. 3. Identification of weeds in crops. 4. Methods of herbicide and fertilizer application. 5. Study of yield contributing characters and yield estimation. 6. Seed germination and viability test. 7. Numerical exercises on fertilizer requirement, plant population, herbicides and water requirement. 8. Use of tillage implements-reversible plough, One way plough, harrow, leveler, seed drill. 9. Study of soil moisture measuring devices. 10. Measurement of field capacity, bulk density and infiltration rate. 11. Measurement of irrigation water.		
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome forAG3141

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will be able to identify seeds, crops, fertilizers, pesticides and weeds	3	Emp, S, Ent
CO2	Students would learn about fertilizer application, seed viability, yield contributing characters and yield estimation	3	Emp, S, Ent
CO3	Students will learn about tillage implements	3	Emp, S, Ent
CO4	Students will be able to learn about soil moisture measuring devices and process.	3	Emp, S, Ent
CO5	Students will learn to calculate fertilizer requirement, plant population, herbicides and water requirement.	3	Emp, S, Ent

CO-PO Mapping for AG3141

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	2	1	2	2	2	2	2	2	2	2	2	2	2
CO 2	3	3	2	3	2	2	3	3	2	3	3	2	3	2
CO 3	3	3	3	3	2	2	2	2	2	3	3	2	2	2
CO 4	3	2	2	2	2	2	3	3	3	3	3	3	3	3
CO 5	3	2	2	2	2	2	3	3	3	3	3	3	3	2
Avg	2.8	2.4	2	2.4	2	2	2.6	2.6	2.4	2.8	2.8	2.4	2.6	2.2

AG3143	Title: Introductory Agro-Meteorology & Climate Change Lab	L T P C 0 0 21
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	This course aims to learn the basic concepts of Agro meteorology.	

List of Experiments

(Perform any Seven)

1. Visit of Agro meteorological Observatory, site selection of observatory.
2. Exposure of instruments and weather data recording.
3. Measurement of total, short wave and long wave radiation and its estimation using Planck's intensity law.
4. Measurement of albedo and sunshine duration.
5. Computation of Radiation Intensity using BSS.
6. Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis.
7. Measurement of soil temperature and computation of soil heat flux.
8. Determination of vapor pressure and relative humidity.
9. Determination of dew point temperature.
10. Measurement of atmospheric pressure and analysis of atmospheric conditions.
11. Measurement of wind speed and wind direction, preparation of wind rose.
12. Measurement, tabulation and analysis of rain.
13. Measurement of open pan evaporation and evapotranspiration. Computation of PET andAET.

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	11-06-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome for AG3143

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will learn the basic concepts of Agro Meteorology	2	Emp
CO2	Students will learn applications of agro meteorology in agriculture.	3	Emp, S, Ent
CO3	Students will get exposure of instruments and weather data recording.	3	Emp
CO4	Students will be able to deal with the relationship between weather/climatic conditions and agricultural production.	3	Emp, Ent
CO5	Student will be able to determine the climatic features, air temperature, humidity etc.	3	Emp

CO-PO Mapping for AG3143

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	2	2	2	3	3	3	3	3	3	3	3
CO 2	3	2	2	2	2	2	3	3	3	3	3	3	3	2
CO 3	3	2	2	2	2	2	3	3	3	3	3	3	3	3
CO 4	3	2	2	2	2	2	3	3	3	3	3	3	2	2
CO 5	3	2	2	2	2	2	3	3	3	3	3	3	3	3
Avg	3	2	2	2	2	2	3	3	3	3	3	3	2.8	2.6

AG3144	Title: Fundamentals of Horticulture Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Students will be exposed to identification of garden tools, horticultural plants. They will be learning to prepare seed bed/nursery bed etc.,	

List of Experiments

(Perform any seven experiments)

1. Identification of garden tools.
2. Identification of horticultural crops.
3. Preparation of seed bed/nursery bed.
4. Practice of sexual and asexual methods of propagation including micro-propagation.
5. Layout and planting of orchard.
6. Training and pruning of fruit trees.
7. Preparation of potting mixture.
8. Fertilizer application in different crops.
9. Visits to commercial nurseries/orchard

Mode of Evaluation	Internal and External Examination
Recommendation by Board of Studies on	11-06-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome For AG3144

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will gain knowledge on the fundamentals of horticulture.	3	Emp, S
CO2	It will provide hands on training on various sexual and asexual methods of propagation	3	Emp, S, Ent
CO3	Students will learn about layout and planting of orchard	3	Emp
CO4	Students will learn about important cultural practices for major fruit and plantation crops.	3	Emp, S, Ent
CO5	Students will raise the nurseries of different vegetable crops for commercial purpose.	3	Emp, S

CO-PO Mapping for AG3144

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	3	3	2	3	2	2	1	2	2	1	2	2	2
CO 2	2	2	2	2	2	2	0	2	1	1	2	1	2	1
CO 3	3	1	3	1	3	3	0	2	2	1	2	2	3	1
CO 4	3	2	2	1	2	2	3	1	2	2	2	2	2	1
CO 5	3	1	1	2	2	2	2	1	2	2	2	2	2	1
Avg	2.6	1.8	2.2	1.6	2.4	2.2	1.4	1.4	1.8	1.6	1.8	1.8	2.2	1.2

SEMESTER 2

MA3202	Title: Statistical Methods	L T PC 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To impart the knowledge of Statistical Techniques.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Introduction and presentation	4
Collection, Classification, Tabulation, Graphic and Diagrammatic presentation of Data ,histogram and ogives,		
Unit II	Measures of central tendency	4
Measures of Central Tendency: Mean, Median, Mode, Geometric Mean.		
Unit III	Measures of Dispersion	5
Range Method, Quartile Deviation, Mean Deviation, Standard Deviation, Coefficient of Variation. Measures of Skewness: Karl Pearson's Coefficient of Skewness, Measure of Kurtosis.		
Unit IV	Correlation and regression	5
Correlation: Karl Pearson's Coefficient of Correlation, Spearman's rank Correlation Coefficient , Regression Analysis		
Unit V	Probability	6
Definition of probability, Additive and Multiplicative Laws of probability and simple problems based on them, Bay's Theorem. Probability Distribution: Binomial , Poisson and Normal		
Text Books	1. Gupta, S.P. Statistical Methods; S. Chand & Sons, New Delhi.	
Reference Books	2. Gupta, S.P. Statistical Methods; S. Chand & Sons, NewDelhi. 3. R.Rangaswamy. A Text Book of Agricultural Statistics.	
Mode of Evaluation	Internal and External Examination	
Recommendation by Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for MA3202

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will be introduced to the basic knowledge of computer hardware	2	Emp
CO2	Students will be introduced to the number system including the conversions and arithmatic calculations	2	Emp
CO3	Students will be able to know about algorithm and flowchart	3	Emp
CO4	Students will be able to understand about various DOS Internal and External commands	2	Emp
CO5	Students will learn about various windows concepts	2	Emp

CO-PO Mapping for MA3202

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	1	3	3	1	1	1	1	1	2	1	1	2	1	2
CO 2	1	3	3	1	1	1	1	1	2	1	1	2	1	2
CO 3	1	3	3	1	1	1	1	1	2	1	1	2	1	2
CO 4	1	3	3	1	1	1	1	1	2	1	1	2	1	2
CO 5	1	3	3	1	1	1	1	1	2	1	1	2	1	2
Avg	1	3	3	1	1	1	1	1	2	1	1	2	1	2

AG3206	Title: Agriculture Microbiology	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To familiarize with various microbes and their effect on plants and to demonstrate the indispensable role of microbes in the environment including elemental cycles, bio-degradation, etc.	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit I	Introduction	3
Introduction. Microbial world: Prokaryotic and eukaryotic microbes.		
Unit II	Bacteria	6
Bacteria: cell structure, chemoautotrophy, photo autotrophy, growth. Bacterial genetics: Genetic recombination-transformation, conjugation and transduction, plasmids, transposon.		
Unit III	Biogeochemical Cycles	5
Role of microbes in soil fertility and crop production: Carbon, Nitrogen, Phosphorus and Sulphur cycles.		
Unit IV	Microbial Interactions	5
Biological nitrogen fixation- symbiotic, associative and asymbiotic. Azolla, blue green algae and mycorrhiza. Rhizosphere and phyllosphere		
Unit V	Microbes in human welfare	5
Microbes in human welfare: silage production, biofertilizers, biopesticides, biofuel production and biodegradation of agro-waste.		
Text Books	1. Biswas, T.D. and Mukherjee. Text Book of Soil Sciences. S.K. Tata McGraw-Hill Publishing Company Limited, NewDelhi. 2. Mukherjee,N.andGhoshT.Agricultural Microbiology. KalyaniPublishers,New Delhi.	
Reference Books	1. Pelczar, Jr. Michel J. Chan, E.C.S. and Krieg, Noel R. Microbiology. Tata McGraw- Hill Edition.India. 2. Rangaswami, G. and Bagyaraj. D.J. Agricultural Microbiology. Prentice Hall of India Pvt. Limited, NewDelhi.	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for AG3206

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will gain the knowledge on basics and importance of Microbiology, characterization of microbes along with microbial structure	2	Emp
CO2	Students will understand the structure and function of various organelles in microbes with their nature of gene transfer	3	Emp
CO3	Students will understand about the biogeochemical cycles of carbon, nitrogen, phosphorus, and Sulphur, and the influence of human activities	2	Emp
CO4	Students will be able to understand the beneficial effects of interactions of microbes and plants and mechanism of biological nitrogen fixation.	3	Emp, Ent
CO5	Students will be able to understand the applications of microbes in human welfare for sustainability	3	Emp, Ent

CO-PO Mapping for AG3206

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	0	0	1	0	1	1	1	2	1	1	1	2	2
CO 2	3	2	1	2	2	2	2	2	2	2	2	2	2	2
CO 3	3	2	2	2	2	2	2	2	2	2	2	2	2	2
CO 4	3	3	3	3	3	3	3	3	3	3	3	3	2	2
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	2	2
Avg	3	2	1.8	2.2	2	2.2	2.2	2.2	2.4	2.2	2.2	2.2	2	2

AG3207	Title: Fundamentals of Agriculture Extension Education	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To provide appropriate solution of farmer's problems, to make the people aware that agriculture is a profit table profession. The extension education is the overall development of the rural people	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit I	Extension Education	4
Extension Education: Meaning, definition, objectives, Principles, Scope, Philosophy and its distinguishing features. Extension Teaching and Learning: Teaching, Teaching Elements, steps in Teaching, Learning, Learning Situation, Basic Principles of Teaching and Learning. Early Extension Efforts in India. Comparative study of Extension Service in India and USA		
Unit-II	Community Development	4
Community Development**:** Meaning, Definition and objectives of community development. Organizational set up and Activities of Community development at State, District, Block and Village level Extension and Rural Development Programmes: Including T and V system, National Demonstration, IRDP, Jawahar Rojgar Yozana		
Unit III	Extension Program	6
Extension Programme Planning, Monitoring and Evaluation: Meaning, Principles and Procedure of Programme Planning. Definition: purpose, types, criteria and steps involved in monitoring and evaluation. New trends in agriculture extension: privatization extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems, etc		
Unit IV	Rural Development	6
Rural Development: concept, meaning, definition; various rural development programmes launched by Govt. of India. Community Dev.-meaning, definition, concept & principles, Philosophy of C.D. Rural Leadership: concept and definition, types of leaders in rural context; extension administration: meaning and concept, principles and functions.		
Unit V	Evaluation and Monitoring	4
Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programmes; transfer of technology: concept and models, capacity building of extension personnel.		
Text Books	1. Dhama, O.P. & Bhatnagar,O.P. Education and Communication for Development. Oxford & IBH Publishing Co.New-Delhi. 2. Kelsey, L.D. & Hearne, C.C. Cooperative Extension Work. CornellUniversity Press, New York,USA.	
Reference Books	1. Ray, G.L. Naya Prakash, Extension Communication and Management. Bidhan Sarni. 2. Reddy, A.A. Extension Education Shri Laxmi Press.	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for AG3207

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will understand that how an extension personal acts as bridge between farmer and scientists	2	Emp
CO2	Students will gain Knowledge about different pre independence and post-independence programmes	2	Emp
CO3	Students will learn about evaluation and new trends in Agriculture extension	3	Emp, Ent
CO4	Students will understand about different steps taken by agricultural scientists to raise the agriculture sector	3	Emp, Ent
CO5	Students will learn about monitoring, evaluation of extension program, concept of transfer of technology and capacity building of extension personnel	3	Emp, Ent

CO-PO Mapping for AG3207

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	1	1	0	0	1	1	1	0	1	1	1	1	1	1
CO 2	2	2	1	1	1	2	2	1	2	2	1	1	1	2
CO 3	3	2	2	1	2	2	2	1	2	2	2	2	1	2
CO 4	3	3	2	2	2	3	2	1	2	3	2	2	2	2
CO 5	3	3	2	2	3	3	3	2	3	3	2	2	2	2
Avg	2.4	2.2	1.4	1.2	1.8	2.2	2	1	2	2.2	1.6	1.6	1.4	1.8

AG3209	Title: Fundamentals of Entomology	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To study about the way beneficial insects contributes to the well being of humans, animals, and plants. To the betterment of humankind by detecting the role of insects in the spread of disease and discovering ways of protecting food and livestock from being damaged	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit I	Introduction of Entomology	5
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.		
Unit II	External Morphology	4
Morphology: Structure and functions of insect cuticle and molting. Body segmentation. Structure of Head, thorax and abdomen. Structure and modifications of insect antennae, mouth parts, legs, Wing venation, modifications and wing coupling apparatus. Structure of male and female genital organ.		
Unit III	Anatomy of Insects	4
Metamorphosis and diapauses in insects. Types of larvae and pupae. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretary (Endocrine) and reproductive system, in insects. Types of reproduction in insects. Major sensory organs like simple and compound eyes, chemoreceptor.		
Unit IV	Classification of Insect	5
Classification of insecticides, toxicity of insecticides and formulations of insecticides. Chemical control-importance, hazards and limitations. Recent methods of pest control, repellents, antifeedants, hormones, attractants, gamma radiation. Insecticides Act 1968-Important provisions. Application techniques of spray fluids. Symptoms of poisoning, first aid and antidotes.		
Unit V	Systematic	6
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, Dictyoptera, Odonata, Isoptera, Thysanoptera, Thripidae, Hemiptera, Neuroptera, Lepidoptera, Coleoptera, Hymenoptera, Diptera.		
Text Books	1. Nayar. K.K, Ananthakrishnan .T.N. and David. B.V. General and Applied EntomologyMc graw Hill publishing Co. Ltd. New Delhi.24 2. Richards O.W. and Davies R.G.Imm's General Text Book of Entomology. Chapman and Hall,London.	
Reference Books	1. Pant. N.C. and Ghai, S. Insect Physiology and Anatomy. ICAR, New Delhi. 2. Chapman .R.F. Insect Structure and Function. ELBS Publishers New Delhi. 3. Mathur and Upadhyay. A Text Book of Entomology. Aman Publishing House, Meerut.	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for AG3209

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will be able to know about the background and history of entomology in India and will also be aware about the relationship of insects with other arthropods.	2	Emp
CO2	Students will be able to know about the external morphology, physiology and anatomy of insects	2	Emp
CO3	Students will gain knowledge about the different methods of pest control and use of chemicals in the prevention of insects.	3	Emp, S, Ent
CO4	Students will understand about the use of systematic in insect class and also learn some important order of insect class.	2	Emp
CO5	Students will learn about the practical methods of preservation of insects, sampling techniques and using of appliances in prevention of pests.	3	Emp, S, Ent

CO-PO Mapping for AG3209

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	2	1	2	0	0	3	2	1	2	2	1
CO 2	3	2	2	2	2	3	3	0	1	2	1	2	1	2
CO 3	2	3	3	2	3	2	2	1	2	2	1	2	2	2
CO 4	2	2	2	2	2	2	0	2	1	1	2	2	2	1
CO 5	3	1	3	1	3	3	0	2	2	2	1	1	3	1
Avg	2.6	2	2.4	1.8	2.2	2.4	1	1	1.8	1.8	1.2	1.8	2	1.4

AG3210	Title: Production Technology for Vegetables and Spices	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To provide complete set of production technology including quality of seedlings and potted plants of summer and winter vegetables	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit I	Introduction of vegetable	4
Classification of vegetables. Importance of vegetables & spices in human nutrition and national economy.		
Unit II	Transplanting Method	*5*
Kitchen gardening, brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield.		
Unit III	Physiological disorder in spices	5
Physiological disorders of important vegetable and spices (Tomato, Brinjal, Chilli, Capsicum, Cucumber, Melons, Gourds, Pumpkin, French bean, Peas).		
Unit IV	Physiological disorder in cole crops	6
Physiological disorder in Cole crops such as Cabbage, Cauliflower, Knol-khol; Bulb crops such as Onion, Garlic; Root crops such as Carrot, Raddish, Beetroot; Tuber crops such as Potato; Leafy vegetables such as Amaranth, Palak, Perennial vegetables).		
Unit V	Cultivation Practices	4
Cultivation and seed production of major vegetable like Potato, Brinjal, chillies, tomato, Cauliflower, Cabbage, Onion, Bottle, gourd, Musk melon, watermelon, Okra, Radish, Carrot and Pea.		
Text Books	1.VishnuSwarup. Vegetable Science and Technology in India . 2.S.P.Singh,NepalSingh,D.K. Singh. VegetableSeedProductionTechnology.	
Reference Books	1. T.K.Bose & J. Kabir. Vegetable Crops. Volume I 2. T.K.Bose , J. Kabir & Others.Vegetable Crops. Volume II 3. T.K.Bose , J. Kabir & Others.Vegetable Crops. Volume III	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for AG3210

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	To impart knowledge on the principles of horticulture, propagation and production techniques of tropical, sub tropical, temperate vegetable and spice crops.	3	Emp, S, Ent
CO2	Students will understand the current applications of vegetable principles and practices: propagation, pest management, production, maintenance, and business practices.	3	Emp, S, Ent
CO3	Students will be able to solve problems and think critically using new knowledge and technological developments in vegetable and spices.	3	Emp, S, Ent
CO4	Students will know about the characteristics of the environment and their influence on plant growth and development	3	Emp, S, Ent
CO5	Students will know about the demonstrate an awareness of diversity within the profession of horticulture and the interplay between horticulture and society in a diverse world through understanding the breadth of diversity (gender, race, culture, religion, etc.); understanding the value of diversity; and knowing how to successfully integrate diverse thought, etc. into the work environment.	3	Emp, S, Ent

CO-PO Mapping for AG3210

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	2	1	2	0	0	3	1	2	1	2	1
CO 2	3	2	2	2	2	3	3	0	1	2	3	1	1	2
CO 3	2	3	3	2	3	2	2	1	2	2	1	2	2	2
CO 4	2	2	2	2	2	2	0	2	1	1	2	1	2	1
CO 5	3	1	3	1	3	3	0	2	2	1	2	2	3	1
Avg	2.6	2	2.4	1.8	2.2	2.4	1	1	1.8	1.4	2	1.4	2	1.4

AG3213	Title: Fundamentals of Genetics	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	This course aims to learn the basic concepts of genetics and cytology and their applications in agriculture.	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit 1	Mendelian Genetics	3
Pre and Post Mendelian concepts of heredity, Mendelian principles of heredity Probability and Chi-square.,		
Unit 2	Principles Of Cytogenetics	5
Architecture of chromosome; chromonemata, chromosome matrix, chromomeres, centromere, secondary constriction and telomere; special types of chromosomes. Chromosomal theory of inheritance- cell cycle and cell division- mitosis and meiosis.		
Unit 3	Gene Interaction	6
Epistatic interactions with example. Multiple alleles, pleiotropism and pseudoalleles, Sex determination and sex linkage, sex limited and sex influenced traits, Blood group genetics, Linkage and its estimation, crossing over mechanisms, chromosome mapping. Dominance relationships.		
Unit 4	Mutation And Quantitative Genetics	6
Structural and numerical variations in chromosome and their implications, Use of haploids, dihaploids and doubled haploids in Genetics. Mutation, classification, Methods of inducing mutations & CIB technique, mutagenic agents and induction of mutation. Qualitative & Quantitative traits, Polygenes and continuous variations, multiple factor hypothesis, Cytoplasmic inheritance.		
Unit 5	Gene And Nucleic Acid	4
Genetic disorders. Nature, structure & replication of genetic material. Protein synthesis, Transcription and translational mechanism of genetic material, Gene concept: Gene structure, function and regulation, Lac and Trp operons.		
Text Books	1. Singh B D. Fundamentals of Genetics. Kalyani Publishers, NewDelhi. 2. Peter J. Russell. Fundamentals of Genetics. FusionBook.	
Reference Books	1. WilliamD. Stansfield. Theory and Problems of Genetics. Schaum's Outline series - McGraw-HillInc. 2. Gardner E J, Simmons M J & SnustardD. Principles of Genetics. P. John Wiley Sons, Newyork.	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for AG3213

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will understand Pre and Post Mendelian theories, Mendel's law of heredity and calculation of Chi-Square test.	2	Emp
CO2	Students will gain the knowledge about chromosome structure, special types of chromosomes and different types of cell division.	2	Emp
CO3	Students will get knowledge about different gene interactions, sex determination, sex linkage, theory of linkage, crossing over and multiple alleles.	3	Emp
CO4	Student will get knowledge about qualitative and quantitative inheritance, cytoplasmic inheritance, chromosome aberrations, polyploidy & mutation.	3	Emp
CO5	Students will learn about the DNA structure, DNA replication, nature of genetic material, gene structure, gene regulation, gene expression & protein synthesis.	2	Emp

CO-PO Mapping for AG3213

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO2
CO 1	1	2	2	1	1	1	1	1	1	1	1	1	1	1
CO 2	2	2	2	1	2	1	1	1	2	2	1	1	1	1
CO 3	3	3	2	2	2	2	2	1	2	2	2	2	1	2
CO 4	3	3	3	2	3	2	2	1	2	2	2	2	2	2
CO 5	3	2	2	2	3	2	2	1	2	2	2	2	2	2
Avg	2.4	2.4	2.2	1.6	2.2	1.6	1.6	1	1.8	1.8	1.6	1.6	1.4	1.6

AG3214	Title: Fundamentals of Soil Science	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To study the *fundamental* concepts in *soil science*	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Soil formation & components	5
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.		
Unit II	Soil physical properties & taxonomy	5
Soil physical properties: soil-texture, structure, density and porosity, soil colour, consistence and plasticity; Elementary knowledge of soil taxonomy classification and soils of India; Soil water retention, movement and availability.		
Unit III	Soil chemical properties &soil colloids	6
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, 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.		
Unit IV	Soil organic matter	4
Soil organic matter: composition, properties and its influence on soil properties; humic substances - nature and properties; soil organisms, Macro and micro organisms, their beneficial and harmful effects.		
Unit V	Soil pollution	4
Soil pollution - behaviour of pesticides and inorganic contaminants, prevention and mitigation of soil pollution.		
Text Books	Sehgal J. A. Textbook of Pedology Concepts and Applications. Kalyani Publishers, New Delhi, Hillel D. 1982. 2. Introduction to Soil Physics. Academic Press, London.	
Reference Books	Brady Nyle C and Ray R Well. Nature and properties of soils. 2002. Pearson Education Inc., New Delhi, Indian Society of Soil Science. 1998. 2.Fundamentals of Soil Science. IARI, New Delhi,	
Mode of Evaluation	Internal and External Examination	
Recommendation by Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for AG3214

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will learn about pedological and edaphological concepts of soil; Soil genesis: soil forming rocks and minerals; weathering, soil Profile, components of soil	3	Emp, S
CO2	Students will learn soil physical properties & soil taxonomy classification, soil water retention, movement and availability	3	Emp, S, Ent
CO3	Students will learn about soil chemical properties &soil colloids, ion exchange, cation exchange capacity and base saturation	3	Emp
CO4	Students will learn about Soil organic matter, humic substances, soil organisms, macro and micro organisms, their beneficial and harmful effects	3	Emp, S, Ent
CO5	The students will gain knowledge on soil pollution, behaviour of pesticides and inorganic contaminants, prevention and mitigation of soil pollution	3	Emp, S

CO-PO Mapping for AG3214

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO2
CO 1	3	2	2	2	1	2	0	0	3	2	1	2	2	1
CO 2	3	2	2	2	2	3	3	0	1	2	1	2	1	2
CO 3	2	3	3	2	3	2	2	1	2	2	1	2	2	2
CO 4	2	2	2	2	2	2	0	2	1	1	2	2	2	1
CO 5	3	1	3	1	3	3	0	2	2	2	1	1	3	1
Avg	2.6	2	2.4	1.8	2.2	2.4	1	1	1.8	1.8	1.2	1.8	2	1.4

MA3240	Title: Statistical Methods Lab	L T P C 0 0 21
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To impart the knowledge of Statistical Techniques.	
	List of Experiments	
	1. Measures of Central Tendency 2. Measures of Dispersion 3. Correlation	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for MA3240

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will learn to apply various sampling methods for data collection.	3	Emp
CO2	Students will learn to display data graphically with interpretation using graphs.	3	Emp
CO3	Students will learn stem plots, histograms and box plots.	2	Emp
CO4	Students will recognize, describe and calculate the measures of the spread of data: variance, standard deviation and range.	3	Emp
CO5	Student will learn to create and interpret a line of best fit and Calculate and interpret the correlation coefficient.	3	Emp

CO-PO Mapping for MA3240

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO2
CO 1	3	3	3	3	3	1	1	1	2	2	3	3	2	2
CO 2	3	3	3	3	3	1	1	1	2	2	3	3	3	2
CO 3	3	3	3	3	3	1	1	1	2	2	3	3	3	2
CO 4	3	3	3	3	3	1	1	1	2	2	3	3	3	2
CO 5	3	3	3	3	3	1	1	1	2	2	3	3	3	2
Avg	3	3	3	3	3	1	1	1	2	2	3	3	2.8	2

AG3240	Title: Agriculture Microbiology Lab	L T P C 0 0 21
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To familiarize with various microbes and their morphology.	

