LOYOLA ACADEMY

OLD ALWAL, SECUNDERABAD 500 010 TS

(Autonomous and affiliated to Osmania University)

A "College with Potential for Excellence" by UGC

www.loyolaacademyugpg.ac.in Ph: 040-27862363 / 27860077

SYLLABUS

Of

B.Sc. (Hons.) Agricultural Science & Rural Development

For the Academic Year 2022-2023

DEPARTMENT OF
AGRICULTURAL SCIENCE & RURAL DEVELOPMENT

LOYOLA ACADEMY

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SYLLABUS

of

B.Sc. (Hons.) Agricultural Science & Rural Development

For the Academic Year 2022-2023

Chairman, Board of Studies **Dean of Academics**

Principal

DEPARTMENT OF
AGRICULTURAL SCIENCE & RURAL DEVELOPMENT

LOYOLA ACADEMY DEGREE & PG COLLEGE, ALWAL, SECUNDERABAD 500 010 TS

B.Sc. (Hons) AGRICULTURAL SCIENCE & RURAL DEVELOPMENT (2020-24) (Choice-Based Credit System)

Sem	Course 1	Course 2	Course 3	Course 4	Course 5	Course 6	Course 7	Course 8	Course 9	Course 10	Hr	Cr	
1	General English-1 (3+0) (AECC-1)	VE & PD (2+0) (AECC-2)	Ag. Her. & Fund. of Agronomy (2+1) (Core-1)	Fund. Of Gen.(2+1) (Core – 2)	Fund. Of CropPhysio (1+1) (Core-3)	Intro. to Pl.Pathogens (2+1) (Core-4)	Find. Of Agri.Econo mics(2+0) (Core-5)	Fund. Of Horticulture (1+1) (Core-6)	Rural socio. & Edu. Psych.(2+0) (Core-7)	Elementary Mathematics (2+0) (SEC-1)	29	24	**AECC=2 Core= 7 SEC= 1**
2	General English-2 (3+0) (AECC-3)	IC (2+0) (AECC-4)	Meteorology& Climate change (1+1) (Core-8)	Intro. to Forestry (1+1) (Core-9)	Ag.Microbi ology (1+1) (GE-1)	Fund of Ent-I(2+1) (Core-10)	Fund. Of Soil Sc. (2+1) (Core-11)	Soil & Water Cons.Engg. (1+1) (Core-12)	Agri-Informatics (1+1) (SEC-2)	Fund. Of Pl. BioChem& Biotech(2+1) (Core-13)	32	24	**AECC=2 Core= 6 GE=1**
3	Generic Elective(2+1) (GE-2)	Crop Prod. Tech. 1 (2+1) (Core -14)	Water Mgmt. (1+1) (Core-15)	Fund. of Pl. Breeding (2+1) (Core-16)	Insect Ecology & IPM(1+1) (Core-17)	Farm Mgmt. &Prod.Econo mics(2+1) (Core-18)	Farm Power& Machinery (1+1) (SEC – 2)	Prin.of Food Sc.& Nutrition (2+0) (Core-19)	Prod. Tech. of Veg& Spices (1+1) (Core-20)	Practical Crop Prod -I(0+1) (SEC-3)	32	22	**GE=1 Core=7 SEC=2**
4	Env. Sci. (3+0) (AECC-5)	Crop Prod. Tech. -2 (2+1) (Core-21)	Prin. Of Seed Sc.& IPR(2+1) (Core-22)	Manures, Fert. & SFM (2+1) (Core-23)	Princ. of Pl. Path.(2+0) (Core-24)	Ag. Finance, Cooperation& Marketin(2+1) (Core-25)	Orn.Crops ,Med&Aro.. Pl.&Landsc(1+1)(Core26)	Statistical Methods (1+1) (SEC-4)	Fund. Of Ag. Extn. (2+1) (Core-27)	Micropropaga tion/ ABM (2+1) (DSE-1)	35	27	**AECC=1 Core=7 SEC=1 DSE=1**
5	RainfedAgri. &Watershed Mng(1+1) (Core-28)	Crop Improvement (2+1) (Core-29)	Ent.Devpt.& Busi. Comm. (1+1) (Core-30)	Diseases of Field crops &Mng.(2+1) (Core-31)	IPDM(1+1) (Core-32)	Prod. Tech. Of Fruits & Plan.Crops(1+ 1) (Core-33)	Pests of Crops &stored grains(2+1) (Core-34)	Problematic Soils & their Mngt(1+1) (SEC-5)	Renewable Energy & Green Tech. (1+1) (SEC-6)	Weed Sc./ Soil, Plant, Water & SeedTesting (2+1) (DSE-2)	34	24	**Core=7 SEC=2 DSE=1**
6	Farming Sys & Org. Far (2+1) (Core-35)	Geo Info, NanoTech. & Prec. Far(1+1) (Core-36)	Practical Crop Prod -II(0+1) (SEC-7)	Mngt. of Beneficial Insects (1+1) (Core-37)	Protected Cultivation & Sec. Agri (1+1) (SEC-8)	Livestock & Poultry Mgmt. (2+1) (SEC-9)	Diseases of Hort. Crops (2+1) (Core-38)	Value Add. Of Fruits & Veg. (1+1) (SEC-10)	Comm. Skills & PD (1+1) (SEC-11)	Agri Chem / Comm. Pl. Breeding (2+1) (DSE-3)	33	23	**Core=4 SEC=5 DSE=1**
7	Rural Awareness Works Experience (SEC-12)					Agro-Industrial Attachment (DSE-4)					36	20	**SEC=5 DSE=1**
8	Ag. Experiential Learning Programme (SEC-13)					Ag. Experiential Learning Programme (SEC-14)					36	20	**SEC=2**
Total	**Legend: 1. Ability Enhancement Compulsory Course: 05 2. Generic Elective:02 3. Skill Enhancement Course:18 4. Core:38 5.Discipline Specific Elective:04**										**267**	**184**	