List of Experiments

(Perform any Seven)

1. Introduction to microbiology laboratory and its equipments.
2. Microscope- parts, principles of microscopy, resolving power and numerical aperture.
3. Methods of sterilization.
4. Nutritional media and their preparations.
5. Enumeration of microbial population in soil- bacteria, fungi, actinomycetes.
6. Methods of isolation and purification of microbial cultures.
7. Isolation of Rhizobium from legume root nodule.
8. Isolation of Azotobacter from soil.
9. Isolation of Azospirillum from roots.
10. Isolation of BGA.
11. Staining and microscopic examination of microbes.

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	11-06-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome for AG3240

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will be able to identify microbes from various sources	2	Emp,S
CO2	Students will be able to visualize and isolate microbes from various sources.	2	Emp,S
CO3	Students are exposed to various laboratory equipment's which might help them for its better applications in near future.	3	Emp, S
CO4	Student will learn plant microbe interactions	3	Emp, S
CO5	Student will study role of plants in antimicrobial activity	3	Emp, S, Ent

CO PO Mapping for AG3240

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	1	0	0	1	1	0	1	1	1	1	1	1	1
CO 2	2	2	2	1	2	2	1	1	2	2	2	2	2	2
CO 3	3	2	2	2	2	2	3	3	3	3	3	3	3	3
CO 4	3	2	2	2	2	2	3	3	3	3	3	3	3	3
CO 5	3	2	2	2	2	2	3	3	3	3	3	3	3	3
Avg	2	2	2	2	2	2	3	3	3	3	3	3	3	3

AG3241	Title: Fundamentals of Agriculture Extension Education Lab	L T P C 0 0 21
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To provide the extension education is the overall development of the rural people.	
List of Experiments		
(Perform any Seven) 1. To get acquainted with university extension system. Group discussion-exercise; 2. Handling and use of audio visual equipments and digital camera and LCD projector; preparation and use of AVaids, 3. Preparation of extension literature – leaflet, booklet, folder, pamphlet news stories and successstories; 4. Presentation skills exercise; micro teaching exercise; A visit to village to understand the problems being encountered by the villagers/ farmers; 5. To study organization and functioning of DRDA and other development departments at districtlevel; 6. Visit to NGO and learning from their experience in rural development; understanding PRA techniques and their application in village developmentplanning; 7. Exposure to mass media: visit to community radio and television studio for understanding the process of programmeproduction 8. Script writing, writing for print and electronic media, developing script for radio andtelevision.		
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for AG3241

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will be able to apply new trends in agricultural extension like private extension, market led extension, expert systems, farmer led extension and cyber extension	2	Emp
CO2	Students will able to develop and prepare extension literature such as leaflets, booklets, etc.	3	Emp,S
CO3	Students will be developing their presentation skills exercise while visiting farmers field	3	Emp, S
CO4	Students will be able to learn about different organizational setup of DRDA and other departments at district level.	2	Emp
CO5	Students will be able to apply communication strategies using agricultural journalism for innovation, diffusion and adoption of agricultural technology.	3	Emp, S, Ent

CO-PO Mapping for AG3241

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	2	2	2	3	3	3	3	3	3	3	3
CO 2	3	2	2	2	2	2	3	3	3	3	3	3	3	3
CO 3	3	2	2	2	2	2	3	3	3	3	3	3	3	3
CO 4	3	2	2	2	2	2	3	3	3	3	3	3	3	3
CO 5	3	2	2	2	2	2	3	3	3	3	3	3	3	3
Avg	3	2	2	2	2	2	3	3	3	3	3	3	3	3

AG3243	Title: Fundamentals of Entomology Lab	L T P C 0 0 21
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To study about the way beneficial insects contributes to the well being of humans, animals, and plants.	
List of Experiments		
(Perform any Seven) 1. Methods of collection and preservation of insects including immaturestages. 2. External features of Grasshopper/Blister beetle; Types of insect antennae, mouthparts andlegs. 3. Wing venation, types of wings and wing couplingapparatus. 4. Types of insect larvae and pupae; Dissection of digestive system in insects(Grasshopper). 5. Dissection of male and female reproductive systems in insects(Grasshopper). 6. Study of characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance. Insecticides and theirformulations. 7. Pesticide appliances and theirmaintenance. 8. Sampling techniques for estimation of insect population anddamage. 9. Pesticide appliances and theirmaintenance. 10. Sampling techniques for estimation of insect population anddamage.		
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for AG3243

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students would learn about the insect collection and preservation, types of insect antennae, mouth parts and legs	2	Emp
CO2	Students would learn about the external features and digestive system of grass hopper	2	Emp
CO3	Students will learn about pesticide appliances and their maintenance	3	Emp, S, Ent
CO4	Students will learn sampling techniques for estimation of insect population and damage	2	Emp
CO5	Students will learn about characters of different orders i.e., Orthoptera, Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera.	3	Emp, S

CO-PO Mapping for AG3243

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	1	1	1	1	1	2	1	1	2	1	0	0	1
CO 2	3	2	2	2	2	2	1	1	2	1	1	1	1	1
CO 3	3	2	1	2	1	1	1	1	1	2	1	1	1	1
CO 4	1	0	1	0	0	1	1	2	1	2	1	2	1	2
CO 5	1	0	1	0	2	1	1	1	2	2	1	3	2	1
Avg	2	1	1.2	1	1.2	1.2	1.2	1.2	1.4	1.8	1	1.4	1	1.2

AG3244	Title: Production Technology for Vegetables and Spices Lab	L T P C 0 0 21
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To provide complete set of production technology including quality of seedlings and potted plants of summer and winter vegetables.	
List of Experiments		
1. Identification of vegetables & spice crops and theirseeds. 2. Nursery raising. Direct seed sowing andtransplanting. 3. Study of morphological characters of different vegetables &spices. 4. Fertilizers applications. Harvesting & preparation formarket. 5. Economics of vegetables and spicescultivation. 6. Production of seeds in vegetable available at the time ofcourse. 7. Cost of cultivation studies in Potato, Tomato, Cauliflower andOkra		
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for AG3244

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will be able to raise the nurseries of different vegetable crops for commercial use.	3	Emp, S, Ent
CO2	They will be able to impart knowledge on the principles of horticulture, propagation and production techniques of tropical, sub tropical, temperate vegetable and spice crops.	3	Emp, S, Ent
CO3	Students will study morphological characters of different vegetables & spices.	3	Emp, S, Ent
CO4	Students will be able to produce various vegetables under poly house as protected cultivation.	3	Emp, S, Ent
CO5	Student will learn to calculate the cost of cultivation in Potato, Tomato, Cauliflower and Okra	3	Emp, S, Ent

CO-PO Mapping for AG3244

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	2	2	3	3	0	1	2	3	1	1	2
CO 2	2	3	3	2	3	2	2	1	2	2	1	2	2	2
CO 3	2	2	2	2	2	2	0	2	1	1	2	1	2	1
CO 4	2	3	3	2	3	2	2	1	2	2	1	2	2	2
CO 5	2	2	2	2	2	2	0	2	1	1	2	1	2	1
Avg	2.2	2.4	2.4	2	2.4	2.2	1.4	1.2	1.4	1.6	1.8	1.4	1.8	1.6

AG3248	Title: Fundamentals of Genetics Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	This course aims to learn the basic concepts of genetics and cytology.	

List of Experiments

(Perform any seven experiments)

1. Study of microscope.
2. Study of cell structure.
3. Mitosis and Meiosis cell division.
4. Experiments on monohybrid, dihybrid, trihybrid, test cross and backcross.
5. Experiments on epistatic interactions including test cross and backcross.
6. Practice on mitotic and meiotic cell division.
7. Experiments on probability and Chi-square test.
8. Determination of linkage and cross-over analysis (through two point test cross and three point test Xdata).
9. Study on sex linked inheritance in Drosophila.
10. Study of models on DNA and RNA structures.

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	11-06-2019
Date of approval by the Academic Council	13-07-2019

Course outcome for AG3248

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will understand Pre and Post Mendelian theories	2	Emp
CO2	Students will gain the knowledge about chromosome structure	2	Emp
CO3	Students will get knowledge about different gene interactions	3	Emp
CO4	Students will get knowledge about Qualitative and Quantitative inheritance	3	Emp
CO5	Students will learn about the DNA structure	2	Emp

CO-PO Mapping for AG3248

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	2	2	2	2	2	2	2	2	2	2	2
CO 2	3	2	2	2	2	2	2	3	2	3	3	2	2	2
CO 3	3	2	2	2	2	2	3	3	3	3	3	3	3	3
CO 4	3	2	2	2	2	2	3	3	3	3	3	3	3	2
CO 5	3	2	2	2	2	2	3	3	3	3	3	3	3	2
Avg	3	2	2	2	2	2	2.6	2.8	2.6	2.8	2.8	2.6	2.6	2.2

AG 3247	Title: Fundamentals of Soil Science Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Students will gain knowledge about Soil as a natural body, Pedological and Edaphological concepts of soil. Students will also study about soil sampling tools, collection of representative soil sample, its processing and storage.	

List of Experiments

(Perform any seven experiments)

1. To study about the soil profile in field
2. To study about the soil sampling tools
3. To studyabout the collection of representative soil sample, its processing and storage
4. To study about the soil forming rocks and minerals
5. To study about the determination of soil density, moisture content and porosity
6. To study about the determination of soil texture by feel and Bouyoucos Methods
7. To study studies about the capillary rise phenomenon of water in soil column and water movement in soil
8. To study determination about the soil pH and electrical conductivity
9. To study about the Determination of Cat ion exchange capacity of soil
10. To study about the soil map.
11. To study about the determination of soil colour.
12. To study about the demonstration of heat transfer in soil.
13. To study about the estimation of organic matter content of soil.

Mode of Evaluation	Internal and External Examination
Recommendation by Board of Studies on	11-06-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome For AG3247

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will acquaint with different soil sampling tools and soil sampling method	3	Emp, S
CO2	Students will learn to study the soil profile, soil forming rocks and minerals	3	Emp, S, Ent
CO3	Students will learn to determine soil density, moisture content and porosity	3	Emp
CO4	Students will learn to determine soil texture, soil pH and EC	3	Emp, S, Ent
CO5	Students will learn to estimate the organic matter content of soil	3	Emp, S

CO-PO Mapping for AG3247

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	3	3	2	3	2	2	1	2	2	1	3	2	2
CO 2	2	2	2	2	2	2	1	2	1	1	2	3	2	1
CO 3	3	1	3	1	3	3	1	2	2	2	1	2	3	1
CO 4	2	2	2	2	2	2	1	2	1	1	2	3	2	1
CO 5	3	1	3	1	3	3	1	2	2	2	1	2	3	1
Avg	2.4	1.8	2.6	1.6	2.6	2.4	1.2	1.8	1.6	1.6	1.4	2.6	2.4	1.2

CY3205	Title: Environmental Studies	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Creating awareness among agriculture students about the importance of environment, the effect of technology on the environment and ecological balance is the prime aim of the course.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Introduction to Environmental studies and Ecosystems	5
Multidisciplinary nature of environmental studies, Scope and importance, Need for public awareness. Concept of an ecosystem-Structure and function of an ecosystem, Energy flow in an ecosystem: food chains, food webs and ecological pyramids, Ecological succession, Case studies of the following ecosystems : a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)		
Unit II	Natural Resources: Renewable and Non- renewable resources	5
Land resources and land use change : Land as a resource, land degradation, landslides (natural & man-induced), soil erosion and desertification. Forests & forest resources : Use and over-exploitation, deforestation, case studies. Impacts of deforestation, mining, dam building on environment, forests, biodiversity and tribal populations. Resettlement and rehabilitation of project affected persons; problems and concerns, case studies. Water resources: Use and over-exploitation of surface and ground water, floods, drought, conflicts over water (international & inter-state). Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources: Renewable and non renewable energy sources, use of alternate energy sources, growing energy needs, case studies.		
Unit III	Biodiversity and Conservation	5
Levels of biological diversity : genetic, species and ecosystem diversity. Biogeographic zones of India. Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational values. Biodiversity patterns and global biodiversity hot spots. India as a mega-biodiversity nation; Endangered and endemic species of India. Threats to biodiversity : Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions. Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.		
Unit IV	Environmental Pollution	4
Environmental pollution and its types. Causes, effects and control measures of : a) Air pollution, b) Water pollution – freshwater and marine, c) Soil pollution, d) Noise pollution, e) Thermal pollution. Nuclear hazards and human health risks. Solid waste management: Control measures of urban and industrial waste. Role of an individual in prevention of pollution. Pollution case studies.		
Unit V	Environmental Policies and Practices	5
Environmental ethics; issues and possible solutions. Climate change, global warning: causes, effects and mitigation (national and international efforts). Ozone layer depletion: causes, effects and mitigation (national and international). Sustainable Development: Definition, concepts and currencies. Sustainable development of agro-ecosystem (organic farming), Sericulture, floriculture, bee keeping, Sustainable development of hydroenergy in Uttaranchal, Traditional Ecological knowledge (TEK). *Anthropogenic* and natural environmental problems. Environmental Protection Act 1986, Air (Prevention and Control of pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act 1972, Forest Conservation Act 1980, The Biological Diversity Act 2002, Issues involved in enforcement of environmental legislation, public awareness, Article 48A and 51A, Automobile Emission standards (Eco/Bharat), Ecomark.		

Text Books	1. Bharucha. E, Textbook of Environmental Studies for Undergraduate Courses. 2. Kaushik Anubha, Kaushik C P, Perspectives in Environmental Studies New Age Publication. 3. C. S. Bohra, An Introduction to Environmental Biology; Discovery Publication, New Delhi.
Reference Books	1. Carson, Rachel. 1962. Silent Spring (Boston: Houghton Mifflin, 1962), Mariner Books, 2002. 2. Cheney, J. 1989. Postmodern environmental ethics. *Environmental Ethics* 11: 117-134.
Mode of Evaluation	Internal and External Examination
Recommendation by Board of Studies on	11-06-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome for CY3205

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will able to understand the scope and importance of ecosystem	3	Emp, S
CO2	Students will understand usage of renewable and nonrenewable resources	3	Emp, S, Ent
CO3	Students will understand about biodiversity and conservation	3	Emp
CO4	Students will be able to understand different types of pollution and their causes	3	Emp, S, Ent
CO5	Students will understand the environmental policies and practices	3	Emp, S

CO-PO Mapping for CY3205

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	0	0	0	0	1	1	1	1	1	0	3	1	0
CO 2	2	2	2	2	1	3	3	2	2	2	2	2	2	2
CO 3	2	2	2	2	1	2	2	2	2	2	2	2	2	2
CO 4	3	2	2	2	2	2	3	2	2	2	2	2	2	2
CO 5	3	2	2	2	2	2	2	2	2	2	2	2	2	2
Avg	2.4	1.6	1.6	1.6	1.2	2	2.2	1.8	1.8	1.8	1.6	2.2	1.8	1.6

AG3306	Title: Crop Production Technology and Crop Improvement - I(*Kharif* crops)	L T P C 2 0 0 2
Version No.	**1.1**	
Course Prerequisites	Nil	
Objectives	To study about latest biotechnology options for crop improvement and production, develop knowledge of integrated crop management systems and to study about the productivity of main food crops cultivated during the *Kharif season*.	
Unit No.	**Unit Title**	**No. of hours (per Unit)**
Unit I	**Introduction**	4
Introduction to *Kharif* Crops including different cultural practices Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Kharif* crops. Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fibers; fodders and cash crops; vegetable and horticultural crops.		
Unit II	**Cultivation practices of Cereals, Pulses, Oilseed and Forages Crops**	6
Cereals - Rice, Maize, Sorghum, Pearl Millet And Finger Millet. Pulses-Pigeonpea, Mungbean and Urdbean. Oilseeds- Sesame, Groundnut, and Soybean. Fibre crops- Cotton & Jute. Forage crops-Maize, Sorghum, Cowpea, Cluster bean and Napier		
Unit III	**Breeding Concepts of Crops**	4
Plant genetic resources, its utilization and conservation, study of genetics of qualitative and quantitative characters; important concepts of breeding self pollinated, cross pollinated and vegetative propagated crops.		
Unit IV	**Breeding Objectives and Hybrid Development**	6
Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional).		
Unit V	**Hybrid Seed Production and Ideotype Breeding**	4
Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeonpea, etc. Ideotype concept and climate resilient crop varieties for future.		
Text Books	1. Mukund joshi. Textbook of field crops. Amazon asia-pacific holdings private limited. 2. Dr. G.s. Tomar, Dr. S.k. Taunk, Dr. J.l. Choudhary.Science of crop production part-1 (kharif crops). Ashabookhouse	
Reference Books	**1.**Joshi M.**Textbook of Field Crops**. Jain Brothers. 2.Field Crop (Kharif) – ICAR ECourse. TNAU	
Mode of Evaluation	Internal and External Examination	
Recommendation by Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for AG3306

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will gain knowledge about cereals, pulses, oilseeds, fodder crops and cash crops of Kharif crops and they will learn different steps of crop production as well as knowledge of economic importance, Centers of origin, distribution of species and wild relatives of Kharif crops	3	Emp, S
CO2	Students will understand about commercial cultivation of cereals; pulses; oilseeds; fodder crops and cash crops of Kharifcrops and they will use their farming knowledge in field to get good yield	3	Emp, S, Ent
CO3	Students will knowledge about germplasm collection, germplasm conservation & germplasm utilization and genetics of Qualitative and Quantitative characters	3	Emp
CO4	Students will understand the objectives of plant breeding and various conventional and modern approaches for development of variety and hybrid under different adverse conditions like drought, disease, Insects, flood and salinity	3	Emp, S, Ent
CO5	Students will gain knowledge on standard procedures of hybrid seed production of Kharif crops	3	Emp, S

CO-PO Mapping for AG3306

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
CO 2	1	1	1	1	1	1	1	1	1	1	1	1	2	2
CO 3	1	1	2	1	2	1	1	1	1	1	1	1	2	2
CO 4	1	3	3	1	2	2	2	1	1	1	1	1	2	2
CO 5	1	3	3	1	2	3	3	2	2	1	1	1	2	2
Avg	1	1.8	2	1	1.6	1.6	1.6	1.2	1.2	1	1	1	1.8	1.8

AG3307	Title: Fundamentals of Plant Pathology	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To study on minimization of the *crop* losses through adaption *principles* of disease prevention.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Introduction	6
Importance of plant diseases, scope and objectives of Plant Pathology. History of Plant Pathology with special reference to Indian work. Terms and concepts in Plant Pathology. Pathogenesis. Causes / factors affecting disease development: disease triangle and tetrahedron and classification of plant diseases. Important plant pathogenic organisms, different groups**:** fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasmas, viruses, viroids, algae, protozoa, phanerogamic parasites and nematodes with examples of diseases caused by them. Diseases and symptoms due to abiotic causes.		
Unit II	Study of Fungi	5
Fungi: general characters, definition of fungus, somatic structures, types of fungal thalli, fungal tissues, modifications of thallus, reproduction (asexual and sexual). Nomenclature, Binomial system of nomenclature, rules of nomenclature, classification of fungi. Key to divisions, sub-divisions, orders and classes.		
Unit III	Study of Bacteria	4
Bacteria and mollicutes: general morphological characters. Basic methods of classification and reproduction.		
Unit IV	Study of Viruses	4
Viruses: nature, structure, replication and transmission. Study of phanerogamic plant parasites.		
Unit V	Study of Nematode	5
Nematodes: General morphology and reproduction, classification, symptoms and nature of damage caused by plant nematodes (*Heterodera, Meloidogyne*, *Anguina, Radopholus* etc.) Growth and reproduction of plant pathogens. Liberation / dispersal and survival of plant pathogens. Types of parasitism and variability in plant pathogens. Pathogenesis. Role of enzymes, toxins and growth regulators in disease development. Defense mechanism in plants**.** Epidemiology: Factors affecting disease development. Principles and methods of plant disease management. Nature, chemical combination, classification, mode of action and formulations of fungicides and antibiotics.		
Text Books	1. Mehrotra, R.S. and Agrawal, A. Plant Pathology. 2013. 2nded. Tata McGraw Hill Publishing Co. Ltd., New Delhi. 2. Singh, R.S. Introduction to Principles of Plant Pathology. 2011. 4thed. Oxford & IBH Publishing Company. New Delhi.	
Reference Books	1. Agrios, G.N. 2005. Plant Pathology. 5th ed. Academic Press, New York. 2. Alexopolus, C.J., Mims, C.W. and Blackwell, M. 2013. Introductory Mycology. John Wiley Estern Private Limited, New York.	
Mode of Evaluation	Internal and External Examination	
Recommendation by Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for AG3307

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will be able to learn about basics of pathology	3	Emp, S
CO2	Students will be able to learn about different micro-organisms	3	Emp, S, Ent
CO3	Students will be able to describe and distinguish role of different microorganisms in plants	3	Emp
CO4	Students will be able to learn about classification of different pathogens	3	Emp, S, Ent
CO5	Students will be able to understand different practices to control disease	3	Emp, S

CO-PO Mapping for AG3307

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	1	2	1	2	3	1	2	2	1	2	1
CO 2	2	1	2	1	2	1	2	3	1	1	2	1	2	1
CO 3	2	1	0	1	1	1	1	1	1	1	1	1	2	1
CO 4	3	1	1	1	1	1	1	1	1	1	1	1	2	1
CO 5	3	2	2	1	1	1	2	1	1	1	1	1	1	2
Avg	2.6	1.4	1.4	1	1.4	1	1.6	1.8	1	1.2	1.4	1	1.8	1.2

AG3309	Title: Agricultural Marketing Trade & Finance and Co-operation	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To understand the Structure of *Agriculture marketing* in India.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Agriculture Marketing	4
Agricultural Marketing: Concepts and definitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation, classification and characteristics of agricultural markets**;** demand, supply and producers surplus of agri-commodities: nature and determinants of demand and supply of farm products, producers surplus meaning and its types, marketable and marketed surplus, factors affecting marketable surplus of agri-commodities.		
Unit II	Product Life cycle and Competitive Strategies	5
Product life cycle (PLC) and competitive strategies: Meaning and stages in PLC; characteristics of PLC; strategies in different stages of PLC; pricing and promotion strategies: pricing considerations and approaches – cost based and competition based pricing; market promotion advertising, personal selling, sales promotion and publicity – their meaning and merits & demerits; marketing process and functions.		
Unit III	Marketing Process	5
Marketing process-concentration, dispersion and equalization; exchange functions buying and selling; physical functions storage, transport and processing; facilitating functions packaging, branding, grading, quality control and labeling (Agmark).		
Unit IV	Market Functionaries and Marketing Channels	5
Market functionaries and marketing channels: Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel; number of channel levels; marketing channels for different farm products; Integration, efficiency, costs and price spread: Meaning, definition and types of market integration; marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs; Role of Govt. in agricultural marketing.		
Unit	Public sector and Agricultural Prices and Policy	5
Public sector institutions- CWC, SWC, FCI, CACP & DMI – their objectives and functions; cooperative marketing in India; Risk in marketing: Types of risk in marketing; speculation & hedging; an overview of futures trading; Agricultural prices and policy: Meaning and functions of price; administered prices; need for agricultural price policy; Trade: Concept of International Trade and its need, theories of absolute and comparative advantage. Present status and prospects of international trade in agri-commodities; GATT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture.		
Text Books	1. Agricultural Marketing Trade and Prices. TNAU 2. James Vercammen. Agricultural Marketing. Taylor & Francis Ltd (Sales)	
Reference Books	1. Munish Alagh. Agricultural Prices in a Changing Economy: an Empirical Study of Indian Agriculture Hardcover. UBSPD. 2.Kallummal Murali. Measures and Market Access Implications for Agricultural Trade. Repro Books-On-Demand.	
Mode of Evaluation	Internal and External Examination	
Recommendation by Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for AG3309

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will learn about Concepts of market, marketing, agricultural marketing, market structure, classification and characteristics of agricultural markets**;** demand, supply and producers surplus of agri-commodities.	3	Emp, S
CO2	Students will learn about Product life cycle (PLC) and competitive strategies: market promotion advertising, personal selling, sales promotion and publicity	3	Emp, S, Ent
CO3	Students will learn about marketing Process: concentration, dispersion and equalization, storage, transport and processing, packaging, branding, grading, quality control and labeling (Agmark).	3	Emp
CO4	Students would learn about Market Functionaries and Marketing Channels	3	Emp, S, Ent
CO5	Students would learn about Public sector institutions and Agricultural Prices and Policy	3	Emp, S

CO-PO Mapping for AG3309

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO2
CO 1	3	2	2	3	2	2	2	1	3	2	1	2	3	2
CO 2	2	3	3	3	2	2	2	1	3	2	1	2	2	3
CO 3	2	3	3	2	-	1	2	0	2	1	2	1	1	2
CO 4	3	1	2	2	3	2	1	2	3	2	1	1	1	2
CO 5	2	1	3	2	2	2	1	1	2	2	1	1	1	3
Avg	2.4	2	2.6	2.4	2.25	1.8	1.6	1	2.6	1.8	1.2	1.4	1.6	2.4

AG3311	Title: Fundamental of Crop Physiology	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Students will study the processes and functions of the crops at cellular, sub-cellular and whole plant levels in response to environmental variables and growth.	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit I	Cell Structure	3
Role of plant physiology in agriculture. Plant Cell structure and function		
Unit II	Nutrient Element	6
Physico-chemical phenomenon-diffusion, osmosis and imbibitions. Essential nutrient elements, their role, deficiency symptoms, mineral salt, absorption.		
Unit III	Bio-synthetic Pathway	5
Photosynthesis - light and dark reactions. Significance of C3, C4 and CAM Pathway		
Unit IV	Metabolic Pathway	5
Mechanism of respiration, transpiration. Fat metabolism, synthesis of fatty acids, glycerol and their condensation.		
Unit V	Plant growth substances	5
Assimilation of nitrogen in plants. Plant growth substances, photoperiodism and vernalization.		
Text Books	1. S.N.Pandey. Plant Physiology. VikasPublishing 2. H.S. Srivastava. Plant Physiology. RastogiPublications	
Reference Books	1.N.K. Gupta & Sunita Gupta. Plant Physiology. Oxford & IBH Publication,New Delhi 2. R.L. Agarwal.Seed Technology. Oxford & IBH Publication, NewDelhi 3. G.R. Noggle and G.J. Fritz. Plant Physiology. Prentic Hall of India Pvt.Ltd. 4.J.B. Salisbury and C.W. Ross. Plant Physiology. Wadswar PublishingCompany, Belmont,California	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for AG3311

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	By the end of this course students will be able to learn about different cell organelles in plant	2	Emp
CO2	By the end of this course students will be able to enhance photosynthetic efficiency of their crops	3	Emp
CO3	By the end of this course students will be able to understand internal processes of plants.	2	Emp
CO4	By the end of this course students will be able to describe and distinguish role of hormones in plants	3	Emp
CO5	By the end of this course students will be able to distinguish different plants on the basis of their appearance & about their physiological activity	2	Emp

CO-PO Mapping for AG3311

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	1	1	1	1	1	1	1	1	1	1	1	2	1	1
CO 2	1	1	1	1	1	1	1	1	2	1	1	2	1	1
CO 3	1	1	1	1	2	1	1	1	1	1	1	2	1	1
CO 4	1	1	1	1	2	1	1	1	2	1	1	2	1	1
CO 5	1	1	1	1	1	1	1	1	2	1	1	2	1	1
Avg	1	1	1	1	1.6	1	1	1	1.6	1	1	2	1	1

AG3312	Title: Fundamentals of Plant Biochemistry and Biotechnology	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	This subject will provide knowledge and understanding of the molecular machinery of living cells and the principles and basic mechanisms of metabolic controland molecular signaling.	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit I	Basic Chemistry and biology	5
Importance of Biochemistry. Properties of Water, pH and Buffer.Carbohydrate: Importance and classification.Structures of Monosaccharides, Reducing and oxidizing properties of Monosaccharides, Mutarotation; Structure of Disaccharides and Polysaccharides. Lipid: Importance and classification; Structures and properties of fatty acids; storage lipids and membrane lipids.		
Unit II	Protien and Enzyme	5
Proteins: Importance of proteins and classification; Structures, titration and zwitterions nature of amino acids; Structural organization of proteins.Enzymes: General properties; Classification; Mechanism of action; Michaelis & Menten and Line Weaver Burk equation & plots; Introduction to allosteric enzymes.		
Unit III	Biosynthetic pathway	5
Nucleic acids: Importance and classification; Structure of Nucleotides, A, B & Z DNA; RNA: Types and Secondary & Tertiary structure. Metabolism of carbohydrates: Glycolysis, TCA cycle, Glyoxylate cycle, Electron transport chain. Metabolism of lipids: Beta oxidation, Biosynthesis of fatty acids.		
Unit IV	Introduction of biotechnology and culture	5
Concepts and applications of plant biotechnology: Scope. organ culture, embryo culture, cell suspension culture, callus culture, anther culture,pollencultureandovulecultureandtheirapplications.Micro-propagation methods; organogenesis and embryogenesis, Synthetic seeds and their significance; Embryo rescue and its significance; somatic hybridization and cybrids; Somaclonal variation and its use in crop improvement.		
Unit V	Cryo-preservation and PCR	4
Cryo-preservation; Introduction to recombinant DNA methods: physical (Gene gun method), chemical (PEG mediated) and Agrobacterium mediated gene transfer methods; Transgenics and its importance in crop improvement; PCR techniques and its applications; RFLP, RAPD, SSR; Marker Assisted Breeding in crop improvement; Biotechnology regulations.		
Text Books	1. H.D.Kumar. Textbook on Biotechnology. 2. Albert L. Lehninger. Biochemistry.	
Reference Books	1. Jeremy M. Bera &Others. Biochemistry. 2. Nicholas C. Price.Fundamentals of Enzymology 3. LaboratoryManualofMirobiologyBiochemistry&MolecularBiology. Jyoti Sexena &Others.	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for AG3312

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students would learn about buffer preparation, classification, structures and function of carbohydrates, lipids, fatty acids and importance of biochemistry	2	Emp
CO2	Students would learn the classification of amino acids, proteins, enzymes, structural organization of proteins, mechanism of enzyme action and allosteric enzymes	2	Emp
CO3	Students will gain knowledge about DNA and RNA, carbohydrate metabolism, lipid metabolism, and CO2 fixation	2	Emp
CO4	Students will understand about the different culture method useful to understand the micropropagation, organogenesis, synthetic seed and its significance	3	Emp, S, Ent
CO5	Students will gain knowledge about cryo-preservation, rDNA technology, gene transfer methods, PCR, molecular markers, MAS and transgenics	3	Emp, S, Ent

CO-PO Mapping for AG3312

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
CO 2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
CO 3	1	1	1	1	1	1	1	1	1	1	1	1	1	1
CO 4	1	2	1	1	2	2	2	1	1	2	2	1	1	2
CO 5	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Avg	1	1.2	1	1	1.2	1.2	1.2	1	1	1.2	1.2	1	1	1.2

AG3313	Title: Introduction to Forestry	L T P C 1 0 0 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To study the fundamentals behind the management of natural forests comes by way of natural ecology.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Introduction	2
Introduction – definitions of basic terms related to forestry, objectives of silviculture, forest classification, salient features of Indian Forest Policies.		
Unit II	Regeneration	3
Forest regeneration, Natural regeneration -natural regeneration from seed and vegetative parts, coppicing, pollarding, root suckers; Artificial regeneration – objectives, choice between natural and artificial regeneration, essential preliminary considerations.		
Unit III	Crown classification	2
Crown classification. Tending operations – weeding, cleaning, thinning –mechanical, ordinary, crown and advance thinning.		
Unit IV	Forest Mensuration	4
Forest Mensuration – objectives, diameter measurement, instruments used in diameter measurement; Non instrumental methods of height measurement - shadow and single pole method; Instrumental methods of height measurement - geometric and trigonometric principles, instruments used in height measurement; tree stem form, form factor, form quotient, measurement of volume of felled and standing trees, age determination of trees.		
Unit V	Agroforestry	3
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.		
Text Books	Introduction to Forestry and Natural Resources. Donald L. Grebner, Peter Bettinger Professor, Jacek P. Siry.Bookswagon. Introduction To Forestry. C. Nagamani S.R. Reddy. Paper Back.	
Reference Books	Introduction to Forestry Economics. Peter H. Pearse. Paper Back. Introduction To Forestry. C. Nagamani S.R. Reddy. Paperback– 2017	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for AG3313

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	To impart knowledge on concepts and principles Indian Forest and Indian Forest Policies	3	Emp, S
CO2	Students will learn different methods of forest regeneration	3	Emp, S, Ent
CO3	Students will gain Knowledge about different silvicultural practices and their effect on tree growth.	3	Emp
CO4	Students will learn the principles and working of tools and equipments used in forestry.	3	Emp, S, Ent
CO5	Students will learn about importance of Agroforestry and different agroforestry system.	3	Emp, S

CO-PO Mapping for AG3313

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	2	2	1	1	1	2	3	1	1	1	1
CO 2	3	2	2	2	3	1	1	2	3	3	1	2	2	1
CO 3	3	2	2	2	3	2	2	0	3	2	1	2	2	1
CO 4	2	2	1	2	3	2	2	1	2	3	1	2	1	1
CO 5	3	2	2	1	2	1	2	1	2	2	1	2	2	1
Avg	2.8	2.0	1.8	1.8	2.6	1.4	1.6	1	2.4	2.6	1	1.8	1.6	1

CY3355	Title: Environmental Studies Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Students will have hands on experience and perform laboratory work in identifying and analyzing different environmental problems related with air, water pollution, and environmental degradation.	

List of Experiments

(Perform any seven experiments)

1. Determination of alkalinity of the supplied water sample
2. Determination of temporary and permanent hardness of water using EDTA (Disodium salt of ethylene– diamine tetra acetic acid)
3. Determination of dissolved oxygen in the given sample of water
4. Determination of BOD (Biological Oxygen Demand) in water
5. Determination of COD (Chemical Oxygen demand in water) in water
6. Determination of pH, Conductivity and turbidity in some drinking water sample and preparation of report
7. Determination of Total dissolved solids in water / effluent sample
8. Documentation of natural resources in local area (river, forest, lake and pond)
9. Study of common plants, birds and mammals in local area
10. Report on visit to National Parks
11. Report on visit to local polluted sites

Mode of Evaluation	Internal and External Examination
Recommendation by Board of Studies on	11-06-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome for CY3355

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will have hands on experience and perform laboratory work in identifying and analyzing different environmental problems related with water pollution and environmental degradation.	3	Emp, S
CO2	Students will be trained to use common chemical and biological techniques for the analysis of environmental samples	3	Emp, S, Ent
CO3	Students will be able to examine the interdependence of ecosystems and how the impact of excessive use of fertilizer or nutrient in agriculture land causes surface as well as ground water pollution.	3	Emp
CO4	Students will be able to understand different types of pollution and their causes	3	Emp, S, Ent
CO5	Students will understand the environmental policies and practices	3	Emp, S

CO-PO Mapping for CY3355

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	2	2	2	3	3	3	3	3	3	3	3
CO 2	3	2	2	2	2	2	3	3	3	3	3	3	3	3
CO 3	3	2	2	2	2	2	3	3	3	3	3	3	3	3
CO 4	3	2	2	2	2	2	3	3	3	3	3	3	3	3
CO 5	3	2	2	2	2	2	3	3	3	3	3	3	3	3
Avg	3	2	2	2	2	2	3	3	3	3	3	3	3	3

AG3340	Title: Crop Production Technology and Crop Improvement - I(*Kharif* crops) Lab	L T P C 0 0 2 1
Version No.	**1.0**	
Course Prerequisites	Nil	
Objectives	The objective of the course is to know the origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of rabi crops.	

List of Experiments

(Perform any seven experiments)

1. To study rice nursery bed preparation and transplanting of rice
2. To study different sowing method of crop
3. To study effect of seed size and sowing depth on germination and seedling vigour of kharif season crops
4. To study identification of weeds in kharif season crops
5. To study of yield contributing characters and yield calculation of kharif season crops
6. To study morphological description of kharif season crops
7. To study floral biology of different crops
8. To study emasculation and hybridization techniques in different crop species
9. To study maintenance breeding of different *kharif* crops
10. To study of field techniques for seed production and hybrid seeds production in *Kharif* crops
11. To study estimation of heterosis, inbreeding depression and heritability
12. To study layout of field experiments

Mode of Evaluation	Internal and External Examination
Recommendation by Board of Studies on	11-06-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome for AG3340

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Each student will be able to work on an allotted land area for field operations like field preparation to harvest and processing	3	Emp, S
CO2	They can raise wetland rice under exigencies like water scarcity with two irrigated dry crops	3	Emp, S, Ent
CO3	They can cultivate Irrigated puddled lowland rice	3	Emp
CO4	Student will learn about the heterosis process and its mechanism.	3	Emp, S, Ent
CO5	Student will learn about the hybridization process.	3	Emp, S

CO-PO Mapping for AG3340

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	1	2	1	2	1	2	2	1	2	2	1	1
CO 2	3	2	1	1	1	1	1	1	2	1	1	2	2	2
CO 3	3	2	2	1	2	1	1	1	2	1	1	2	2	2
CO 4	3	2	1	1	1	1	1	1	2	1	1	2	2	2
CO 5	3	2	2	2	2	1	1	1	2	2	2	3	2	2
Avg	3	2	1.4	1.4	1.4	1.2	1	1.2	2	1.2	1.2	2.2	1.8	1.8

AG3341	Title:Fundamentals of Plant Pathology Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To study the nature, causes and prevention/protection of *plant diseases*. To study on minimization of the *crop* losses through adaption *principles* of disease prevention.	
	List of Experiments	

(Perform any Seven Experiments)

1. Acquaintance with various laboratory equipments and microscopy.
2. Collection and preservation of disease specimen.
3. Preparation of media, isolation and Koch's postulates.
4. General study of different structures of fungi.
5. Study of symptoms of various plant diseases.
6. Study of representative fungal genera
7. Staining and identification of plant pathogenic bacteria.
8. Study of phanerogamic plant parasites and transmission of plant viruses.
9. Study of morphological features and identification of plant parasitic nematodes.
10. Sampling and extraction of nematodes from soil and plant material, preparation of nematode mounting.
11. Study of fungicides and their formulations.
12. Methods of pesticide application and their safe use.
13. Calculation of fungicide sprays concentrations.

Mode of Evaluation	Internal and External Examination
Recommendation by Board of Studies on	11-06-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome for AG3341

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students would learn about compound microscope and its different components & different laboratory equipment's and their principle and uses, isolation of the fungal plant pathogens from affected plant parts (leaf) and prove Koch' postulates	3	Emp, S
CO2	Students would learn about the different structures of fungi, symptoms of various plant diseases and also study phanerogamic plant parasites	3	Emp, S, Ent
CO3	Students would learn about fungicides and their formulations, preparation of fungicidal solutions, slurries and pastes and their applications along with precautions in their handling, sampling and extraction of nematodes from soil and plant material and preparation of nematode mounting	3	Emp
CO4	Students would learn about the staining of pathogenic bacteria.	3	Emp, S, Ent
CO5	Students would learn about the identification and transmission of plant virus	3	Emp, S

CO-PO Mapping for AG3341

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	2	2	2	1	2	3	2	2	2	2	2
CO 2	3	2	2	2	1	2	1	1	2	1	1	3	1	2
CO 3	3	2	1	2	2	1	1	2	2	1	1	2	1	1
CO 4	3	1	2	2	2	1	2	1	2	1	2	3	1	1
CO 5	3	1	2	1	1	1	2	2	2	1	1	2	1	1
Avg	3	1.6	1.8	1.8	1.6	1.4	1.4	1.6	2.2	1.2	1.4	2.4	1.2	1.4

AG3343	Title: Agricultural Marketing Trade and Finance and Co-operation Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To understand the Structure of *Agriculture marketing* in India.	

List of Experiments

(Perform any seven experiments)

1. To study of plotting and study of demand and supply curves and calculation of elasticity
2. To study of relationship between market arrivals and prices of some selected commodities
3. To study of Computation of marketable and marketed surplus of important commodities
4. To Study of price behavior over time for some selected commodities
5. To study of Construction of index numbers
6. Visit to a local market to study various marketing functions performed by different agencies
7. Identification of marketing channels for selected commodity
8. Collection of data regarding marketing costs, margins and price spread and presentation of report in the class
9. Visit to market institutions – NAFED, SWC, CWC, cooperative marketing society, etc. to study their organization and functioning
10. To study Application of principles of comparative advantage of international trade

Mode of Evaluation	Internal and External Examination
Recommendation by Board of Studies on	11-06-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome for AG3343

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	The course will give the exposure to the students on market concepts, marketing of agricultural commodities, intermediaries involved	3	Emp, S
CO2	It will impart knowledge on principles of finance, banking and co –operation and farm-financial analysis	3	Emp, S, Ent
CO3	This course will also help in understanding the functions of various institutions involved in farm financing and different crop insurance products	3	Emp
CO4	This course will also help in forecasting the price, demand and supply	3	Emp, S, Ent
CO5	Understand nature and scope of financial management in agri business	3	Emp, S

CO-PO Mapping for AG3343

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	3	3	2	1	2	2	0	2	1	2	1	1	2
CO 2	3	1	2	2	3	1	1	2	3	2	1	1	1	2
CO 3	2	1	3	2	2	1	1	1	2	2	1	1	1	3
CO 4	3	1	2	2	3	1	1	2	3	2	1	1	1	2
CO 5	2	1	3	2	2	1	2	1	2	2	1	1	1	3
Avg	2.4	1.4	2.6	2	2.2	1.2	1.4	1.2	2.4	1.8	1.2	1	1	2.4

AG3344	Title:Farm Machinery and Power Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To study the socio-economic conditions of the farmers and assess their capabilities for acquiring and adopting the needed *agricultural equipment*/machinery and the uses of farm *power*, ultimate requirement, ways and means to fulfill the gaps for various farm operations.	

List of Experiments

(Perform any seven experiments)

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

Mode of Evaluation	Internal and External Examination
Recommendation by Board of Studies on	11-06-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome for AG3344

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	At the end of the course student will be able to learn about the component of IC engine and cooling system	3	Emp, S
CO2	Students will get knowledge of fuel supply system of engine and power tiller	3	Emp, S, Ent
CO3	At the end of the course student will be able to learn about the primary and secondary tillage and Seed Cum Fertilizer	3	Emp
CO4	Students will expose to seed-cum-fertilizer drills their seed metering mechanism and calibration, planters and transplanter.	3	Emp, S, Ent
CO5	Students will exposed to different types of sprayers and dusters	3	Emp, S

CO-PO Mapping for AG3344

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	1	3	2	2	2	2	2	1	3	2	1
CO 2	3	2	2	2	3	2	2	1	3	3	1	2	2	2
CO 3	3	1	1	2	3	2	2	2	3	2	2	3	2	1
CO 4	3	2	2	1	3	2	2	2	2	2	1	3	2	1
CO 5	3	2	2	2	3	2	2	1	3	3	1	2	2	2
Avg	3	1.8	1.8	1.6	3	2	2	1.6	2.6	2.4	1.2	2.6	2	1.4

AG3349	Title: Fundamental of Crop Physiology Lab	L T P C 0 0 21
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Students will study the processes and functions of the crops at cellular, sub-cellular and whole plant levels in response to environmental variables and growth.	

List of Experiments

(Perform any Seven)

1. Study of plantcells.
2. Experiments on diffusion, osmosis andimbibitions.
3. Determination of transpiration rate byphotometers.
4. Extraction of photosynthetic pigments, separation of chlorophyll "a" and "b" andcarotenoides.
5. Experiments on factors affecting rate of photosynthesis (CO, light andtemperature).
6. Determination of photosynthetic and respiration rates through portable CO2 gasanalyzer.
7. Separation of photosynthetic pigments through paperchromatography.
8. Estimation of relative watercontent.

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	11-06-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome for AG3349

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	At the end of the subject, student will collect the knowledge about the structure of cell and cell division.	2	Emp
CO2	At the end of the subject students will be able to know about the Photosynthesis process & learn to determine the rate of photosynthesis and respiration.	2	Emp
CO3	At the end of the subject students will learn about the metabolic process in plants i.e, osmosis, diffusion, transpiration.	2	Emp
CO4	By the end of this course students will be able to describe and distinguish role of hormones in plants	2	Emp
CO5	By the end of this course students will be able to distinguish different plants on the basis of their appearance & about their physiological activity.	3	Emp, S

CO-PO Mapping for AG3349

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	1	1	1	1	0	1	1	1	1	1	1	2	1	2
CO 2	1	1	1	1	2	1	1	1	2	1	1	3	1	1
CO 3	1	1	1	1	2	1	1	1	2	1	1	3	1	2
CO 4	1	1	1	1	2	1	1	1	2	1	1	3	1	1
CO 5	2	1	1	1	2	1	1	1	2	1	1	3	1	1
Avg	1.2	1	1.0	1	1.6	1	1	1	1.8	1	1	2.8	1	1.4

AG3350	Title: Fundamentals of Plant Biochemistry and Biotechnology Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Use of biotechnology in crops, with a view to understanding the techniques	

List of Experiments

(Perform any Seven)

1. Preparation of solution, pH &buffers.
2. Qualitative tests of carbohydrates and aminoacids.
3. Quantitative estimation of glucose/proteins.
4. Titration methods for estimation of aminoacids/lipids.
5. Effect of pH, temperature and substrate concentration on enzyme action.
6. Paper chromatography/ TLC demonstration for separation of amino acids/ Monosaccharides.
7. Sterilization techniques.
8. Composition of various tissue culture media
9. Preparation of stock solutions for MS nutrient medium.
10. Callus induction from various explants.
11. Micro-propagation, hardening and acclimatization.
12. Demonstration on isolation of DNA.
13. Demonstration of gel electrophoresis techniques and DNA fingerprinting

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	11-06-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome for AG3350

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will learn about preparation of solutions, buffer, qualitative tests of carbohydrates and amino acids	2	Emp
CO2	Students will learn about quantitative estimation of glucose/proteins and titration methods for estimation of amino acids/lipids	3	Emp, S, Ent
CO3	Students would learn preparation of stock solutions for MS nutrient medium	3	Emp, S, Ent
CO4	Students would learn callus induction from various explants	3	Emp, S, Ent
CO5	Students would learn about basic steps of DNA isolation, gel electrophoresis techniques and DNA finger printing	3	Emp, S, Ent

CO-PO Mapping for AG3350

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	1	2	2	1	1	1	2	1	1	1	2	1
CO 2	3	2	1	2	2	2	1	1	2	1	1	1	2	1
CO 3	1	1	1	1	1	1	1	1	1	1	2	2	0	1
CO 4	3	2	1	2	2	2	1	1	2	1	1	1	2	1
CO 5	1	1	1	1	1	1	1	1	1	1	2	0	0	1
Avg	2.2	1.6	1	1.6	1.6	1.4	1	1	1.6	1	1.4	1	1.2	1

AG3351	Title: Introduction to Forestry Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To study the fundamentals behind the management of natural forests comes by way of natural ecology.	

List of Experiments

(Perform any Seven)

1. Identification of tree-species.
2. Diameter measurements using callipers and tape,
3. Height measurement of standing trees by shadow method.
4. Height measurement of standing trees by single pole method.
5. Height measurement of standing trees at different conditions by Abney's Level.
6. Volume measurement of logs using Quarter girth formula.
7. Volume measurement of wood by using xylometric principle.
8. Visits of nearby forest based industries.

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	11-06-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome for AG3351

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will gain knowledge on the Forest and Forest Policies in India	3	Emp, S
CO2	It will provide Hands on training using tools and equipments in forestry	3	Emp, S, Ent
CO3	Students will exposed to various forest based industries	3	Emp
CO4	Students will learn about forest menstruation appropriate tools and techniques and its management objectives	3	Emp, S, Ent
CO5	Students will know, understand, and articulate essential principles of sustainable forestry	3	Emp, S

CO-PO Mapping for AG3351

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	3	3	2	2	2	2	0	2	1	2	3	1	2
CO 2	3	1	2	2	3	2	1	2	3	2	1	3	1	2
CO 3	2	1	3	2	2	1	1	1	2	2	1	2	1	3
CO 4	3	1	2	2	3	1	1	2	3	2	1	3	1	2
CO 5	2	1	3	2	2	1	2	1	2	2	1	3	1	3
Avg	2.4	1.4	2.6	2	2.4	1.4	1.4	1.2	2.4	1.8	1.2	2.8	1	2.4

Program Elective and Their Labs

AG3316	**Title: Food Safety and Standards**	**L T P C** **2 0 0 2**
Version No.	**1.0**	
Course Prerequisites	Nil	
Objectives	To study about standards of food, manufacture, storage, distribution, sale etc.,	
Unit No.	**Unit Title**	**No. of hours (per Unit)**
Unit I	**Food Safety, Hazards Types and Management**	2
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.		
Unit II	**Product Design, Food Service Establishment and Measurement of Food Safety**	3
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.		
Unit III	**Management Tools of Food Safety**	3
Food Safety Management Tools- Basic concepts. PRPs, GHPs, GMPs, SSOPs etc. HACCP. ISO series. TQM - concept and need for quality, components of TQM, Kaizen. Risk Analysis. Accreditation and Auditing, Water Analysis, Surface Sanitation and Personal Hygiene.		
Unit IV	**Food Laws And Standards and Recent Concerns of New Pathogens**	2
Food laws and Standards- Indian Food Regulatory Regime, FSSA. Global Scenario CAC. Other laws and standards related to food. Recent concerns- New and Emerging Pathogens.		
Unit V	**Packaging, Labeling 0f Genetically Modified Foods and Food Products Standards**	2
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.		
Text Books	1. M. Shafiur Rahman. Handbook of Food Preservation.. 2007., 2nd Ed. CRC Press, Boca Raton,FL, USA. 2. James G. Brennan. Food Processing Handbook. 2006. Wiley-VCH Verlag GmbH & Co.KGaA, Weinheim, Germany.	
Reference Books	1. Marcus Karel and Darvl B. Lund.Physical Principles of Food Preservation. 2003, 2nd Ed. Marcel Dekker, Inc., NY, USA.	
Mode of Evaluation	Internal and External Examination	
Recommendation by Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for AG3316

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	By the end of this course students will be able to learn about food safety	3	Emp, S
CO2	By the end of this course students will be able to keep food safely from different hazards	3	Emp, S, Ent
CO3	By the end of this course students will be able to understand food safety management system	3	Emp
CO4	By the end of this course students will be able to learn different rules and laws related to food safety	3	Emp, S, Ent
CO5	By the end of this course students will be able to learn about labeling of food	3	Emp, S

CO-PO Mapping for AG3316

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	1	1	2	3	2	2	2	1	2	3	1	1
CO 2	3	2	1	1	2	3	2	2	2	1	2	2	1	1
CO 3	3	1	1	1	1	2	1	2	1	1	1	3	1	1
CO 4	2	1	1	1	1	2	1	1	1	1	2	2	1	1
CO 5	3	1	1	1	1	2	1	1	1	1	1	3	1	1
Avg	2.8	1.4	1	1	1.4	2.4	1.4	1.6	1.4	1	1.6	2.6	1	1

	AG3345	**Title: Food Safety and Standards Lab**	**L T P C 0 0 2 1**
	Version No.	**1.0**	
	Course Prerequisites	**Nil**	
	Objectives	Students will be able to bring food safety by applying safety regulatory practices.	

List of Experiments

1. Water quality analysis physico-chemical and microbiological
2. Preparation of different types of media.
3. Microbiological Examination of different food samples.
4. Assessment of surface sanitation by swab/rinse method.
5. Assessment of personal hygiene
6. Biochemical tests for identification of bacteria. Scheme for the detection of food borne pathogens.
7. Preparation of plans for Implementation of FSMS - HACCP.

Mode of Evaluation	Internal and External Examination
Recommendation by Board of Studies on	11-06-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome for AG3345

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	At the end of the course students will be able to learn about the personal hygiene and the methods of sanitization	3	Emp, S
CO2	At the end of the course students will be able to learn about to determine the constituents and amount of alkalinity of the supplied water sample	3	Emp, S, Ent
CO3	At the end of the course students will be able to learn about the Preparation of plan for implementation of FSMS-HACCP	3	Emp
CO4	At the end of the course students will be able to learn about the microorganisms to degrade the amino acid tryptophan.	3	Emp, S, Ent
CO5	At the end of the course students will be able to learn about how to calculate the presence of coliform bacteria in water.	3	Emp, S

CO-PO Mapping for AG3345

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	1	2	1	3	2	2	2	2	1	2	2	1
CO 2	2	2	2	1	1	2	2	1	2	1	2	2	1	2
CO 3	3	1	1	2	1	2	2	2	1	1	2	2	1	2
CO 4	2	1	1	1	2	1	1	1	1	1	2	1	1	2
CO 5	2	1	1	1	1	1	1	1	1	1	1	1	1	1
Avg	2.4	1.4	1.2	1.4	1.2	1.8	1.6	1.4	1.4	1.2	1.6	1.6	1.2	1.6

AG3406	Title: Crop Production Technology and Crop Improvement – II (*Rabi* crops)	L T P C 2 0 0 2
Version No.	**1.1**	
Course Prerequisites	Nil	
Objectives	To study proven technologies for wheat-legume rotation systems through the scaling out of improved wheat and food legume varieties and associated production technologies, including supplemental irrigation. To develop stable and high yielding varieties of both food and cash crops.	
Unit No.	**Unit Title**	**No. of hours (per Unit)**
Unit I	**Introduction**	4
Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi*crops. Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fodder crops and cash crops.		
Unit II	**Cultivation of Cereals, Pulses, Oilseeds and Fibre Crops**	6
Cereals –wheat and barley, pulses-chickpea, lentil, peas, oilseeds-rapeseed, mustard and sunflower; sugar crops-sugarcane; medicinal and aromatic crops-mentha, lemon grass and citronella, Forage crops-berseem, lucerne and oat.		
Unit III	**Study of Horticulture crops**	4
Vegetable and horticultural crops- Okra, Spinach, Cabbage, Potatoes, Brinjal, Carrot, radish, Beetroot, Sweet Potato, Pea, Onion, Garlic and Tomato. Plant genetic resources, its utilization and conservation.		
Unit IV	**Study of genetics improvement and qualitative genetics**	6
Study of genetics of qualitative and quantitative characters; Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield. Adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional).		
Unit V	**Seed production technology**	4
Hybrid seed production technology of *rabi* crops- Barley, Sunflower, Oakra and Potato. Ideotype concept and climate resilient crop varieties for future.		
Text Books	1. Chidda Singh. Modern techniques of raising field crops. 1997. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi. 2. Ahlawat,I.P.S., Om Prakash and G.S.Saini.Scientific Crop Production in India. 1998. Rama Publishing House, Meerut.	
Reference Books	1. Chatterjee,B.N. and K.K.Bhattacharyya.Principles and Practices of Grain legume production. 1986. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi. 2. Chatterjee,B.N. and P.K.Das.Forage crop production - Principles and Practices. 1989. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.	
Mode of Evaluation	Internal and External Examination	
Recommendation by Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for AG3406

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students would have gained knowledge of centers of origin, distribution, economic importance and wild relatives of rabi crops	3	Emp, S
CO2	To understand about commercial cultivation of cereals, pulses, oilseeds, fodder crops and cash crops of rabi season	3	Emp, S, Ent
CO3	Students will gain knowledge about cultivation practices of horticultural and vegetable crops and also learn about plant genetic resources	3	Emp
CO4	To understand genetics of qualitative and quantitative characters and development procedure of variety and hybrid	3	Emp, S, Ent
CO5	To learn standard procedure of hybrid seed production of rabi crops, ideotype concept and climate resilient crop varieties for future in rabi crops	3	Emp, S

CO-PO Mapping for AG3406

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	1	1	2	2	1	1	1	1	1	2	1	1
CO 2	3	2	2	2	2	2	1	1	2	1	1	3	2	2
CO 3	3	2	2	2	1	2	1	1	2	1	1	3	2	2
CO 4	3	2	2	2	2	2	1	1	2	1	1	3	2	2
CO 5	3	2	2	2	2	2	1	1	2	1	1	3	2	2
Avg	3	2	1.8	1.8	1.8	2	1	1	1.8	1	1	2.8	1.8	1.8

AG3407	Title: Management of Beneficial Insects	L T P C 1 0 0 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To study about *beneficial insects* and their functions in pest control strategy, organic farming, organic gardening or integrated pest *management.*	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Introduction	3
Importance of beneficial Insects, Beekeeping and pollinators, bee biology, commercial methods of rearing, equipment used, seasonal management, bee enemies and disease.		
Unit II	Role of Honey bee	5
Bee pasturage, bee foraging and communication. Insect pests and diseases of honey bee. Role of pollinators in cross pollinated plants.		
Unit III	Study of silkworm and mulberry cultivation	5
Types of silkworm, voltinism and biology of silkworm. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves.		
Unit IV	Processing of silk	5
Rearing, mounting and harvesting of cocoons. Pest and diseases of silkworm, management, rearing appliances of mulberry silkworm and methods of disinfection. supplements and feed additives. Feeding of livestock and poultry.		
Unit V	Study of lac insect	6
Species of lac insect, morphology, biology, host plant, lac production – seed lac, button lac, shellac, lac- products. Identification of major parasitoids and predators commonly being used in biological control. Insect orders bearing predators and parasitoids used in pest control and their mass multiplication techniques. Important species of pollinator, weed killers and scavengers with their importance.		
Text Books	1. Mathur and Upadhyay. A Text Book of Entomology. 2005. Aman Publishing House, Meerut. 2. Richards O.W. and Davies R.G. Imm's General Text Book of Entomology. 1977. Vol. I & II. Chapman and Hall, London.	
Reference Books	1. Dhamo K. Butani. Periodical Expert Book Agency. 1979. Insects and Fruits. pp.415. Delhi. 2. Dhamo K. Butani and M. G. Jotwani. Insects in Vegetables. 1984. pp.356. Periodical Expert Book Agency, Delhi.	
Mode of Evaluation	Internal and External Examination	
Recommendation by Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for AG3407

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will be introduced with the basic knowledge about the bee keeping and its different components	3	Emp, S
CO2	Students will be able to know about the management of bee diseases and its natural enemies	3	Emp, S, Ent
CO3	Students will be able to know about the concepts of silk farming and mulberry cultivation	3	Emp
CO4	Student will gain knowledge about the processing of silk and its different requirements	3	Emp, S, Ent
CO5	Students will be aware with the study of lac culture and its processing and management	3	Emp, S

CO-PO Mapping for AG3407

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	2	1	2	0	0	3	2	1	2	2	1
CO 2	3	2	2	2	2	3	3	0	1	2	1	2	1	2
CO 3	2	3	3	2	3	2	2	1	2	2	1	2	2	2
CO 4	2	2	2	2	2	2	0	2	1	1	2	2	2	1
CO 5	3	1	3	1	3	3	0	2	2	2	1	1	3	1
Avg	2.6	2	2.4	1.8	2.2	2.4	1	1	1.8	1.8	1.2	1.8	2	1.4

AG3408	Title:Production Technology for Fruit and Plantation Crops	L T P C 1 0 0 1
Version No.	1.1	
Course Prerequisites	Nil	
Objectives	To study about scientific information's in solving major problems that limit *fruit* and plantation crops *production* and marketing.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Introduction	3
Importance and scope of fruit and plantation crop industry in India.		
Unit II	Production technologies of major fruits	5
Importance of rootstocks; Production technologies for the cultivation of major fruits-Mango, Banana, Citrus, Grape.		
Unit III	Study of fruits crops	5
Guava, Litchi, Papaya, Sapota, Apple, Pear, Peach, Walnut, Almond		
Unit IV	Study of minor fruit crops	6
Minor fruits- Date, Ber, Pineapple, Pomegranate, Jackfruit, Strawberry, Kilmode, Plum, Apricot		
Unit V	Study of plantation crops	5
Plantation crops-Coconut, Arecanut, Cashew, Tea, Coffee and Rubber.		
Text Books	1. Adams, C.R.and M. P. Early. Principles of horticulture. 2004. Butterworth –Heinemam, Oxford University Press. 2. Bansil. P.C Horticulture in India.. 2008. CBS Publishers and Distributors, New Delhi.	
Reference Books	1. Jitendra Singh. Basic Horticulture. 2006. Kalyani Publishers, New Delhi. 2. Chattopadhyaya, P.K.A text book on Pomology (Fundamentals of fruit growing). 2001. Kalyani Publication, New Delhi. 3. Kumar, N. Introduction to Horticulture. 1997. Rajalakshmi Publication, Nagercoil.	
Mode of Evaluation	Internal and External Examination	
Recommendation by Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for AG3408

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will gain brief knowledge of importance and different career in fruit science	3	Emp, S
CO2	Students will be able to understand the farming system in different fruit crops	3	Emp, S, Ent
CO3	Students will be able to understand the different growing techniques of temperate fruit	3	Emp
CO4	Students will be able to understand the best growing techniques of minor fruit	3	Emp, S, Ent
CO5	Students will be able to understand the ideal farming system in different plantation crops	3	Emp, S

CO-PO Mapping for AG3408

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	3	2	2	2	1	3	1	2	1	3	2
CO 2	2	3	3	3	2	2	2	1	3	2	2	2	2	3
CO 3	2	3	3	2	1	1	2	1	2	1	1	1	1	2
CO 4	3	1	2	2	3	1	1	2	3	1	1	1	1	2
CO 5	2	1	3	2	2	2	1	2	2	1	2	2	1	3
Avg	2.4	2	2.6	2.4	2	1.6	1.6	1.4	2.6	1.2	1.6	1.4	1.6	2.4

AG3409	Title: Manures, Fertilizers and Soil Fertility Management	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To impart knowledge of *fertilizers and manures* as sources of plant nutrients and apprise about the integrated approach of plant nutrition and sustainability of *soil fertility.*	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Introduction	3
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.		
Unit II	Classification	4
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		
Unit III	History of soil	5
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.		
Unit IV	Soil Chemistry	5
Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients. Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil.		
Unit V	Study of nutrients in soil, plant analysis	7
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.		
Text Books	1. Mehra R.K. Text book of Soil Science.2004. ICAR New Delhi 2. Yawalkar, K.S. and Agarwal. J.P. 1992. Manure and fertilizers. Agriculture-Horticulture Publishing House, Nagpur.	
Reference Books	1. Biswas, T.D. and Mukherjee, S.K. 2006. Text book of soil science. Tata McGraw Hill publishing Co. Ltd, New Delhi 2. Das, D.K. Introductory Soil Science. 2002. Kalyani publisher, New Delhi	
Mode of Evaluation	Internal and External Examination	
Recommendation by Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for AG3409

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	To impart knowledge of fertilizers and manures as sources of plant nutrients	3	Emp, S
CO2	To provide knowledge and function of essential primary, secondary & micronutrients fertilizer on crop production	3	Emp, S, Ent
CO3	Students will know how the soil fertility and productivity can be maintained for better crop production	3	Emp
CO4	To provide knowledge chemistry of major, minor & micronutrients, which are available in soil in several forms	3	Emp, S, Ent
CO5	Students will know the requirements of fertilizers for various crops and their proper time of application and provide knowledge of rapid plant tissue tests and indicator plants	3	Emp, S

CO-PO Mapping for AG3409

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	2	2	1	1	1	1	2	1	2	2	1
CO 2	3	1	1	1	2	1	2	1	2	2	1	2	2	1
CO 3	3	2	1	2	3	2	2	2	2	2	2	3	3	2
CO 4	3	2	2	2	2	2	3	1	3	2	1	3	2	1
CO 5	3	2	1	2	3	2	2	1	2	2	1	3	2	1
Avg	3	1.8	1.4	1.8	2.4	1.6	2	1.2	2	2	1.2	2.6	2.2	1.2

AG3410	Title:Principles of Food Science and Nutrition	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To familiarize with basic concepts of food science, processing, preservation To understand concepts nutrition and nutritional disorders	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit 1	Concepts	6
Concepts of Food Science (definitions, measurements, density, phase change, pH, osmosis, surface tension, colloidal systems etc.); Food composition and chemistry (water, carbohydrates, proteins, fats, vitamins, minerals, flavours, colours, miscellaneous bioactives, important reactions).		
Unit 2	Food Microbiology	5
Food microbiology (bacteria, yeast, moulds, spoilage of fresh & processed foods, Production of fermented foods).		
Unit 3	Food Processing and Preservation	5
Principles and methods of food processing and preservation (use of heat, low temperature, chemicals, radiation, drying etc.,		
Unit 4	Nutrition	3
Food and nutrition, Malnutrition (over and under nutrition), nutritional disorders.		
Unit 5	Energy Metabolism	5
Energy metabolism (carbohydrate, fat, proteins); Balanced/ modified diets, Menu planning, New trends in food science and nutrition.		
Text Books	1. Sumati R. Mudambi, Shalini M. Rao and M.V. Rajagopal. Food Science. 2006. 2nd Ed. New Age International (P) Limited, New Delhi. 2. Principles of Human Nutrition. Martin Eastwood. 2003. Blackwell Science Ltd., Oxford.	
Reference Books	1. Norman N. Potter. Food Science. 1998. 5th Ed. Springer Science+ Business Media, New York. 2. . Michael J. Pelczar Jr., E.C.S. Chan and Noel R. Krieg. Microbiology1998. 5th Ed. Tata McGrawHill Education, New Delhi.	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council on	13-07-2019	

Course Outcome for AG3410

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	By the end of this course students will be able to understand the basic information about food nutrition and composition of food	3	Emp, S
CO2	By the end of this course students will be able to understand microorganism role in food science	3	Emp, S, Ent
CO3	By the end of this course students will be able to illustrate the different methods of food preservation and processing	3	Emp
CO4	By the end of this course students will be able to understand the nutrition value and its disorders	3	Emp, S, Ent
CO5	By the end of this course students will be able to understand about the metabolism process of food components in human body	3	Emp, S

CO-PO Mapping for AG3410

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	2	2	2	1	1	2	2	1	2	2	3	2	1
CO 2	3	1	1	1	2	3	1	1	2	1	1	3	2	1
CO 3	2	1	2	2	2	3	2	2	2	1	1	3	2	1
CO 4	3	2	2	1	2	3	2	1	2	1	2	3	3	1
CO 5	3	2	2	1	2	2	2	1	2	2	2	3	2	1
Avg	2.6	1.6	1.8	1.4	1.8	2.4	1.8	1.4	1.8	1.4	1.6	3	2.2	1

AG3412	Title: Fundamentals of Plant Breeding	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To improve the characteristics of plants and study about breeding process is to achieve in the form of higher yielding	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit I	Introduction of Breeding	5
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.		
Unit II	Genetic Variation	4
Self-incompatibility and male sterility- genetic consequences, cultivar options. Domestication, Acclimatization and Introduction; Centres of origin/diversity, components of Genetic variation; Heritability and genetic advance.		
Unit III	Breeding Methods	6
Genetic basis and breeding methods in self- pollinated crops - mass and pure line selection, hybridization techniques and handling of segregating population; Multiline concept. Concepts of population genetics and Hardy-Weinberg Law. Genetic basis and methods of breeding cross pollinated crops, modes of selection; Population improvement Schemes- Ear to row method, Modified Ear to Row, recurrent selection schemes.		
Unit IV	Heterosis and Inbreeding Depression	5
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.		
Unit V	Mutation and IPR	4
Mutation breeding-methods and uses; Breeding for important biotic and abiotic stresses; Biotechnological tools-DNA markers and marker assisted selection. Participatory plant breeding; Intellectual Property Rights, Patenting, Plant Breeders and & Farmer's Rights.		
Text Books	1. Alard, R.W. Principles of Plant Breeding. John Willey & Sons, NewYork. 2. Chahel, G.S. and S.S. Ghosal. PrinciplesandProceduresofPlantBreeding,BiotechnologicalandConventional Approaches. Narosa Publishing House, New Delhi.	
Reference Books	1. Singh, B.D. Plant Breeding. Kalyani Publishing House, NewDelhi. 2. Singh, P. Essentials of Plant Breeding-Principles and Methods. Kalyani Publishing House, NewDelhi.	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for AG3412

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will gain knowledge about concept, nature and role, major achievements of plant breeding, genetics & plant breeding relationship & modes of reproduction and apomixes	2	Emp
CO2	Students will understand the concepts of self-incompatibility, male sterility, introduction, centres of diversity, heritability and genetic advance	2	Emp
CO3	Students will gain knowledge about breeding methods, handling of segregating population & population improvement schemes	3	Emp, S
CO4	Students will understand heterosis and inbreeding depression, development of inbred lines, hybrids, composite and synthetic varieties, wide hybridization polyploidy application	3	Emp, S
CO5	Student will gain knowledge about mutation breeding, biotic and abiotic stresses, biotechnological tools, IPR, Plant Breeders & Farmer's Rights	3	Emp, S

CO-PO Mapping for AG3412

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	1	0	0	1	1	0	1	1	1	1	1	1	1
CO 2	2	2	2	1	2	2	1	1	2	2	2	2	2	2
CO 3	3	3	3	2	2	2	2	1	2	2	2	2	2	2
CO 4	3	3	3	3	3	3	3	2	3	3	2	2	2	3
CO 5	3	3	2	2	3	3	3	1	3	3	2	2	2	3
Avg	2.6	2.4	2	1.6	2.2	2.2	1.8	1.2	2.2	2.2	1.8	1.8	1.8	2.2

AG3413	Title: Livestock and poultry Management	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites		
Objectives	To enhance per capita availability of milk, eggs, and meat including *poultry and their disease management.*	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Introduction	4
Role of livestock in the national economy. Reproduction in farm animals and poultry. Housing principles, space requirements for different species of livestock and poultry.		
Unit II	Management of Animals	5
Management of calves, growing heifers and milch animals. Management of sheep, goat and swine. Incubation, hatching and brooding. Management of growers and layers.		
Unit III	Study of farm animals breeds	4
Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry. Improvement of farm animals and poultry.		
Unit IV	Study of digestion in livestock and poultry	6
Digestion in livestock and poultry. Classification of feedstuffs. Proximate principles of feed. Nutrients and their functions. Feed ingredients for ration for livestock and poultry. Feed supplements and feed additives. Feeding of livestock and poultry.		
Unit V	Study of livestock and poultry diseases	5
Introduction of livestock and poultry diseases. Prevention (including vaccination schedule) and control of important diseases of livestock and poultry.		
Text Books	1.Introduction to Information Technology. Alexis Leon and Mathews Leon (2001), Tata McGraw-Hi 2. A Text Book of Animal Husbandry. Choudhary J.L. and Gupta Lokesh. 2016. Somani Publication	
Reference Books	1. A Text Book of Animal Husbandry. Banerjee, G.C. 2013. 8th Ed.ICAR. 2. A Text Book of Animal Husbandry. Choudhary J.L. and Gupta Lokesh.2016. Somani Publication 3. Swine Production and Health Management. Dimri,U, Sharma,M C and Tiwari R.2013. New India Pub Agency. 4. Livestock Production and Management.Sastry N S R and Thomas, Ck 2006. Kalyani	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for AG3413

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will learn role of livestock in the national economy. Reproduction in farm animals and poultry, space requirements for different species of livestock and poultry.	3	Emp, S
CO2	Students will learn management of calves, growing heifers and milch animals. Management of sheep, goat and swine, Incubation, hatching and brooding and Management of growers and layers.	3	Emp, S, Ent
CO3	Students will learn about Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry and Improvement of farm animals and poultry.	3	Emp
CO4	Students will study digestion in livestock and poultry.	3	Emp, S, Ent
CO5	Students will study livestock and poultry diseases and their prevention and control.	3	Emp, S

CO-PO Mapping for AG3413

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	2	2	1	1	1	1	2	2	2	2	1
CO 2	3	1	1	1	2	1	2	1	2	2	1	2	2	1
CO 3	3	2	1	2	3	2	2	2	2	2	2	3	3	2
CO 4	3	2	2	2	2	2	3	1	3	2	2	3	2	1
CO 5	3	2	1	2	3	2	2	1	2	2	2	3	2	1
Avg	3	1.8	1.4	1.8	2.4	1.6	2	1.2	2	2	1.8	2.6	2.2	1.2

AG3440	Title:Crop Production Technology and Crop Improvement – II (*Rabi* crops) Lab	L T P C 0 0 2 1
Version No.	**1.0**	
Course Prerequisites	Nil	
Objectives	To study proven technologies for wheat-legume rotation systems through the scaling out of improved wheat and food legume varieties and associated production technologies, including supplemental irrigation. To develop stable and high yielding varieties of both food and cash crops.	

List of Experiments

(Perform any Seven Experiments)

1. Sowing methods of wheat and sugarcane,
2. Identification of weeds in *rabi* season crops,
3. Study of morphological characteristics of *rabi* crops,
4. Study of yield contributing characters of *rabi* season crops,
5. Yield and juice quality analysis of sugarcane.
6. Study of *rabi* forage experiments, oil extraction of medicinal crops, visit to research stations of related crops
7. Floral biology, emasculation and hybridization techniques in different crop species namely Wheat, Oat, Barley, Chickpea, Lentil, Field pea, Rajma, Horse gram, Rapeseed Mustard, Sunflower, Safflower, Potato, Berseem. Sugarcane, Tomato, Chilli, Onion
8. Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods
9. Study of field techniques for seed production and hybrid seeds production in *Rabi* crops
10. Estimation of heterosis, inbreeding depression and heritability;
11. Study of quality characters, study of donor parents for different characters
12. Visit to seed production plots; Visit to AICRP plots of different field crops

Mode of Evaluation	Internal and External Examination
Recommendation by Board of Studies on	11-06-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome for AG3440

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students would learn about the sowing methods of wheat and sugarcane	3	Emp, S
CO2	Students would learn to identify weeds in rabi season crops	3	Emp, S, Ent
CO3	Students would learn about yield contributing characters and morphological characters of rabi crops	3	Emp
CO4	Students would learn about estimation of heterosis, inbreeding depression and heritability and also learn handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods	3	Emp, S, Ent
CO5	Students would learn about field techniques for seed production and hybrid seeds production in rabicrops	3	Emp, S

CO-PO Mapping for AG3440

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	1	1	2	1	1	1	1	1	1	1	3	1	1
CO 2	3	2	1	1	1	1	1	1	1	1	1	2	2	2
CO 3	3	2	2	2	2	1	1	1	1	1	1	3	2	2
CO 4	3	1	1	1	1	1	1	1	1	1	1	3	1	1
CO 5	3	2	2	2	2	1	1	1	1	1	1	3	2	2
Avg	3	1.6	1.4	1.6	1.4	1	1	1	1	1	1	2.8	1.6	1.6

AG3441	Title: Management of Beneficial Insects Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To study about *beneficial insects* and their functions in pest control strategy, organic farming, organic gardening or integrated pest *management*.	

List of Experiments

(Perform any Seven Experiments)

1. Honey bee species, castes of bees. Beekeeping appliances and seasonal management, bee enemies and disease.
2. Bee pasturage, bee foraging and communication.
3. Types of silkworm, voltinism and biology of silkworm.
4. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves.
5. Species of lac insect, host plant identification.
6. Identification of other important pollinators, weed killers and scavengers.
7. Visit to research and training institutions devoted to beekeeping, sericulture, lac culture and natural enemies.
8. Identification and techniques for mass multiplication of natural enemies.

Mode of Evaluation	Internal and External Examination
Recommendation by Board of Studies on	11-06-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome for AG3441

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students would learn the impart knowledge on the economically important insects and principles of insect pest management, including concept and components of IPM	3	Emp, S
CO2	Student will be able to know about honey bee species, castes of bees	3	Emp, S, Ent
CO3	Student will be able to know about mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves	3	Emp
CO4	Students would learn about types of silkworm, voltinism and biology of silkworm	3	Emp, S, Ent
CO5	Students will visit to research and training institutions devoted to beekeeping, sericulture, lac culture and natural enemies	3	Emp, S

CO-PO Mapping for AG3441

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	2	2	3	3	0	1	2	1	2	1	2
CO 2	2	3	3	2	3	2	2	1	2	2	1	2	2	2
CO 3	2	2	2	2	2	2	0	2	1	1	2	2	2	1
CO 4	2	2	1	2	2	1	1	1	2	1	1	2	2	1
CO 5	2	2	1	2	2	2	2	1	2	1	2	1	1	1
Avg	2.2	2.2	1.8	2	2.2	2	1.6	1	1.6	1.4	1.4	1.8	1.6	1.4

AG3442	Title:Production Technology for Fruit and Plantation Crops Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To study about scientific information in solving major problems that limit *fruit* and plantation crops *production* and marketing.	

List of Experiments

1. Study of seed propagation. .
2. Scarification and stratification of seeds.
3. Propagation methods for fruit and plantation crops.
4. Description and identification of fruit.
5. Preparation of plant bio regulators and their uses
6. Important pests, diseases and physiological disorders of above fruit and plantation crops.
7. Visit to commercial orchards.

Mode of Evaluation	Internal and External Examination
Recommendation by Board of Studies on	11-06-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome for AG3442

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will be able to understand planting system and morphology of fruit and plantation crops and different forms and external structures of fruit	3	Emp, S
CO2	Students will be able to get Knowledge of the seed propagation & different methods of seed treatment & the various seed treatment methods for breaking dormancy	3	Emp, S, Ent
CO3	Students will be able to apply the sexual and asexual propagation techniques in horticulture plants	3	Emp
CO4	Students will be able to understand the role of different bio regulators	3	Emp, S, Ent
CO5	Students will be able to understand the different insect-pests of fruit and plantation crops and their management	3	Emp, S

CO-PO Mapping for AG3442

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	2	1	2	2	1	1	1	2	1	1	2	2	1
CO 2	2	2	1	2	2	2	2	1	2	1	2	1	1	1
CO 3	2	2	1	2	2	1	1	2	2	2	1	1	2	1
CO 4	2	2	2	2	2	2	0	2	1	1	2	2	2	1
CO 5	2	2	1	2	2	1	1	1	2	1	1	2	2	1
Avg	2	2	1.2	2	2	1.4	1	1.4	1.8	1.2	1.4	1.6	1.8	1

AG3443	Title:Manures, Fertilizers and Soil Fertility Management Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To impart knowledge of *fertilizers and manures* as sources of plant nutrients and apprise about the integrated approach of plant nutrition and sustainability of *soil fertility*.	

List of Experiments

1. Introduction of analytical instruments and their principles, calibration and applications, Colorimetry and flame photometry.
2. Estimation of soil organic carbon, Estimation of alkaline hydrolysable N in soils.
3. Estimation of soil extractable P in soils. Estimation of exchangeable K; Ca and Mg in soils.
4. Estimation of soil extractable S in soils.
5. Estimation of DTPA extractable Zn in soils. Estimation of N in plants. Estimation of P in plants.
6. Estimation of K in plants. Estimation of S in plants.

Mode of Evaluation	Internal and External Examination
Recommendation by Board of Studies on	11-06-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome for AG3443

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	The student will be able to understand the analytical instruments and their principles.	3	Emp, S
CO2	Students will learn to analyze the estimation of soil organic carbon and alkaline hydrolysable N in soils	3	Emp, S, Ent
CO3	Students will learn to analyze the estimation of soil extractable P and S in soils.	3	Emp
CO4	Students will learn to analyze estimation of DTPA extractable Zn in soils. Estimation of N and P in plants.	3	Emp, S, Ent
CO5	Students will learn to analyze estimation of K and S in plants.	3	Emp, S

CO-PO Mapping for AG3443

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	1	2	3	2	3	2	2	1	1	3	3	2
CO 2	3	2	2	1	2	2	3	1	2	2	2	2	2	1
CO 3	3	1	1	2	2	2	2	1	2	2	2	2	2	1
CO 4	2	2	2	2	2	2	0	2	1	1	2	1	2	1
CO 5	3	1	3	1	3	3	0	2	2	1	2	2	3	1
Avg	2.8	1.6	1.8	1.6	2.4	2.2	1.6	1.6	1.8	1.4	1.8	2	2.4	1.2

AG3448	Title: Fundamentals of Plant Breeding Lab	L T P C 0 0 21
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To improve the characteristics of plants and study about breeding process is to achieve in the form of higher yielding	

List of Experiments

(Perform any Seven)

1. Study of germplasm of variouscrops.
2. Study of floral structure of self-pollinated and cross pollinatedcrops.
3. Emasculation and hybridization techniques in self & cross pollinatedcrops.
4. Consequences of inbreeding on genetic structure of resultingpopulations.
5. Study of male sterility system. Handling of segregationpopulations.
6. Methods of calculating mean, range, variance, standard deviation,heritability.
7. Designs used in plant breeding experiments, analysis of Randomized BlockDesign.
8. To work out the mode of pollination in a given crop and extent of naturalout-crossing.
9. Prediction of performance of double crosshybrids.

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	11-06-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome for AG3448

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will learn about Germplasm Collection, floral structure and emasculation & hybridization in self & cross pollinated crops.	3	Emp, S
CO2	Students will be able to handle segregation generation, different experimental designs and understand concept of male sterility.	3	Emp, S, Ent
CO3	Students would learn about basic statistical methods and concept of Inbreeding depression in plant breeding	3	Emp
CO4	Students will gain knowledge about breeding methods.	3	Emp, S, Ent
CO5	Student will gain knowledge about biotic and abiotic stresses.	3	Emp, S

CO-PO Mapping for AG3448

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	2	1	2	2	1	1	1	2	1	1	1	2	1
CO 2	3	2	1	2	2	1	1	1	2	1	1	1	2	1
CO 3	3	2	1	1	2	1	1	1	2	1	1	1	2	1
CO 4	2	2	1	2	2	1	1	1	2	1	1	1	2	1
CO 5	3	2	1	2	2	1	1	1	2	1	1	1	2	1
Avg	2.6	2	1	1.8	2	1	1	1	2	1	1	1	2	1

AG3449	Title: Livestock and poultry Management Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To enhance per capita availability of milk, eggs, and meat including *poultry.*	

List of Experiments

(Perform any Seven)

1. External body parts of cattle, buffalo, sheep, goat, swine and poultry.
2. Handling and restraining of livestock. Identification methods of farm animals and poultry.
3. Visit to IDF and IPF to study breeds of livestock and poultry and daily routine farm operations and farm records. Judging of cattle, buffalo and poultry.
4. Culling of livestock and poultry. Planning and layout of housing for different types of livestock. Computation of rations for livestock.
5. Formulation of concentrate mixtures. Clean milk production, milking methods.
6. Hatchery operations, incubation and hatching equipments.
7. Management of chicks, growers and layers. Debeaking, dusting and vaccination.
8. Economics of cattle, buffalo, sheep, goat, swine and poultry production

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	11-06-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome for AG3449

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will learn about external body part of cattle, buffalo, sheep, goat, swine and poultry	3	Emp, S
CO2	Students will be able to understand handling and restraining of livestock and identification methods of farm animals and poultry	3	Emp, S, Ent
CO3	Students will learn about culling of livestock and poultry and planning and layout of housing for different types of livestock	3	Emp
CO4	Students will be able to understand clean milk production techniques and milking methods in farm animals	3	Emp, S, Ent
CO5	Students will be able to understand economics of cattle, buffalo, sheep, goat, swine and poultry production	3	Emp, S

CO-PO Mapping for AG3449

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	3	3	2	3	2	2	1	2	2	1	2	2	2
CO 2	2	2	2	2	2	2	0	2	1	1	2	1	2	1
CO 3	3	1	3	1	3	3	0	2	2	1	2	2	3	1
CO 4	3	2	1	2	3	2	3	2	2	1	1	3	3	2
CO 5	3	2	2	1	2	2	3	1	2	2	2	2	2	1
Avg	2.6	2	2.2	1.6	2.6	2.2	1.6	1.6	1.8	1.4	1.6	2	2.4	1.4

Elective Course-II

AG3417	Title: Agribusiness Management	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To study about business aspect of agriculture production and its international trade.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Agribusiness systems & Agribusiness Management	2
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.		
Unit II	Agro- industries &Agri-value chain	3
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.		
Unit III	Meaning, types, goals & procedures of Planning	3
Planning, meaning, definition, types of plans. Purpose or mission, goals or objectives, Strategies, polices 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.		
Unit IV	Agribusiness management	2
Capital Management and Financial management of Agribusiness. Financial statements and their importance. Marketing Management: Segmentation, targeting & positioning. Marketing mix and marketing strategies.		
Unit V	Consumer behaviour analysis & Project Management	2
Consumer behaviour analysis, Product Life Cycle (PLC). Sales & Distribution Management. Pricing policy, various pricing methods. Project Management definition, project cycle, identification, formulation, appraisal, implementation, monitoring and evaluation. Project Appraisal and evaluation techniques.		
Text Books	1. L.M. Prasad. Principles and Practices of Management. 2001. 9th Ed. S. Chand & Sons, New Delhi. 2. Koontz Harold. Principles of Management. Tata McGraw-Hill Education Private Limited, New Delhi.	
Reference Books	1. S.S. Johl, J.R. Kapur. Fundamentals of Farm Business Management. 2006. Kalyani Publishers, New Delhi 2. Karan Singh and Kahlon A S. Economics of Farm Management in India. Theory and Practice. New Delhi. Allied. 3. P.C. Thomas.Managerial Economics. 9th Ed. Kalyani Publishers. 4. Heady Earl O and Herald R. Jenson. Farm Management Economics. 1954, Prentice Hall, New Delhi	
Mode of Evaluation	Internal and External Examination	
Recommendation by Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for AG3417

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will be able to know about the background of agribusiness system and its importance along with the agricultural policy	3	Emp, S
CO2	Students will be aware with the structure of Agro- industries and Agri-value chain in India and at the global level	3	Emp, S, Ent
CO3	Students will be able to know about the Meaning, types, goals and procedures of business planning	3	Emp
CO4	Students will learn about the Capital Management and Financial Management of agribusiness structure	3	Emp, S, Ent
CO5	Students will know about the Consumer Behaviour and Project Management and the pricing policy of institution	3	Emp, S

CO-PO Mapping for AG3417

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	3	2	1	1	1	3	2	1	2	3	2
CO 2	2	3	3	3	2	2	1	1	3	2	1	2	2	2
CO 3	2	3	3	2	-	1	1	0	2	1	2	2	1	2
CO 4	3	1	2	2	3	1	1	2	3	2	1	1	1	2
CO 5	2	1	3	2	2	2	2	1	2	2	1	2	1	3
Avg	2.4	2	2.6	2.4	2.25	1.4	1.2	1	2.6	1.8	1.2	1.8	1.6	2.2

AG 3446	Title: Agribusiness Management Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Expected Outcome	Students will be able to market their own products .	

List of Experiments

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

Mode of Evaluation	Internal and External Examination
Recommendation by Board of Studies on	11-06-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome for AG3446

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will be able to know about the background of agribusiness system and its importamce along with the agricultural policy	3	Emp, S
CO2	Students will be aware with the structure of Agro- industries and Agri-value chain in India and at the global level	3	Emp, S, Ent
CO3	Students will be able to know about the Meaning, types, goals and procedures of business planning	3	Emp
CO4	Students will learn about the Capital Management and Financial Management of agribusiness structure	3	Emp, S, Ent
CO5	Students will know about the Consumer Behaviour and Project Management and the pricing policy of institution	3	Emp, S

CO-PO Mapping for AG3446

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	3	3	2	0	1	1	0	2	1	2	2	1	2
CO 2	3	1	2	2	3	1	1	2	3	2	1	2	1	2
CO 3	2	1	3	2	2	1	2	1	2	2	1	2	1	3
CO 4	2	3	3	2	0	1	0	0	2	1	2	1	1	2
CO 5	3	1	2	2	3	1	1	2	3	2	1	2	1	2
Avg	2.4	1.8	2.6	2	1.6	1	1.2	1	2.4	1.6	1.4	1.8	1	2.2

EM3503	Title: Fundamentals of Agricultural Economics	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Students will gain knowledge on basic concepts and principles necessary for economic analysis in Agriculture sector	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit 1	Introduction	6
Economics: Meaning, scope and subject matter, definitions, activities, approaches to economic analysis; micro and macro economics, positive and normative analysis. Nature of economic theory; rationality assumption, concept of equilibrium, economic laws as generalization of human behavior. Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare. Agricultural economics: meaning, definition, characteristics of agriculture, importance and its role in economic development. Agricultural planning and development in the country		
Unit 2	Demand	5
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. *Laws of returns*: Law of variable proportions and law of returns to scale.		
Unit 3	Cost	5
Cost: Cost concepts, short run and long run cost curves. Supply: Stock v/s supply, law of supply, supply schedule, supply curve, determinants of supply, elasticity of supply. Market structure: meaning and types of market, basic features of perfectly competitive and imperfect markets. Price determination under perfect competition; short run and long run equilibrium of firm and industry, shut down and break even points. Distribution theory: meaning, factor market and pricing of factors of production. Concepts of rent, wage, interest and profit.		
Unit 4	National Income	4
National income: Meaning and importance, circular flow, concepts of national income accounting and approaches to measurement, difficulties in measurement. Population: Importance, Malthusian and Optimum population theories, natural and socio-economic determinants, current policies and programmes on population control. Money: Barter system of exchange and its problems, evolution, meaning and functions of money, classification of money, money supply, general price index, inflation and deflation.		
Unit 5	Banking	4
Banking: Role in modern economy, types of banks, functions of commercial and central bank, credit creation policy. Agricultural and public finance: meaning, micro v/s macro finance, need for agricultural finance, public revenue and public expenditure. *Tax:* meaning, direct and indirect taxes, agricultural taxation, VAT. *Economic systems:* Concepts of economy and its functions, important features of capitalistic, socialistic and mixed economies, elements of economic planning.		
Text Books	1. K.K. Dewett and J.D. Verma. 1986. Elementary Economic Theory, S.Chand& Company, New Delhi 2. P.A. Samuelson & W.D. Nordhaus.1987. Economics, McGraw-Hill, Singapore	
Reference Books	1. S.K. Mishra and V.K. Puri.1996. Indian Economy, Himalaya Publishing House, New Delhi 2. G.B. Jathar and S.G. Beri. 1996. Elementary Principles of Economics, Oxford University Press (10th Edition), Delhi	

Mode of Evaluation	Internal and External Examination
Recommended by the Board of Studies on	11-06-2019
Date of approval by the Academic Council on	13-07-2019

Course Outcome for EM3503

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will able to understand the concepts, scope and importance of Agricultural economics	2	Emp
CO2	Students will understand the framework about consumer behavior, producer behavior and analyzing consumer- producer decisions.	2	Emp, S
CO3	Students will understand the role-played by cost and revenue in long run and short run-in different market structure and thus direct firms and industries for minimization of cost and maximization of revenue.	3	Emp, S, Ent
CO4	Students will be able to understand macroeconomic concepts like National economy, population, money, inflation and deflation.	3	Emp, S
CO5	Students will understand the banking system and credit policies and practices	3	Emp, S

CO-PO Mapping for EM3503

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	1	1	1	1	1	1	1	1	1	1	0	1	1
CO 2	3	1	1	1	1	1	1	1	1	1	1	1	1	1
CO 3	3	2	1	1	2	1	1	1	1	2	0	1	1	1
CO 4	3	2	1	1	1	1	1	1	1	1	2	2	1	2
CO 5	3	2	1	1	1	1	2	1	1	1	2	2	1	1
Avg.	3	1.6	1	1	1.2	1	1.2	1	1	1.2	1.6	1.2	1	1.2

AG3501	Title: Agri-Informatics	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Students will be familiarized to different crop simulation models, use of DBMS in agriculture; will gain awareness on smart phone mobile apps in agriculture and application of decision support system in agriculture.	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit 1	Introduction	6
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		
Unit 2	World Wide Web	4
World Wide Web (WWW): Concepts and components. Introduction to computer programming languages, concepts and standard input/output operations		
Unit 3	e-Agriculture	6
e-Agriculture, concepts and applications, Use of ICT in Agriculture. Computer Models for understanding plant processes. IT application for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management, Smartphone Apps in Agriculture for farm advises, market price, postharvest management etc;		
Unit 4	Technology in Agriculture	4
Geospatial technology for generating valuable agri-information. Decision support systems, concepts, components and applications in Agriculture, Agriculture Expert System		
Unit 5	Information Systems	4
Soil Information Systems etc for supporting Farm decisions. Preparation of contingent crop-planning using IT tools.		
Text Books	1.G. Vanitha and M. Kalpana. 2011.Agro-Informatics Hardcover. New India Publishing Agency. 2.R Chakravarthy. 2006. Agri Informatics: An Introduction. ICFAI UNIVERSITY PRESS.	
Reference Books	1. Dr.Mamta Rana and D. Prasad. Agro-informatics. Bioscientific Publisher. 2017.	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council on	13-07-2019	

Course Outcome for AG3501

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will be aware of the basics in computers, operating systems, data interpretation and statistical analysis along with database management concepts	2	Emp, S
CO2	Students will gain knowledge on concepts of Networks and basics of programming languages in computer	3	Emp, S
CO3	Students will learn about the applications of ICT in agriculture, smart phone apps in agriculture for farm advises and about computer models in agriculture	3	Emp, S,Ent
CO4	Students will gain keen knowledge on geospatial technology for agri-information and decision support system along with expert system	3	Emp, S
CO5	Students will be able to understand the soil information systems for supporting farm decisions and preparing crop planning using IT tools	3	Emp, S,Ent

CO-PO Mapping for AG3501

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO 1	3	2	2	0	3	2	2	1	1	3	1	1	3	2
CO 2	2	3	3	3	2	2	1	1	3	2	2	1	2	3
CO 3	2	3	3	2	0	1	0	1	2	1	1	1	1	2
CO 4	3	1	2	2	3	0	1	2	3	2	1	2	1	2
CO 5	2	1	3	2	2	0	1	1	2	1	2	1	1	3
Avg.	2.4	2	2.6	1.8	2	1	1	1.2	2.2	1.8	1.4	1.2	1.6	2.4

AG3502	Title: Farming System and Sustainable Agriculture	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Students will learn the fundamental principles of farming systems and sustainable agriculture and how to improve the economic condition of the farmer.	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit 1	Introduction	5
Farming System-scope, importance, and concept, Types and systems of farming system and factors affecting types of farming, Farming system components and their maintenance		
Unit 2	Cropping System	4
Cropping system and pattern, multiple cropping system, Efficient cropping system and their evaluation, Allied enterprises and their importance, Tools for determining production and efficiencies in cropping and farming system		
Unit 3	Sustainable Agriculture	6
Sustainable agriculture-problems and its impact on agriculture, indicators of sustainability, adaptation and mitigation, conservation agriculture strategies in agriculture, HEIA, LEIA and LEISA and its techniques for sustainability		
Unit 4	Integrated Farming System	4
Integrated farming system-historical background, objectives and characteristics, components of IFS and its advantages, Site specific development of IFS model for different agro-climatic zones		
Unit 5	Farming System	5
Resource use efficiency and optimization techniques, Resource cycling and flow of energy in different farming system, farming system and environment, Visit of IFS model in different agro-climatic zones of nearby states University/ institutes and farmers field.		
Text Books	1. Arun K. Sharma. 2006. A hand book of organic farming - Agrobios (India) Jodhpur. 2. Jayanthi C, Devasenapathy P and Vinnila, C. Farming systems principles and practice. Satish serial publishing house, Delhi. 2008.	
Reference Books	1. Panda.S.C. 2017. Cropping and farming systems. Agrobios (India) Jodhpur. 2. Ruthenburg, H. 1980. Farming systems in the tropics. Oxford university press.	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council on	13-07-2019	

Course Outcome for AG3502

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will get knowledge about farming system types, components and its maintenance	2	Emp, S
CO2	Students will gain knowledge about different cropping system and cropping pattern and allied enterprises of farming system	3	Emp, S
CO3	Students will learn about meaning, problems, impact and different techniques of sustainable agriculture and their management	3	Emp, S
CO4	Student will learn about objectives, characteristics, components, advantages and site-specific model of Integrated Farming System	3	Emp, S,Ent
CO5	Students will gain knowledge about resource use efficiency, optimization techniques, Resource cycling and flow of energy in different farming system	3	Emp, S,Ent

CO-PO Mapping for AG3502

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	2	1	1	2	1	1	2	1	3	1	2
CO 2	3	2	2	1	1	1	2	1	1	1	1	3	1	2
CO 3	3	3	2	2	2	1	2	1	1	2	1	3	1	2
CO 4	3	2	2	1	1	1	2	1	1	1	1	3	2	2
CO 5	3	2	2	1	1	1	2	1	1	2	1	3	2	2
Avg.	3	2.2	2	1.4	1.2	1	2	1	1	1.6	1	3	1.4	2

AG3504	Title: Intellectual Property Rights	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Students will be understanding IP and associated rights; will study about types of IP and legislation covering IPR in India; impart significance of IPR in realizing wealth and value creation as knowledge based economy.	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit 1	Introduction	3
Introduction and meaning of intellectual property, brief introduction to GATT, WTO, TRIPs and WIPO, Treaties for IPR protection: Madrid protocol, Berne Convention, Budapest treaty, etc		
Unit 2	IPR	5
Types of Intellectual Property and legislations covering IPR in India:-Patents, Copyrights, Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets. Patents Act 1970		
Unit 3	Patents	6
Patent system in India, patentability, process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement, Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database.		
Unit 4	Plant Protection	6
Origin and history including a brief introduction to UPOV for protection of plant varieties, Protection of plant varieties under UPOV and PPV&FR Act of India, Plant breeders rights, Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights. Traditional knowledge meaning and rights of TK holders.		
Unit 5	International Treaty on Plant Genetic Resources	4
Convention on Biological Diversity, International treaty on plant genetic resources for food and agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing.		
Text Books	1.Acharya, N.K. 2014. Text book of Intellectual Property Rights. Asia Law House, Hyderabad. 2. Loganathan, E.T. 2012. Intellectual Property Rights. New Century Publications, New Delhi.	
Reference Books	1. Rosedar, S.R.A. 2016. Intellectual Property Rights. Lexis Nexis (2nd Ed.), Nagpur. 2. Pandey Neeraj and Dharni Khushdeep.2014. Intellectual Property Rights. PHI Publication.	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council on	13-07-2019	

Course Outcome for AG3504

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will gain knowledge on basics in IPR	2	Emp, S
CO2	Students will able to understand about patent and patent filling	3	Emp, S
CO3	Students will be able to illustrate the rights of farmers and researchers	3	Emp, S
CO4	Students will be able to know about different treaty over IPR	2	Emp, S
CO5	Students will be able to understand about UPOV and acts over biodiversity	3	Emp, S

CO-PO Mapping for AG3504

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	1	2	1	2	1	2	1	2	1	1	3	1	1
CO 2	3	3	1	1	2	2	2	1	2	1	2	3	2	2
CO 3	3	1	0	1	2	1	2	1	2	1	2	3	1	2
CO 4	3	1	1	1	2	0	2	1	2	1	1	3	1	1
CO 5	3	1	1	1	1	1	2	1	2	1	2	3	1	1
Avg.	3	1.4	1	1	1.8	1	2	1.0	2	1	1.6	3	1.2	1.4

AG3505	Title: Production Technology for Ornamental Crops, MAP and Landscaping	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	The main objective is to enhance knowledge on the cultivation practices of various ornamental crops; impart knowledge about importance of Ornamentals in Landscaping and beautification; impart technical skills through practical approach required to raise and manage ornamental crops.	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit 1	Introduction	6
Importance and scope of ornamental crops, medicinal and aromatic plants and landscaping. Principles of landscaping. Landscape uses of trees, shrubs and climbers		
Unit 2	Production technology of Flowers	6
Production technology of important cut flowers like Rose, Marigold, Gladiolus, Poppy, Primulas, Gerbera, Carnation, Lilium and Orchids under protected conditions and gladiolus, tuberose, chrysanthemum under open conditions.		
Unit 3	Package	3
Package of practices for loose flowers like marigold and jasmine under open conditions.		
Unit 4	Production Technology of Medicinal Plants	6
Production technology of important medicinal plants like Ashwagandha, Asparagus, aloe, costus, Cinnamomum, periwinkle, isabgol and aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, rose, geranium, vetiver		
Unit 5	Value Addition	3
Processing and value addition in ornamental crops and MAPs produce.		
Text Books	1. G. S. Randhawa, A.N. Mukhopadyay, A. Mukhopadhyay . 1998. Floriculture in India.Allied Publishers Private Limited. 2. K.L. Chadha.2019. Handbook of Horticulture. ICAR.	
Reference Books	1. J.S. Arora. 2016. Introductory Ornamental Horticulture. Kalyani Publications. 2. Laxmi Lal. 2018.Textbook of Production Technology For Ornamental Crops, Maps & Landscaping. : Agrotech Books.	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council on	13-07-2019	

Course Outcome for AG3505

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will be able to learn about the ornamental crops, medicinal and aromatic plants and landscaping	3	Emp, S,Ent
CO2	Students will be aware of production technology of flowers like rose, marigold, poppy, primulas, gerbera, carnation, lilium, orchids and gladiolus, tuberose, chrysanthemum under open condition	3	Emp, S,Ent
CO3	Students will be able to know about the package of practices for loose flowers like marigold and jasmine	3	Emp, S,Ent
CO4	Students will learn about production technology of important medicinal plants	3	Emp, S
CO5	Students will know about processing and value addition in ornamental crops and MAPs produce	3	Emp, S

CO-PO Mapping for AG3505

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	2	1	2	0	0	3	1	2	1	2	1
CO 2	3	2	2	2	2	3	3	0	1	2	3	1	1	2
CO 3	2	3	3	2	3	2	2	1	2	2	1	2	2	2
CO 4	2	2	2	2	2	2	0	2	1	1	2	1	2	1
CO 5	3	1	3	1	3	3	0	2	2	1	2	2	3	1
Avg.	2.6	2	2.4	1.8	2.2	2.4	1	1	1.8	1.4	2	1.4	2	1.4

AG3506	Title: Soil and Water Conservation Engineering	L T P C 1 0 0 1
Version No.	1.0	
Course Prerequisites		
Objectives	To teach about fundamental aspects of soil and water conservation engineering To improve the understanding of soil and water dynamics through use of modern technology.	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit 1	Soil & Water Erosion	4
Soil erosion - Introduction, causes and types - geological and accelerated erosion, agents, factors affecting and effects of erosion. Water erosion - Mechanics and forms - splash, sheet, rill, gully, ravine and stream bank erosion. Gullies - Classification, stages of development.		
Unit 2	Erosivity &Erodibilty	6
Soil loss estimation – Universal soil loss equation (USLE) and modified USLE. Rainfall erosivity – estimation by KE>25 and EI methods. Soil erodibility - topography, crop management and conservation practice factors. Measurement of soil erosion - Runoff plots, soil samplers. Water erosion control measures - agronomical measures - contour farming, strip cropping, conservation tillage and mulching.		
Unit 3	Engineering Measures	5
Engineering measures– Bunds and terraces. Bunds - contour and graded bunds - design and surplussing arrangements. Terraces - level and graded broad base terraces, bench terraces - planning, design and layout procedure, contour stonewall and trenching.		
Unit 4	Gully And Ravine Reclamation	4
Gully and ravine reclamation - principles of gully control - vegetative measures, temporary structures and diversion drains. Grassed waterways and design.		
Unit 5	Wind Erosion	5
Wind erosion- Factors affecting, mechanics, soil loss estimation and control measures - vegetative, mechanical measures, wind breaks and shelter belts and stabilization of sand dunes. Land capability classification. Rate of sedimentation, silt monitoring and storage loss in tanks.		
Text Books	1. Land and Water Management Engineering. 1982. Murthy V.V.N. Kalyani Pubhliers, New Delhi. 2. Irrigation: Theory and Practices.1989. Michael A.M. Vikas Publishing House Pvt. Ltd., New Delhi.	
Reference Books	1. Principles of Agricultural. Engineering. Vol. II. 1993. Michael A.M. and T.P. Ojha. Jain Brothers, New Delhi. 2. Irrigation Agronomy. S. R. Reedy. 3. Soil Chemistry Nutrient & Water Management in Agriculture Soil. TVS Prasad. 4. Soil and Water Conservation engineering. R. Suresh.	
Mode of Evaluation	Internal and External Examinations	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council on	13-07-2019	

Course Outcome for AG3506

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will learn about Soil erosion - causes and types, agents, factors affecting soil erosion	2	Emp
CO2	Students will learn about parameters to measure soil erosion	2	Emp
CO3	Engineering structures to control soil erosion	3	Emp, S
CO4	Students would learn about principles of gully control - vegetative measures, temporary structures and diversion drains, Grassed waterways and design.	3	Emp, Ent
CO5	Students will learn the effect of wind on soil erosion.	2	Emp

CO-PO Mapping for AG3506

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	2	3	2	0	1	1	1	2	2	0	2	**1**	**1**
CO 2	2	3	2	2	1	1	2	1	3	3	1	3	**1**	**2**
CO 3	3	2	3	3	1	2	2	1	2	3	1	3	**1**	**1**
CO 4	2	3	2	3	1	1	3	1	3	2	0	2	**1**	**2**
CO 5	3	2	1	2	2	1	2	1	3	3	1	3	1	1
Avg.	2.4	2.4	2.2	2.4	1	1.2	2	1.0	2.6	2.6	0.6	2.6	1	1.4

AG3508	Title: Principles of Integrated Pest and Disease Management	L T P C 1 0 0 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Students will get familiarized with various categories of pest, understand the strategies and practices of IPM, including biological, cultural, regulatory, mechanical and chemical/bio-pesticidal, pest monitoring, and decision making. based on the symptoms from various pests and recommend the management practices.	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit 1	Introduction to Integrated Pest Management	2
IPM: Introduction, history, importance, concepts, principles and tools of IPM. Economic importance of insect pests, diseases and pest risk analysis.		
Unit 2	Method of Detection	2
Categories of insect pests and diseases.Methods of detection and diagnosis of insect pest and diseases. Calculation and dynamics of economic injury level and importance of Economic threshold level.		
Unit 3	Control and Management	3
Methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control. Ecological management of crop environment .Introduction to conventional pesticides for the insect pests and disease management.		
Unit 4	Survey and Forecasting	3
Survey surveillance and forecasting of Insect pest and diseases. Development and validation of IPM module .Implementation and impact of IPM (IPM module for Insect pest and disease. Safety issues in pesticide uses.		
Unit 5	Legal Implication of IPM	2
Political, social and legal implication of IPM. Case histories of important IPM programmes. Case histories of important IPM programmes.		
Text Books	1. Dhaliwal, G. S. and Ramesh Arora. Integrated pest management: Concepts and approaches. 2001. Kalyani Publishers Ludhiana. 2. Metcalf, R. L .and Luckman, W. H. Introduction to insect pest management. 1982. Wiley inter science publishing, New York.	
Reference Books	1. Larry P Pedigo. Entomology and pest management. 1991. Prentice Hall of India Private Ltd., New Delhi. 2. Venugopala Rao, N., Umamaheswari, Rajendraprasad, P., Naidu, V.G and Savithri, P. Integrated Insect Pest Management. 2004. Agrobios (India) Limited, Jodhpur. 3. Chaube, H.S. and Ramji Singh. Introductory Plant Pathology. 2001. International Book Distribution Co., Lucknow.	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council on	13-07-2019	

Course Outcome for AG3508

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will be able to understand, what is a pest and disease and categories of Pest and diseases.	2	Emp
CO2	Students will be able to understand, IPDM and tools of IPDM.	2	Emp
CO3	Students will be able to understand, cultural, mechanical, physical, biological, microbial and legislative methods of pest and disease management.	3	Emp, S, Ent
CO4	Students will be able to understand, chemical control of pests and diseases	3	Emp, S, Ent
CO5	Students will be able to calculate and applying insecticides and fungicides.	3	Emp, S, Ent

CO-PO Mapping for AG3508

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO 1	3	2	2	2	1	2	0	0	3	2	1	2	2	1
CO 2	3	2	2	2	2	3	3	0	1	2	1	2	1	2
CO 3	2	3	3	2	3	2	2	1	2	2	1	2	2	2
CO 4	2	2	2	2	2	2	0	2	1	1	2	2	2	1
CO 5	3	1	3	1	3	3	0	2	2	2	1	1	3	1
Avg.	2.6	2	2.4	1.8	2.2	2.4	1	1	1.8	1.8	1.2	1.8	2	1.4

AG3509	Title:Pests of Crops and Stored Grains and their Management	L T P C 1 0 0 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	The main objective is to identify the insect and mite pests and study about their symptoms, biology, host range, etc. under field and storage conditions and to study suitable/viable management strategies	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit 1	Introduction to Pest	2
General account on nature and type of damage by different arthropods pests. Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage.		
Unit 2	Management of Field and Vegetable Crop	2
Management of major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests of various field crop, vegetable crop.		
Unit 3	Management of Fruit and Plantation Crop	2
Management of major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests of various Fruit crop, Plantation crop.		
Unit 4	Management of Ornamental Crop, Spices and Condiments	2
Management of major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests of various ornamental crops, spices and condiments.		
Unit 5	Storage Management	4
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.		
Text Books	1. Vasantharaj David, B. and Rama Murthy V.V. Elements of Economic Entomology. 2016. Popular Book Depot, Coimbatore. 80 2. Vasantharaj David, B and Aanathakrishnan, T.N. General and Applied Entomology. 2006. Tata McGraw-Hill Publishing House, New Delhi.	
Reference Books	1. Nair MRGK. Insects and Mites of crops in India. 1986. Indian Council of Agricultural Research New Delhi. 2. Ramakrishna Ayyar, T.V. Handbook of Economic Entomology for South India. 1963. Government Press, Madras. .	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council on	13-07-2019	

Course Outcome for AG3509

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will be familiar in identification of different insect pest of field, horticulture, ornamentals, vegetables and stored grains at the field level	2	Emp
CO2	Students will understand how insects affect animal and plant health and agricultural production, and be able to safely manipulate populations of beneficial and destructive species in habitats	3	Emp, S
CO3	Students will be able about the biology, diversity, distribution of insects, and their relationships to crop and the environment condition of a particular area	3	Emp, S
CO4	Students will be able to identify nature of damage and symptoms caused by the pest so suitable technique of pest management can be apply for effective control	3	Emp, S, Ent
CO5	Management of crop pest through Integrated Pest Management approach without side effect on plant, animal and environment health	3	Emp, S, Ent

CO-PO Mapping for AG3509

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	1	0	1	0	1	2	1	2	2	1	3	3	2
CO 2	3	2	1	0	1	1	2	1	3	3	1	3	1	1
CO 3	3	1	1	1	1	1	2	1	2	3	1	3	2	1
CO 4	3	1	2	1	1	1	3	1	3	2	1	2	2	1
CO 5	3	2	1	2	2	1	2	1	3	3	1	3	3	2
Avg.	3	1.4	1	1	1	1	2.2	1.0	2.6	2.6	1	2.8	2.2	1.4

AG3511	Title: Diseases of Field & Horticultural Crops & their Management-I	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Students will be able to identify and understand the symptoms, etiology, disease cycle and management of various field and horticultural crops.	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit 1	Disease study and Management of Field Crop	6
Symptoms, etiology, disease cycle and management of major diseases of following crops- Field Crops: Rice: blast, brown spot, bacterial blight, sheath blight, false smut, khaira and tungro;Maize: stalk rots, downy mildew, leaf spots; Sorghum: smuts, grain mold and anthracnose, Bajra :downy mildew and ergot; Finger millet: Blast and leaf spot Groundnut: early and late leaf spots, wilt		
Unit 2	Disease Study and Management of Pulses	4
Symptoms, etiology, disease cycle and management of major diseases of following crops -Soybean: Rhizoctonia blight, bacterial spot, seed and seedling rot and mosaic; Pigeonpea: Phytophthora blight, wilt and sterility mosaic; black & green gram: Cercospora leaf spot and anthracnose, web blight and yellow mosaic.		
Unit 3	Disease study and Management	4
Symptoms, etiology, disease cycle and management of major diseases of following crops Castor: Phytophthora blight; Groundnut: early and late leaf spots; Tobacco: black shank, black root rot and mosaic.		
Unit 4	Disease and Management of Fruits	4
Symptoms, etiology, disease cycle and management of major diseases of following crops-Horticultural Crops: Guava: wilt and anthracnose; Banana: Panama wilt, bacterial wilt, Sigatoka and bunchy top; Papaya: foot rot, leaf curl and mosaic, Pomegranate: bacterial blight.		
Unit 5	Disease Study and Managemet of Vegetable Crops	6
Symptoms, etiology, disease cycle and management of major diseases of following crops-Cruciferous vegetables: Alternaria leaf spot and black rot; Brinjal: Phomopsis blight and fruit rot and Sclerotinia blight; Tomato: damping off, wilt, early and late blight, buck eye rot and leaf curl and mosaic; Okra: Yellow Vein Mosaic; Beans: anthracnose and bacterial blight; Ginger: soft rot; Colocasia: Phytophthora blight; Coconut: wilt and bud rot; Tea: blister blight; Coffee: rust.		
Text Books	1. H.S Chaube, V.S. Pundhir. Crop Diseases and Their management. 2. Rangaswami, Gand K.Mahadevan. Diseases of crop plants in India. 2001. Prentice Hall of India Pvt.Ltd, New Delhi.	
Reference Books	1. Singh, R.S. Plant Diseases. 2005. Oxford & IBH Publications, New Delhi. 2. Parvathy Reddy .Diseases of Horticultural Crops. Scientific Publishers Journals Dept.	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council on	13-07-2019	

Course Outcome for AG3511

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will study about important taxonomic characters and symptoms produced by important microorganisms in order to manage them.	2	Emp
CO2	Students will gain knowledge on plant disease management by different methods.	3	Emp, S
CO3	Students will gain the knowledge on different diseases in field and horticultural crops	2	Emp
CO4	Students will gain the knowledge mass multiplication of biocontrol agents like *Trichoderma viride*, *Pseudomons fluorescens* and *Bacillus subtilis* and also learn about the method of applications	3	Emp, S, Ent
CO5	Students will learn diseases of various field crops and horticultural crops and to know their management practices.	3	Emp, S, Ent

CO-PO Mapping for AG3511

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO2
CO 1	3	2	2	2	1	2	0	0	3	2	1	2	2	1
CO 2	3	2	2	2	2	3	3	0	1	2	1	2	1	2
CO 3	2	3	3	2	3	2	2	1	2	2	1	2	2	2
CO 4	2	2	2	2	2	2	0	2	1	1	2	2	2	1
CO 5	3	1	3	1	3	3	0	2	2	2	1	1	3	1
Avg.	2.6	2	2.4	1.8	2.2	2.4	1	1	1.8	1.8	1.2	1.8	2	1.4

AG3512	Title: Rainfed Agriculture and Watershed Management	L T P C 1 0 0 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Students will be learning about soil and water conservation techniques , to manage crops in rainfed areas and to demonstrate soil moisture conservation and water harvesting structures.	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit 1	Introduction	2
Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India.		
Unit 2	Soil and water conservation	2
Soil and climatic conditions prevalent in rainfed areas; Soil and water conservation techniques.		
Unit 3	Drought	3
Drought: types, effect of water deficit on physio- morphological characteristics of the plants, Crop adaptation and mitigation to drought.		
Unit 4	Water harvesting	3
Water harvesting: importance, its techniques, Efficient utilization of water through soil and crop management practices, Management of crops in rainfed areas.		
Unit 5	Watershed Management	2
Concept, objective, principles and components of watershed management, factors affecting watershed management.		
Text Books	1. T.Yellamanda Reddy and G.H.Sankara Reddi. Principles of Agronomy. 2010. Kalyani Publishers, New Delhi. 2. Reddy, S. R. and Prabhakar Reddy, G. Dryland Agriculture. 2015. Kalyani Publishers.	
Reference Books	1. Dhruva Narayana, V.V., Sastry, G.S. and Patnaiak, V.S. Watershed Management in India. 1999. ICAR, New Delhi. 2. Jeevananda Reddy, S. Dryland Agriculture in India: An agro-climatological and agrometeorological perspective. 2002. B S publications.	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council on	13-07-2019	

Course Outcome For AG3512

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will gain knowledge about meaning, classifications, problems, management and historical background of rainfed farming	2	Emp
CO2	Students will understand soil types, climatic condition and crop management in rainfed farming	2	Emp
CO3	Students will gain knowledge drought, drought types, drought effects on biometrical and morphological characters on crops and drought management	3	Emp
CO4	Students will understand meaning, importance, application of water harvesting, crop management techniques and its utilization in rainfed area	3	Emp, Ent
CO5	Students will gain knowledge about concept, objectives, principles, components and factors of watershed management	2	Emp, Ent

CO-PO Mapping for AG3512

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	1	0	0	1	1	1	0	1	1	0	1	1	1
CO 2	2	2	1	1	2	1	1	1	1	1	0	1	1	1
CO 3	3	2	2	1	2	2	2	1	2	2	1	2	1	1
CO 4	3	3	3	2	3	2	2	1	3	2	2	2	2	2
CO 5	3	3	3	3	3	3	2	2	3	3	2	2	2	2
Avg.	2.6	2.2	1.8	1.4	2.2	1.8	1.6	1	2	1.8	1	1.6	1.4	1.4

AG3518	Title: Protected Cultivation and Secondary Agriculture	L T P C 1 0 0 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Students will be learning about protected agriculture techniques ,Planning and design of greenhouses, Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation.	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit 1	Introduction	2
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.		
Unit 2	Green house equipments	2
Green house equipments, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying. Cost estimation and economic analysis.		
Unit 3	Important Engineering properties	3
Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation.		
Unit 4	Drying and dehydration	3
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).		
Unit 5	Material handling equipment	2
Material handling equipment; conveyer and elevators, their principle, working and selection.		
Text Books	1. T.Yellamanda Reddy and G.H.SankaraReddi. Principles of Agronomy. 2010. Kalyani Publishers, New Delhi. 2. Reddy, S. R. and Prabhakar Reddy, G. Dryland Agriculture. 2015. Kalyani Publishers.	
Reference Books	1. Singh Brahma and Balraj Singh. 2014. Advances in protected cultivation, New India Publishing Company. 2. Sharma P. 2007. Precision Farming. Daya Publishing House New Delhi.	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council on	13-07-2019	

Course Outcome for AG3518

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	To get knowledge about green house technology, types of green houses and construction of green houses	2	Emp
CO2	Course will give the knowledge of Green house equipments, materials of construction for traditional and low cost green houses	2	Emp
CO3	This course will help the students to learn about Irrigation systems used in greenhouses, shade net house in protected cultivation	3	Emp, S, Ent
CO4	By this course student get the of concepts of cleaning and grading Moisture measurement	3	Emp, S, Ent
CO5	Students will be able to understand the Material handling equipment, principle and working	2	Emp, S, Ent

CO-PO Mapping for AG3518

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	1	1	2	2	1	1	1	2	3	1	1	1	1
CO 2	3	1	1	2	3	1	1	2	3	3	1	2	2	1
CO 3	3	2	1	2	3	2	2	0	3	2	1	2	2	1
CO 4	2	0	1	2	3	2	2	1	2	3	1	2	1	1
CO 5	3	1	2	1	2	1	2	1	2	2	1	2	2	1
Avg.	2.8	1.0	1.2	1.8	2.6	1.4	1.6	1	2.4	2.6	1	1.8	1.6	1.0

AG3540	Title: Agri-Informatics Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Students will be familiarized to different crop simulation models, use of DBMS in agriculture; will gain awareness on smart phone mobile apps in agriculture and application of decision support system in agriculture.	

List of Experiments

(Perform any Seven Experiments)

1. Study of Computer Components, accessories, practice of important DOS Commands.
2. Introduction of different operating systems such as windows, Unix/ Linux, Creating, Files & Folders, File Management.
3. Use of MS-WORD and MS Power-point for creating, editing and presenting a scientific Document.
4. MS-EXCEL - Creating a spreadsheet, use of statistical tools, writing expressions, creating graphs, analysis of scientific data.
5. MS-ACCESS: Creating Database, preparing queries and reports, demonstration of Agriinformation system.
6. Introduction to World Wide Web (WWW).
7. Introduction of programming languages.
8. Hands on Crop Simulation Models (CSM) such as DSSAT/Crop-Info/CropSyst/ Wofost;
9. Computation of water and nutrient requirements of crop using CSM and IT tools.
10. Introduction of Geospatial Technology for generating valuable information for Agriculture.
11. Hands on Decision Support System.
12. Preparation of contingent crop planning.

Mode of Evaluation	Internal and External Examination
Recommended by the Board of Studies on	11-06-2019
Date of approval by the Academic Council on	13-07-2019

Course Outcome for AG3540

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will be able to learn about demonstration with DSSAT, CropSyst and Wofost crop simulation models	3	Emp, S,Ent
CO2	Students will be able to provide better agricultural services through ICT initiatives	3	Emp, S
CO3	Students will be able to compute water and nutrient requirements of crop using IT tools	3	Emp, S
CO4	Students will gain knowledge on geospatial technology for agri-information	3	Emp, S
CO5	Students will learn to Prepare contingent crop planning	3	Emp, S

CO-PO Mapping for AG3540

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	1	2	1	1	1	1	1	1	0	1	0	1	1
CO 2	3	1	1	1	1	1	1	1	1	1	0	1	1	1
CO 3	3	2	0	1	1	1	1	1	1	2	0	1	1	1
CO 4	3	2	1	1	1	1	1	1	1	1	2	2	1	1
CO 5	3	2	1	1	1	1	1	1	1	1	2	2	1	2
Avg.	3	1.6	1	1	1	1	1	1	1	1	1	1.2	1	1.2

AG3541	Title: Principles of Integrated Pest and Disease Management Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Students will be familiarized with various categories of pest, understand how IPM decisions are made and factors that influence the decision-making process and to apply knowledge gained to solve actual pest management problems.	
	List of Experiments	

(Perform any seven experiments)

1. Methods of diagnosis and detection of various insect pests, and plant diseases.
2. Methods of insect pests and plant disease measurement.
3. Assessment of crop yield losses, calculations based on economics of IPM.
4. Identification of biocontrol agents, different predators and natural enemies.
5. Mass multiplication of *Trichoderma, Pseudomonas*, *Trichogramma*, NPV etc.
6. Identification and nature of damage of important insect pests and diseases and their management.
7. Crop (agro-ecosystem) dynamics of a selected insect pest and diseases.
8. Plan & assess preventive strategies (IPM module) and decision making crop monitoring attacked by insect, pest and diseases.
9. Awareness campaign at farmers fields.

Mode of Evaluation	Internal and External Examination
Recommended by the Board of Studies on	11-06-2019
Date of approval by the Academic Council on	13-07-2019

Course Outcome for AG3541

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Student will be able to know about the important taxonomic characters and symptoms produced by important microorganisms in order to manage them	2	Emp, S
CO2	They will gain the knowledge on different diseases in the field and horticultural crops	3	Emp, S
CO3	It imparts knowledge on plant disease management by different methods	3	Emp, S, Ent
CO4	Student will be able to know about the Plan & assess preventive strategies (IPM module) and decision-making crop monitoring attacked by insect, pests' and diseases.	3	Emp, S, Ent
CO5	The students will be able to understand, apply, analyze and evaluate different methods of pest management.	2	Emp, S, Ent

CO-PO Mapping for AG3541

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO2
CO 1	2	3	3	2	3	2	2	1	2	2	1	2	2	2
CO 2	2	2	2	2	2	2	0	2	1	1	2	2	2	1
CO 3	3	1	3	1	3	3	1	2	2	2	1	1	3	1
CO 4	2	3	3	2	3	2	2	1	2	2	1	2	2	2
CO 5	2	2	2	2	2	2	0	2	1	1	2	2	2	1
Avg.	2.2	2.2	2.6	1.8	2.6	2.2	1.0	1.6	1.6	1.6	1.4	1.8	2.2	1.4

AG3542	Title: Pests of Crops and Stored Grains and their Management Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	The main objective is to identify the insect and mite pests and study about their symptoms, biology, host range, etc. under field and storage conditions and to study suitable/viable management strategies	
	List of Experiments	

(Perform any seven experiments)

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

Mode of Evaluation	Internal and External Examination
Recommended by the Board of Studies on	11-06-2019
Date of approval by the Academic Council on	13-07-2019

Course Outcome for AG3542

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will know about pest of crops and stored grains like cereals, pulses, oilseeds and their management	3	Emp, S
CO2	They will gain the knowledge on climate change and its management	3	Emp, S
CO3	It will make students to gain expertise in practical aspects of warehouse management	3	Emp, S, Ent
CO4	Students will able to know about the determination of insect infestation by different methods and assessment of losses due to insects.	3	Emp, S, Ent
CO5	Students will able to know about the identification of birds and bird control operations in godowns.	2	Emp, S, Ent

CO-PO Mapping for AG3542

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	3	3	2	3	2	2	1	2	2	1	2	2	2
CO 2	2	2	2	2	2	2	0	2	1	1	2	2	2	1
CO 3	3	1	3	1	3	3	0	2	2	2	1	1	3	1
CO 4	3	1	3	1	3	3	0	2	2	2	1	1	3	1
CO 5	2	3	3	2	3	2	2	1	2	2	1	2	2	2
Avg.	2.4	2	2.8	1.6	2.8	2.4	0.8	1.6	1.8	1.8	1.2	1.6	2.4	1.4

AG3544	Title:Diseases of Field & Horticultural Crops & their Management-I Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To understand the symptoms, etiology, disease cycle and management of various field and horticultural crops	
	List of Experiments	
1. Identification and histo pathological studies of selected diseases of field and horticultural crops covered in theory. 2. Field visit for the diagnosis of field problems. 3. Collection and preservation of plant diseased specimens for Herbarium; Note: Students should submit 50 pressed and well-mounted specimens.		
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council on	13-07-2019	

Course Outcome for AG3544

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will learn about diseases of various Field crops and Horticultural crops and to know their management practices	3	Emp, S
CO2	Students will gain the knowledge on different diseases of field and horticultural crops	3	Emp, S
CO3	Students will learn about the Mass multiplication of biocontrol agents like Trichoderma viride, Pseudomons fluorescens and Bacillus subtilis and also learn about the method of applications	3	Emp, S,
CO4	Students will learn about about taxonomic characters and symptoms produced by various pathogens.	3	Emp, S,
CO5	Students would learn about fungicides and their doses to control various plant diseases.	3	Emp, S, Ent

CO-PO Mapping for AG3544

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	3	3	2	3	2	2	1	2	2	1	2	2	2
CO 2	2	2	2	2	2	2	1	2	1	1	2	2	2	1
CO 3	3	1	3	1	3	3	1	2	2	2	1	1	3	1
CO 4	3	1	3	1	3	3	1	2	2	2	1	1	3	1
CO 5	3	1	3	1	3	3	1	2	2	2	1	1	3	1
Avg.	2.6	1.6	2.8	1.4	2.8	2.6	1.2	1.8	1.8	1.8	1.2	1.4	2.6	1.2

AG3543	Title: Production Technology for Ornamental Crops, MAP and Landscaping Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	The main objective is to enhance knowledge on the cultivation practices of various ornamental crops; impart knowledge about importance of Ornamentals in Landscaping and beautification; impart technical skills through practical approach required to raise and manage ornamental crops.	
	List of Experiments	

(Perform any Seven Experiments)

1. Identification of Ornamental plants.
2. Identification of Medicinal and Aromatic Plants.
3. Nursery bed preparation and seed sowing.
4. Training and pruning of Ornamental plants.
5. Planning and layout of garden.
6. Bed preparation and planting of MAP.
7. Protected structures – care and maintenance.
8. Intercultural Operations in flowers and MAP.
9. Harvesting and post harvest handling of cut and loose flowers.
10. Processing of MAP.
11. Visit to commercial flower/MAP unit.

Mode of Evaluation	Internal and External Examination
Recommended by the Board of Studies on	11-06-2019
Date of approval by the Academic Council on	13-07-2019

Course Outcome for AG3543

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Student will become aware about the ornamental plants	2	Emp
CO2	Student will learn about the medicinal and aromatic plants.	2	Emp
CO3	Student will be aware about the training and pruning of ornamental plants	3	Emp, S
CO4	Students will learn about production technology of important medicinal plants	3	Emp, S
CO5	Students will know about processing and value addition in ornamental crops and MAPs produce	3	Emp, S,Ent

CO-PO Mapping for AG3543

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO 1	3	2	2	0	3	2	1	0	1	3	1	1	3	2
CO 2	2	3	3	3	2	2	1	1	3	2	2	1	2	3
CO 3	2	3	3	2	0	1	1	1	2	1	1	1	1	2
CO 4	3	1	2	2	3	0	1	2	3	2	1	2	1	2
CO 5	2	1	3	2	2	0	1	1	2	1	2	1	1	3
Avg.	2.4	2	2.6	1.8	2	1	1	1	2.2	1.8	1.4	1.2	1.6	2.4

AG3545	Title:Rain fed Agriculture and Watershed Management Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Students will be learning about soil and water conservation techniques, to manage crops in rainfed areas and to demonstrate soil moisture conservation and water harvesting structures.	
	List of Experiments	

(Perform any seven experiments)

1.Studies on climate classification

2. Studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons.

3. Studies on cropping pattern of different rainfed areas in the country and demarcation of rainfed area on map of India.

4. Interpretation of meteorological data and scheduling of supplemental irrigation on the basis of evapotranspiration demand of crops.

5. Critical analysis of rainfall and possible drought period in the country, effective rainfall and its calculation.

6. Studies on cultural practices for mitigating moisture stress.

7. Characterization and delineation of model watershed.

8. Field demonstration on soil & moisture conservation measures.

9. Field demonstration on construction of water harvesting structures.

10. Visit to rainfed research station/watershed

Mode of Evaluation	Internal and External Examination
Recommended by the Board of Studies on	11-06-2019
Date of approval by the Academic Council on	13-07-2019

Course Outcome for AG3545

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will learn cropping pattern of different rainfed areas and cultural practices for mitigating moisture stress	3	Emp, S
CO2	Students will understand about different types of climate and rainfall pattern in rainfed areas and pattern of onset and withdrawal of monsoons	3	Emp, S
CO3	Students will learn about the construction of water harvesting structures and characterization and delineation of model watershed	3	Emp, S,
CO4	Students will gain knowledge about construction of water harvesting structures	3	Emp, S, Ent
CO5	Students will understand Characterization of model watershed	3	Emp, S, Ent

CO-PO Mapping for AG3545

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	3	3	2	3	2	2	1	2	2	1	2	2	2
CO 2	2	2	2	2	2	2	1	2	1	1	2	2	2	1
CO 3	3	1	3	1	3	3	0	2	2	2	1	1	3	1
CO 4	3	1	3	1	3	3	1	2	2	2	1	1	3	1
CO 5	3	1	3	1	3	3	1	2	2	2	1	1	3	1
Avg.	2.6	1.6	2.8	1.4	2.8	2.6	1	1.8	1.8	1.8	1.2	1.4	2.6	1.2

AG3546	Title: Protected Cultivation and Secondary Agriculture Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Students will be learning about protected agriculture techniques ,Planning and design of greenhouses, Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation.	
	List of Experiments	

(Perform any seven experiments)

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

Mode of Evaluation	Internal and External Examination
Recommended by the Board of Studies on	11-06-2019
Date of approval by the Academic Council on	13-07-2019

Course Outcome for AG3546

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	To get knowledge about green house technology, types of green houses and construction of green houses	3	Emp, S
CO2	Course will give the knowledge of Green house equipments, materials of construction for traditional and low cost green houses	3	Emp, S
CO3	This course will help the students to learn about Irrigation systems used in greenhouses, shade net house in protected cultivation	3	Emp, S,Ent
CO4	Students will learn to determine moisture content of various grains by oven drying methods	3	Emp, S
CO5	Students would gain knowledge about various equipments/ instruments used in Post Harvest Laboratories	3	Emp, S

CO-PO Mapping for AG3546

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	1	1	2	2	2	2	1	2	2	1	2	2	2
CO 2	2	2	2	2	2	2	0	2	1	1	2	2	2	1
CO 3	2	1	1	1	1	1	0	2	2	2	1	1	1	1
CO 4	3	2	2	2	2	2	3	3	3	3	3	3	3	3
CO 5	2	2	2	2	2	2	0	2	1	1	2	2	2	1
Avg.	2.2	1.6	1.6	1.8	1.8	1.8	1	2	1.8	1.8	1.8	2	2	1.6

AG3547	Title: Soil and Water Conservation Engineering Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites		
Objectives	To teach about fundamental aspects of soil and water conservation engineering To improve the understanding of soil and water dynamics through use of modern technology.	

List of Experiments

(Perform any Seven)

1. General status of soil conservation in India.
2. Calculation of erosion index.
3. Estimation of soil loss.
4. Measurement of soil loss.
5. Preparation of contour maps.
6. Design of grassed water ways.
7. Design of contour bunds.
8. Design of graded bunds.
9. Design of bench terracing system.
10. Problem on wind erosion

Mode of Evaluation	Internal and External Examinations
Recommended by the Board of Studies on	11-06-2019
Date of approval by the Academic Council on	13-07-2019

Course Outcome for AG3547

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students would learn about general status of soil conservation in India, estimation of soil loss and measurement of soil loss	3	Emp, S
CO2	Students would learn about preparation of contour maps	3	Emp, S
CO3	Students would learn about design of contour bunds	3	Emp, S
CO4	Students would learn about design of graded bunds	3	Emp, S
CO5	Students would learn about problem on wind erosion	3	Emp, S

CO-PO Mapping for AG3547

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	2	2	2	3	3	3	3	3	3	3	3
CO 2	3	2	2	2	2	2	3	3	3	3	3	3	3	3
CO 3	3	2	2	2	2	2	3	3	3	3	3	3	3	3
CO 4	2	2	2	2	2	2	0	2	1	1	2	2	2	1
CO 5	2	1	1	1	1	1	0	2	2	2	1	1	1	1
Avg.	2.6	1.8	1.8	1.8	1.8	1.8	1.8	2.6	2.4	2.4	2.4	2.4	2.4	2.2

Semester-6

AG3603	Title:Entrepreneurship Development and Business Communication	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	The main objective is to sharpen students skills and help them manage the business better; it provides them an opportunity to enter into a process which leads to the realization of an individual's passion for innovation and development etc.,	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit 1	Introduction	4
Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs; SWOT Analysis and achievement motivation		
Unit 2	Policy and Skills	5
Government policy and programs and institutions for entrepreneurship development, Impact of economic reforms on Agribusiness/ Agrienterprises, Entrepreneurial Development Process; Business Leadership Skills.		
Unit 3	Skills	6
Developing organizational skill (controlling, supervising, problem solving, monitoring & evaluation), Developing Managerial skills, Business Leadership Skills (Communication, direction and motivation Skills), Problem solving skill/		
Unit 4	Management	5
Supply chain management and Total quality management, Project Planning Formulation and report preparation		
Unit 5	Enterprise	4
Financing of enterprise, Opportunities for agri-entrepreneurship and rural enterprise.		
Text Books	1. Anil Kumar, S., Poornima, S. C., Mini, K., Abraham andJayashree, K. 2003. Entrepreneurship Development. New Age International Publishers, New Delhi 2. Bhaskaran, S. 2014. Entrepreneurship Development & Management. Aman Publishing House, Meerut	
Reference Books	1. Gupta, C.B. 2001. Management: Theory and Practice. Sultan Chand and Sons, New Delhi 2. Indu Grover 2008. Handbook on Empowerment and Entrepreneurship. Agrotech Publishing Academy, Udaipur	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council on	13-07-2019	

Course Outcome for AG3603

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will understand the function of the entrepreneur in the successful, commercial application of innovations	3	Emp, S,Ent
CO2	Students will be aware of different opportunities and successful growth in Business and can improve communication and problem-solving skills, manage strong impulses and feelings	3	Emp, S
CO3	Students should learn organizational skill viz	3	Emp, S,Ent
CO4	Students will gain knowledge to develop and demonstrate competence in basic business and marketing planning and basic knowledge of international business	3	Emp, S,Ent
CO5	Students will gain knowledge on different concepts underlying corporate financial decision making and student also understand different opportunity in agri-business	3	Emp, S,Ent

CO-PO Mapping for AG3603

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	1	0	0	1	1	1	0	1	1	1	1	1	1
CO 2	3	2	2	2	3	2	2	1	2	2	2	2	2	2
CO 3	3	3	3	2	2	2	2	1	3	3	2	2	2	2
CO 4	3	3	3	2	3	3	2	2	3	2	2	2	2	2
CO 5	3	2	2	2	2	2	2	1	2	2	2	2	2	2
Avg.	2.8	2.2	2	1.6	2.2	2	1.8	1	2.2	2	1.8	1.8	1.8	1.8

Subject Code: AG3613	Title: Geoinformatics and Nanotechnology and Precision Farming	L T P C 1 0 0 1
Version No.	1.0	
Course Prerequisites		
Objectives	• To acquaint with GIS software, data creation and editing. • To familiarize with the concepts of precision farming	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Precision agriculture	5
Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture; Geo-informatics-definition, concepts, tool and techniques; their use in Precision Agriculture.		
Unit II	Application of Technologies	6
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.		
Unit III	Global positioning system	5
Global positioning system (GPS), components and its functions; Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs; STCR approach for precision agriculture.		
Unit IV	Nanotechnology	5
Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors, Use of nanotechnology in seed.		
Unit V	Farm Productivity	3
Water, fertilizer, plant protection for scaling-up farm productivity.		
Text Books	1. The Essentials:Understanding Nanoscience and Nanotechnolgy. Pradeep. T. 2007. NANO: Tata McGraw-Hill Publishing Company Limited, New Delhi 2. Text book of Remote sensing and Geographical Information Systems, (3rd edition). Anji Reddy, M. 2006. B.S. Publications, Hyderabad	
Reference Books	1. Remote sensing and image interpretation. Lillesand, T.M. and Kiefer, R. W. 1994. 2. Precision Farming-Soil Fertility and Productivity Aspects K. R. Krishna. Apple Acdemic Press.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for AG3613

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Student would learn about precision agriculture and Geo-informatics- their uses in Precision Agriculture	3	Emp, S
CO2	Student would learn about 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	3	Emp, S
CO3	Student would learn about Global positioning system (GPS), components and its functions; crop Simulation Models and their uses for optimization of Agricultural Inputs; STCR approach for precision agriculture	3	Emp, S,Ent
CO4	Student would learn about nanotechnology- definition, concepts and techniques, nano scale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors	3	Emp, S,Ent
CO5	Student would learn about use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity	3	Emp, S

CO-PO Mapping for AG3613

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	1	1	1	1	1	1	1	1	0	0	0	1	1
CO 2	3	1	1	1	1	1	1	1	1	1	1	1	1	1
CO 3	3	1	2	2	1	1	1	1	1	2	1	1	1	1
CO 4	3	2	2	2	1	1	1	1	1	1	2	2	1	1
CO 5	3	1	2	1	1	2	1	1	1	1	2	2	1	1
Avg.	3	1.2	1.6	1.4	1	1.2	1	1	1	1	1.2	1.2	1	1

AG3606	Title: Diseases of Field and Horticultural Crops and their Management-II	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Students will be able to understand the Symptoms, etiology, disease cycle and management of various field and horticultural crops.	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit 1	Diseases and Management- Wheat	3
Symptoms, etiology, disease cycle and management of following diseases Wheat: rusts, loose smut, karnal bunt, powdery mildew, alternaria blight, and ear cockle; Sugarcane: red rot, smut, wilt, grassy shoot, ratoon stunting and Pokkah Boeng; Sunflower: Sclerotinia stem rot and Alternaria blight.		
Unit 2	Diseases and Management-Mustard	6
Symptoms, etiology, disease cycle and management of following diseases Mustard: Alternaria blight, white rust, downy mildew and Sclerotinia stem rot; Gram: wilt, grey mould and Ascochyta blight; Lentil: rust and wilt; Cotton: anthracnose, vascular wilt, and black arm; Pea: downy mildew, powdery mildew and rust.		
Unit 3	Diseases and Management- Mango	6
Symptoms, etiology, disease cycle and management of following diseases Mango: anthracnose, malformation, bacterial blight and powdery mildew; Citrus: canker and gummosis; Grape vine: downy mildew, Powdery mildew and anthracnose; Apple: scab, powdery mildew, fire blight and crown gall; Peach: leaf curl.		
Unit 4	Diseases and Management- Strawberry	5
Symptoms, etiology, disease cycle and management of following diseases Strawberry: leaf spot Potato: early and late blight, black scurf, leaf roll, and mosaic;Cucurbits: downy mildew, powdery mildew, wilt; Onion and garlic: purple blotch, and Stemphylium blight.		
Unit 5	Diseases and Management- Chillies	4
Symptoms, etiology, disease cycle and management of following diseases Chillies: anthracnose and fruit rot, wilt and leaf curl; Turmeric: leaf spot Coriander: stem gall Marigold: Botrytis blight; Rose: dieback, powdery mildew and black leaf spot.		
Text Books	1.Rangaswami, G & Mahadevan, K. 2001. Diseases of crop plants in India, Prentice Hall of India Pvt.Ltd, New Delhi. 2. Singh, R.S. 2005. Plant Diseases. Oxford & IBH Publications, New Delhi	
Reference Books	1. Pathak, V.N. 2001. Diseases of Fruit crops. Oxford & IBH Publications, New Delhi 2. Singh, R.S. 1999. Diseases of Vegetable crops. Oxford & IBH Publications, New Delhi 3. Chaube, H.S and V.S. Pundhir, 2012. Crop Diseases & Their Management. PHI Pvt.Ltd, New Delhi	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council on	13-07-2019	

Course Outcome for AG3606

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will gain knowledge on important taxonomic characters and symptoms produced by important microorganisms in order to manage them	3	Emp, S
CO2	Students will knowledge on plant disease management by different methods	3	Emp, S
CO3	Students will gain knowledge on different diseases in field and horticultural crops	2	Emp, S
CO4	Students will analyze plant health and provide management solutions to farmers	3	Emp, S
CO5	Students will gain knowledge on diseases of various Field crops and Horticultural crops and to know their management practices	2	Emp, S

CO-PO Mapping for AG3606

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	2	1	2	0	0	3	1	2	1	2	1
CO 2	3	2	2	2	2	3	3	0	1	2	3	1	1	2
CO 3	2	3	3	2	3	2	2	1	2	2	1	2	2	2
CO 4	2	2	2	2	2	2	0	2	1	1	2	1	2	1
CO 5	3	1	3	1	3	3	0	2	2	1	2	2	3	1
Avg.	2.6	2	2.4	1.8	2.2	2.4	1	1	1.8	1.4	2	1.4	2	1.4

AG3608	Title:Problematic Soils and their Management	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Students will gain on soil health/quality and distribution of waste land/problematic soils in India and to acquaint with methods reclamation of various problematic soils with respect to plant growth and utilization of saline water in agriculture.	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit 1	Introduction to Soil and its Problems	4
Soil quality and health, distribution of waste land and problem soils in India and their categorization based on properties.		
Unit 2	Reclamation and Management of different Soil	6
Reclamation and management of Saline and Sodic soils, Acid soils, Acid Sulphate soils, Eroded and Compacted soils, flooded soils, polluted soils inoccurrence classification, formation, diagnosis, characteristics and management.		
Unit 3	Irrigation	4
Irrigation water – quality and standards, utilization of saline water in agriculture.		
Unit 4	Remote Sensing and Land Classification	5
Remote sensing and GIS in diagnosis and management of problem soils. Land capability and classification, land suitability classification.		
Unit 5	Bioremedation	5
Multipurpose tree species, bio remediation through MPTs of soils. Problematic soils under different Agro-ecosystems.		
Text Books	1. IARI, New Delhi. 2012. Fundamentals of Soil Science. Indian Society of Soil Science. 2. Nylec Brady. The Nature and Properties of Soils.	
Reference Books	1. Das, D. K . 2015. Introductory Soil Science. 4th Edition, Kalyani Publishers, New Delhi. 2. Sehgal,J. 2015. A Text Book of Pedology – Concepts and Applications. Kalyani Publishers, New Delhi.	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council on	13-07-2019	

Course Outcome for AG3608

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	By the end of this course students will gain knowledge on basics in soil and its properties with its problem	2	Emp
CO2	By the end of this course students will be able to learn about physical and chemical properties of soil	2	Emp
CO3	By the end of this course students will be able to illustrate the irrigation methods	3	Emp, S
CO4	By the end of this course students will be able to demomstrate the application of remote sensing	3	Emp, S
CO5	By the end of this course students will be able to learn about the soil problems in different agro ecosystem	3	Emp

CO-PO Mapping for AG3608

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	1	1	1	1	3	2	1	2	2	1	1	1	3	2
CO 2	1	1	1	1	3	2	1	2	2	1	1	1	3	2
CO 3	1	1	1	1	3	2	1	2	2	1	1	1	3	2
CO 4	1	1	1	1	3	2	1	2	2	1	1	1	3	2
CO 5	1	1	1	1	3	2	1	2	2	1	1	1	3	2
Avg	1	1	1	1	3	2	1	2	2	1	1	1	3	2

AG3609	Title: Farm Management, Production & Resource Economics	L T P C 1 0 0 1
Version No.	1.0	
Course Prerequisites		
Objectives	To enable students to understand the principles required for the allocation of inputs at the level of individual farms.	
Course Outcome		
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Farm Management	3
Meaning and concept of farm management, objectives and relationship with other sciences. Meaning and definition of farms, its types and characteristics, factor determining types and sizeof farms.		
Unit II	Principles of Farm Management	5
Principles of farm management: concept of production function and its type, use of production function in decision-making on a farm, factor-product, factor-factor and product 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 ofcost in managing farm business and estimation of gross farm income, net farm income, family labour income and farm business income.		
Unit III	Farm Business Analysis	5
Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises. Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain on farm, farm inventory, balance sheet, profit and loss accounts.		
Unit IV	Farm Planning And Budgeting	5
Meaning and importance of farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting-linear programming, appraisal of farm resources, selection of crops and livestock's enterprises. Concept of risk and uncertainty occurs in agriculture production, nature and sources of risks and its management strategies, Crop/livestock/machinery insurance– weather based crop insurance, features, determinants of compensation.		
Unit V	Resource Economics	6
Concepts of resource economics, differences between NRE and agricultural economics, unique properties of natural resources. Positive and negative externalities in agriculture, Inefficiency and welfare loss, solutions, Important issues in economics and management of common property resources of land, water, pasture and forest resources etc.		
Text Books	1. Introduction to Agricultural Economic Analysis. Bishop, C.E. and W. D. Tousaint. 1958. John Wiley and Sons, London. 2. Economics of Agricultural Production and Resource Use. Heady, Earl O. 1964. Prentice Hall of India, Private Limited, New Delhi	
Reference Books	1. S.S. Johl, J.R. Kapur. 2006. Fundamentals of Farm Business Management. 2. Principles of Farm Business Management. Kahlon, A.S. and Karam Singh. 1965. Kalyani Publishers, New Delhi. 3. Economics of Farm Production and Management. Raju, V.T. and D.V.S. Rao. 2006. Oxford & IBH Publishing Co. Pvt. Limited, New Delhi	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	29-07-2020	
Date of approval by the Academic Council	13-07-2019	

Course Outcome For AG3609

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will understand the meaning of Farm management and its relationship with other sciences	2	Emp
CO2	Students will learn Principles and economics of farm management	3	Emp, S
CO3	Students will learn the importance of maintaining farm records and their analysis..	2	Emp
CO4	Students will learn the steps in farm planning and budgeting	3	Emp, Ent
CO5	By the end of this course students will be able to learn about role of economics in farm management	3	Emp, Ent

CO-PO Mapping for AG3609

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	2	1	1	1	1	1	0	1	1	1	1	1	1
CO 2	3	2	2	2	3	2	2	1	2	2	2	2	2	2
CO 3	3	3	3	2	2	2	2	1	3	3	2	2	2	2
CO 4	3	3	3	2	3	3	2	2	3	2	2	2	2	2
CO 5	3	2	2	2	2	2	2	1	2	2	2	2	2	2
Avg.	2.8	2.4	2.2	1.8	2.2	2	1.8	1	2.2	2	1.8	1.8	1.8	1.8

AG3610	Title: Principles of Seed Technology	L T P C 1 0 0 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Students will be able to understand the concepts of seed science and technology and impart training for entrepreneurship in commercial seed production of various crops.	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit 1	Seed Quality	3
Seed and seed technology: introduction, definition and importance. Deterioration causes of crop varieties and their control; Maintenance of genetic purity during seed production, seed quality; Definition, Characters of good quality seed, different classes of seed.		
Unit 2	Seed production in Crops	4
Foundation and certified seed production of important cereals, pulses, oilseeds, fodder and vegetable.		
Unit 3	Seed Certification and Legislation	6
Seed certification, phases of certification, procedure for seed certification, field inspection. Seed Act and Seed Act enforcement. Duty and powers of seed inspector, offences and penalties. Seeds Control Order 1983, Varietal Identification through Grow Out Test and Electrophoresis, Molecular and Biochemical test. Detection of genetically modified crops,Transgene contamination in non-GM crops, GM crops and organic seed production.		
Unit 4	Seed processing and Storage	5
Seed drying, processing and their steps, seed testing for quality assessment, seed treatment, its importance, method of application and seed packing. Seed storage; general principles, stages and factors affecting seed longevity during storage. Measures for pest and disease control during storage.		
Unit 5	Seed Marketing	6
Seed marketing: structure and organization, sales generation activities, promotional media. Factors affecting seed marketing, Role of WTO and OECD in seed marketing. Private and public sectors and their production and marketing strategies.		
Text Books	1. Agarwal, R.L. Seed Technology. 1995. Oxford and IBH Publication Co.,New Delhi. 2. Agarwal, P.K. Principles of Seed technology. 1994. ICAR, New Delhi.	
Reference Books	1. Agarwal, P.K. and Dadlani, M. Techniques in Seed Science and Technology. 1986. South Asian Publishers, New Delhi. 2. Dhirendra Khare and Mohan S. Bhale. Seed Technology. 2007. Scientific Publishers (India), Jodhpur.	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	29-07-2020	
Date of approval by the Academic Council on	13-07-2019	

Course Outcome for AG3610

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	By the end of this course students will be able to recognize and memorise the basic introduction of seed and quality seed parameters	2	Emp
CO2	By the end of this course students will be able to know about seed production methods in different crops.	3	Emp, S
CO3	By the end of this course students will be able to Know about the legislation system related to seed.	2	Emp
CO4	By the end of this course students will be able to know about the storage and processing methods of seed	3	Emp, Ent
CO5	By the end of this course students will be able to learn about marketing of seed.	3	Emp, Ent

CO-PO Mapping for AG3610

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	2	1	1	1	1	1	0	1	1	1	1	1	1
CO 2	3	2	2	2	3	2	2	1	2	2	2	2	2	2
CO 3	3	3	3	2	2	2	2	1	3	3	2	2	2	2
CO 4	3	3	3	2	3	3	2	2	3	2	2	2	2	2
CO 5	3	2	2	2	2	2	2	1	2	2	2	2	2	2
Avg.	2.8	2.4	2.2	1.8	2.2	2	1.8	1	2.2	2	1.8	1.8	1.8	1.8

AG3611	Title: Renewable Energy and Green Technology	L T P C 1 0 0 1
Version No.	1.0	
Course Prerequisites		
Objectives	To familiarize with different forms of bio-energy sources and their contribution in agricultural sectors	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Classification	3
Classification of energy sources, contribution of these of sources in agricultural sector.		
Unit II	Biomass	4
Familiarization with biomass utilization for biofuel production and their application.		
Unit III	Natural Bioenergy Sources	6
Familiarization with types of biogas plants and gasifiers, biogas, bio alcohol, biodiesel and bio oilproduction and their utilization as bio energy resource, introduction of solar energy, collectionand their application.		
Unit IV	Solar Energy	7
Familiarization with solar energy gadgets: solar cooker, solar water heater,application of solar energy: solar drying, solar pond, solar distillation, solar photovoltaic systemand their application.		
Unit V	Wind Energy	4
Introduction of wind energy and their application.		
Text Books	1. Non-conventional Energy Sources. Rai, G.D. 2004. Khanna Publishers, New Delhi. 2. Non-conventional Energy Sources. Rajput, R. K. 2012. S. Chand Publishers.	
Reference Books	1. Principles of Agricultural Engineering. Ojha, T.P. and Michael, A.M Vol. I, Jain Brothers, New Delhi. 2. Alternate Sources of Energy. Rathore, N.S., Mathur, A.N. and Kothari, S. ICAR Publication.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	11-06-2019	
Date of approval by the Academic Council	13-07-2019	

Course Outcome for AG3611

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	To understand the role of renewable sources in agriculture sector	3	Emp, S
CO2	To understand the bio fuel production and their applications in today's world	3	Emp, S
CO3	To understand and utilizing the solar energy in various aspects	3	Emp, S,Ent
CO4	Students will gain practical aspects of utilizing various renewable energy like solar energy, wind energy and other energy efficient technologies, etc	3	Emp, S,Ent
CO5	To gain the knowledge on climate change and disaster management	3	Emp, S

CO-PO Mapping for AG3611

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	2	1	2	0	0	3	1	2	1	2	1
CO 2	3	2	2	2	2	3	3	0	1	2	3	1	1	2
CO 3	2	3	3	2	3	2	2	1	2	2	1	2	2	2
CO 4	2	2	2	2	2	2	0	2	1	1	2	1	2	1
CO 5	3	1	3	1	3	3	0	2	2	1	2	2	3	1
Avg.	2.6	2	2.4	1.8	2.2	2.4	1	1	1.8	1.4	2	1.4	2	1.4

AG3612	Title: Principles of Organic Farming	L T P C 1 0 1 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Students will gain on soil health/quality and distribution of waste land/problematic soils in India and to acquaint with methods reclamation of various problematic soils with respect to plant growth and utilization of saline water in agriculture.	
Unit Nos.	Unit Title	Number of hours (per Unit)
Unit 1	Introduction to Soil and its Problems	2
Organic farming, principles and its scope in India; Initiatives taken by Government (central/state)		
Unit 2	Reclamation and Management of different Soil	3
NGOs and other organizations for promotion of organic agriculture; Organic ecosystemand their concepts		
Unit 3	Irrigation	2
Organic nutrient resources and its fortification; Restrictions to nutrient use in organic farming		
Unit 4	Remote Sensing and Land Classification	2
Choice of crops and varieties in organic farming; Fundamentals of insect, pest, disease and weed management under organic mode of production; Operational structure of NPOP		
Unit 5	Bioremedation	3
Certification process and standards of organic farming; Processing, leveling, economic considerations and viability, marketing and export potential of organic products.		
Text Books		
Reference Books		
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council on	13-07-2019	

Course Outcome for AG3612

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Initiative from Government for organic produce.	3	Emp, S
CO2	Role of NGOs in producing organic products	3	Emp, S, Ent
CO3	Selection of crops and varieties for organic produce	3	Emp
CO4	Certification of organic produce.	3	Emp, S, Ent
CO5	Students get to know about the organic farming practices.	3	Emp, S

CO-PO Mapping for AG3612

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	1	2	2	2	1	1	1	2	3	1	1	1	1
CO 2	3	2	1	2	3	1	1	2	3	3	1	2	2	1
CO 3	3	2	1	2	3	2	2	0	3	2	1	2	2	1
CO 4	2	2	1	2	3	2	2	1	2	3	1	2	1	1
CO 5	3	1	2	1	2	1	2	1	2	2	1	2	2	1
Avg	2.8	1.6	1.4	1.8	2.6	1.4	1.6	1	2.4	2.6	1	1.8	1.6	1

AG3640	Title:Post-harvest Management and Value Addition of Fruits and Vegetables Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Expected Outcome	Students will acquire knowledge on post harvest management tools and novel packaging techniques.	
	List of Experiments	

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

Mode of Evaluation	Internal and External Examination
Recommended by the Board of Studies on	11-06-2019
Date of approval by the Academic Council on	13-07-2019

Course Outcome for AG3640

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students learn about the effect of temperature on quality of produce after harvest	3	Emp, S
CO2	Students will have knowledge about post harvest injuries of fruits and vegetables	2	Emp
CO3	Student will learn the procedure of extracting and preserving pulps and juices and estimation of physico chemical properties of products.	3	Emp, S, Ent
CO4	Students will learn about preparation of jam, jelly, nectar, squash etc.	3	Emp, S, Ent
CO5	Students will become aware about the modern packaging materials and their effects on product.	2	Emp, S, Ent

CO-PO Mapping for AG3640

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	1	0	0	1	1	1	0	1	1	1	1	1	1
CO 2	3	2	2	2	3	2	2	1	2	2	2	2	2	2
CO 3	3	3	3	2	2	2	2	1	3	3	2	2	2	2
CO 4	3	3	3	2	3	3	2	2	3	2	2	2	2	2
CO 5	3	2	2	2	2	2	2	1	2	2	2	2	2	2
Avg.	2.8	2.2	2	1.6	2.2	2	1.8	1	2.2	2	1.8	1.8	1.8	1.8

AG3641	Title: Entrepreneurship Development and Business Communication Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	The main objective is to sharpen students skills and help them manage the business better; it provides them an opportunity to enter into a process which leads to the realization of an individual's passion for innovation and development etc.,	
	List of Experiments	
(Perform any Seven Experiments) 1.Assessing entrepreneurial traits, 2. Problem solving skills, managerial skills and achievement 3. Motivation 4. Exercise in creativity 5. Time audit through planning, monitoring and supervision 6. Identification and selection of business idea 7. Preparation of business plan and proposal writing 8. Visit to entrepreneurship development institute and entrepreneurs		
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council on	13-07-2019	

Course Outcome for AG3641

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Student will learn to assess entrepreneurial traits of entrepreneur	3	Emp, S,Ent
CO2	It will develop student's problem solving skills, managerial skills and entrepreneurial motivation	3	Emp, S,Ent
CO3	Student will learn about time audit through planning, monitoring and supervision which will develop creative skills, like problem-solving, communication and innovation through creative exercise	3	Emp, S
CO4	Students would learn about identification and selection of business idea	3	Emp, S
CO5	Students will be able to prepare a business plan and proposal writing	3	Emp, S,Ent

CO-PO Mapping for AG3641

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	2	1	2	0	0	3	1	2	1	2	1
CO 2	3	2	2	2	2	3	3	0	1	2	3	1	1	2
CO 3	2	3	3	2	3	2	2	1	2	2	1	2	2	2
CO 4	2	2	2	2	2	2	0	2	1	1	2	1	2	1
CO 5	3	1	3	1	3	3	0	2	2	1	2	2	3	1
Avg.	2.8	2	2.4	1.8	2.2	2.4	1	1	1.6	1.4	2	1.4	2	1.4

AG3652	Title: Geoinformatics and Nanotechnology and Precision Farming Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites		
Objectives	• To acquaint with GIS software, data creation and editing. • To familiarize with the concepts of precision farming	

List of Experiments

(Perform any Seven)

1. Introduction to GIS software, spatial data creation and editing.
2. Introduction to image processing software.
3. Visual and digital interpretation of remote sensing images. Generation of spectralprofiles of different objects. Supervised and unsupervised classification and acreage estimation.
4. Multispectral remote sensing for soil mapping. Creation of thematic layers of soil fertility based on GIS.
5. Creation of productivity and management zones.
6. Fertilizer's recommendations based of VRT and STCR techniques.
7. Crop stress (biotic/abiotic) monitoring using geospatial technology.
8. Use of GPS for agricultural survey. Formulation, characterization and applications of nanoparticles in agriculture.
9. Projects formulation and execution related to precision farming.

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	11-06-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome for AG3652

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students would introduce to GIS software, spatial data creation and editing and image processing software	3	Emp, S,Ent
CO2	Students would learn about visual and digital interpretation of remote sensing images	3	Emp, S
CO3	Students would learn to generate spectral profiles of different objects	3	Emp, S
CO4	Students would learn about supervised and unsupervised classification and acreage estimation	3	Emp, S
CO5	Student would learn about fertilizers recommendations based on VRT and STCR techniques and also learn about formulation, characterization and applications of nanoparticles in agriculture	3	Emp, S

CO-PO Mapping for AG3652

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	1	0	0	1	1	1	0	1	1	1	1	1	1
CO 2	3	2	2	2	3	2	2	1	2	2	2	2	2	2
CO 3	3	3	3	2	2	2	2	1	3	3	2	2	2	2
CO 4	3	3	3	2	3	3	2	2	3	2	2	2	2	2
CO 5	3	2	2	2	2	2	2	1	2	2	2	2	2	2
Avg.	2.8	2.2	2	1.6	2.2	2	1.8	1	2.2	2	1.8	1.8	1.8	1.8

AG3643	**Title:Diseases of Field and Horticultural Crops and their Management-II Lab**	**L T P C** **0 0 2 1**
Version No.	**1.0**	
Course Prerequisites	Nil	
Objectives	Students will be able to understand the Symptoms, etiology, disease cycle and management of various field and horticultural crops.	
	List of Experiments	
	1. Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory. 2. Field visit for the diagnosis of field problems. 3. Collection and preservation of plant diseased specimens for herbarium.	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council on	13-07-2019	

Course Outcome for AG3643

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students would learn about the identification, diagnosis and study of different diseases of wheat	3	Emp, S
CO2	Students would learn about the identification, diagnosis and study of different diseases of sugarcane	3	Emp, S
CO3	Students would learn about the identification, diagnosis and study of different diseases of mustard and potato	3	Emp, S
CO4	Students would learn about the identification, diagnosis and study of different diseases of chilies and apple	3	Emp, S
CO5	Students will learn about the diagnosis of field problems during field visits	3	Emp, S

CO-PO Mapping for AG3643

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	2	1	1	2	1	1	2	1	3	1	2
CO 2	3	2	2	1	1	1	2	1	1	1	1	3	1	2
CO 3	3	3	2	2	2	1	2	1	1	2	1	3	1	2
CO 4	3	2	2	1	1	1	2	1	1	1	1	3	2	2
CO 5	3	2	2	1	1	1	2	1	1	2	1	3	2	2
Avg.	3	2.2	2	1.4	1.2	1	2	1	1	1.6	1	3	1.4	2

AG3644	Title:Principle of Seed Science Technology Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Students will be able to understand the concepts of seed science and technology and impart training for entrepreneurship in commercial seed production of various crops.	
	List of Experiments	

(Perform any seven experiments)

1. Seed production in major cereals: Wheat, Rice, Maize, Sorghum, Bajra and Ragi.
2. Seed production in major pulses: Urd, Mung, Pigeonpea, Lentil, Gram, Field bean, pea.
3. Seed production in major oilseeds: Soybean, Sunflower, Rapeseed, Groundnut and Mustard.
4. Seed production in important vegetable crops.
5. Seed sampling and testing: Physical purity, germination, viability, etc.
6. Seed and seedling vigour test.
7. Genetic purity test:
8. Grow out test and electrophoresis.
9. Seed certification: Procedure, Field inspection, Preparation of field inspection report.
10. Visit to seed production farms, seed testing laboratories and seed processing plant.

Mode of Evaluation	Internal and External Examination
Recommended by the Board of Studies on	11-06-2019
Date of approval by the Academic Council on	13-07-2019

Course Outcome for AG3644

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students will learn about the quality parameters of seed	3	Emp, S
CO2	Students will learn about the seed production technology in different crops	3	Emp, S
CO3	Students will learn about the seed processing technology	3	Emp, S,
CO4	Students will be able to understand grow out test and electrophoresis techniques	3	Emp, S, Ent
CO5	Students will be able to understand seed production farms, seed testing laboratories and seed processing plant	3	Emp, S, Ent

CO-PO Mapping for AG3644

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	3	3	2	1	3	3	3	3	2	2	3	3	3
CO 2	3	3	3	2	2	2	3	2	2	3	2	3	2	2
CO 3	3	3	3	2	1	3	3	2	2	3	3	3	2	2
CO 4	3	1	3	1	3	3	0	2	2	2	1	1	3	1
CO 5	3	1	3	1	3	3	0	2	2	2	1	1	3	1
Avg.	3	2.2	3	1.6	2	2.8	1.8	2.2	2.2	2.4	1.8	2.2	2.6	1.8

AG3645	Title: Renewable Energy and Green Technology Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites		
Objectives	To teach about gasifier, bio-fuel, solar light, solar pumping, solar fencing, solar drying, etc.	

List of Experiments

(Perform any Seven)

1. Familiarization with renewable energy gadgets.
2. To study biogas plants,
3. To study gasifier
4. To study the production process of biodiesel
5. To study briquetting machine
6. To study the production
7. To study process of bio-fuels
8. Familiarization with different solar energy gadgets
9. To study solar photovoltaic system: solar light, solar pumping, solar fencing.
10. To study solar cooker
11. To study solar drying system
12. To study solar distillation and solar pond

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	11-06-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome for AG3645

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	To understand the role of renewable sources in agriculture sector	3	Emp, S
CO2	To understand the bio fuel production and their applications in today's world	3	Emp, S
CO3	To understand and utilizing the solar energy in various aspects	3	Emp, S
CO4	Students will have Basic Knowledge about biogas plants	3	Emp, S,Ent
CO5	Students will gain the knowledge about the process of bio-fuels	3	Emp, S

CO-PO Mapping for AG3645

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	1	1	1	2	1	2	2	2	1	1	3	1	1
CO 2	3	3	1	1	2	2	2	1	2	1	2	3	2	2
CO 3	3	1	1	1	2	1	2	1	2	1	2	3	1	2
CO 4	3	1	1	1	2	1	2	1	2	1	1	3	1	1
CO 5	3	1	1	2	1	1	2	0	2	1	2	3	1	1
Avg.	3	1.4	1	1.2	1.8	1.2	2	1	2	1	1.6	3	1.2	1.4

AG3646	Title: Farm Management, Production & Resource Economics Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To enable students to understand the principles required for the allocation of inputs at the level of individual farms.	

List of Experiments

(Perform any Seven)

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

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	11-06-2019
Date of approval by the Academic Council	13-07-2019

Course Outcome for AG3646

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	To understand the role of renewable sources in agriculture sector	3	Emp, S
CO2	To understand the bio fuel production and their applications in today's world	3	Emp, S
CO3	To understand and utilizing the solar energy in various aspects	3	Emp, S
CO4	Students will have Basic Knowledge about biogas plants	3	Emp, S,Ent
CO5	Students will gain the knowledge about the process of bio-fuels	3	Emp, S

CO-PO Mapping for AG3646

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	3	3	2	1	3	3	3	3	2	2	3	1	1
CO 2	3	3	3	2	2	2	3	2	2	3	2	3	2	2
CO 3	3	3	3	2	1	3	3	2	2	3	3	3	1	2
CO 4	3	1	3	1	3	3	0	2	2	2	1	1	1	1
CO 5	3	1	3	1	3	3	0	2	2	2	1	1	1	1
Avg.	3	2.2	3	1.6	2	2.8	1.8	2.2	2.2	2.4	1.8	2.2	1.2	1.4

AG 3648	Title: Principles of Organic Farming Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	The objective is to raise awareness related to the major future prospects of organic farming, provide knowledge about the biofertilizers, diseases, pests through different methods.	
	List of Experiments 1. Visit of organic farms to study the various components and their utilization. 2. Preparation of enrich compost, vermicompost, 3. Bio-fertilizers/bio-inoculants and their quality analysis. 4. Indigenous technology knowledge (ITK) for nutrient. 5. Indigenous technology knowledge (ITK) for insect, pest disease and weed management; 6. Cost of organic production system. 7. Post harvest management; Quality aspect, grading, packaging and handling.	
Mode of Evaluation	Internal and External Examinations	
Recommended by the Board of Studies on	11-06-2019	
Date of approval by the Academic Council on	13-07-2019	

Course Outcome for AG3648

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Initiative from Government for organic produce.	3	Emp, S
CO2	Role of NGOs in producing organic products.	3	Emp, S, Ent
CO3	Selection of crops and varieties for organic produce	3	Emp
CO4	Students will gain the knowledge about the methods of propagation	3	Emp, S, Ent
CO5	Students will be aware about layout and planting of orchard.	3	Emp, S

CO-PO Mapping for AG3648

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	2	2	2	2	2	2	2	2	3	2	2
CO 2	3	2	2	2	1	2	2	2	2	2	1	3	2	1
CO 3	3	1	2	2	1	2	2	1	3	3	1	2	2	2
CO 4	3	2	1	2	1	2	2	2	3	2	2	3	2	1
CO 5	3	1	2	2	1	2	2	1	3	3	1	2	2	2
Avg	3	1.6	1.8	2	1.2	2	2	2.6	2.6	2.6	1.4	2.6	2	1.6