LOYOLA ACADEMY DEGREE & PG COLLEGE, ALWAL, SECUNDERABAD 500 010 TS

B.Sc. (Hons) AGRICULTURAL SCIENCE & RURAL DEVELOPMENT (2022-26) (Choice-Based Credit System)

Sem	Course 1	Course 2	Course 3	Course 4	Course 5	Course 6	Course 7	Course 8	Course 9	Course 10	Hr	Cr	
1	General English-1 (3+0) (AECC-1)	VE & PD (2+0) (AECC-2)	Ag. Her. & Fund. of Agronomy (2+1) (Core-1)	Fund. Of Gen.(2+1) (Core – 2)	Fund. Of CropPhysio (1+1) (Core-3)	Intro. to Pl.Pathogens (2+1) (Core-4)	Find. Of Agri.Economics(2+0) (Core-5)	Fund. Of Horticulture (1+1) (Core-6)	Rural socio. & Edu. Psych.(2+0) (Core-7)	Elementary Mathematics (2+0) (SEC-1)	29	24	**AECC=2 Core= 7 SEC= 1**
2	General English-2 (3+0) (AECC-3)	IC (2+0) (AECC-4)	Meteorology& Climate change (1+1) (Core-8)	Intro. to Forestry (1+1) (Core-9)	Ag.Microbiology (1+1) (GE-1)	Fund of Ent-I(2+1) (Core-10)	Fund. Of Soil Sc. (2+1) (Core-11)	Soil & Water Cons.Engg. (1+1) (Core-12)	Agri-Informatics (1+1) (SEC-2)	Fund. Of Pl. BioChem& Biotech(2+1) (Core-13)	32	24	**AECC=2 Core= 6 GE=1**
3	Generic Elective(2+1) (GE-2)	Crop Prod. Tech. 1 (2+1) (Core -14)	Water Mgmt. (1+1) (Core-15)	Fund. of Pl. Breeding (2+1) (Core-16)	Insect Ecology & IPM(1+1) (Core-17)	Farm Mgmt. &Prod.Economics(2+1) (Core-18)	Farm Power& Machinery (1+1) (SEC – 2)	Prin.of Food Sc.& Nutrition (2+0) (Core-19)	Prod. Tech. of Veg& Spices (1+1) (Core-20)	Practical Crop Prod -I(0+1) (SEC-3)	32	22	**GE=1 Core=7 SEC=2**
4	Env. Sci. (3+0) (AECC-5)	Crop Prod. Tech. -2 (2+1) (Core-21)	Prin. Of Seed Sc.& IPR(2+1) (Core-22)	Manures, Fert. & SFM (2+1) (Core-23)	Princ. of Pl. Path.(2+0) (Core-24)	Ag. Finance, Cooperation& Marketin(2+1) (Core-25)	Orn.Crops ,Med&Aro.. Pl.&Landsc(1+1)(Core26)	Statistical Methods (1+1) (SEC-4)	Fund. Of Ag. Extn. (2+1) (Core-27)	Micropropagation/ ABM (2+1) (DSE-1)	35	27	**AECC=1 Core=7 SEC=1 DSE=1**
5	RainfedAgri. &Watershed Mng(1+1) (Core-28)	Crop Improvement (2+1) (Core-29)	Ent.Devpt.& Busi. Comm. (1+1) (Core-30)	Diseases of Field crops &Mng.(2+1) (Core-31)	IPDM(1+1) (Core-32)	Prod. Tech. Of Fruits & Plan.Crops(1+1) (Core-33)	Pests of Crops &stored grains(2+1) (Core-34)	Problematic Soils & their Mngt(1+1) (SEC-5)	Renewable Energy & Green Tech. (1+1) (SEC-6)	Weed Sc./ Soil, Plant, Water & SeedTesting (2+1) (DSE-2)	34	24	**Core=7 SEC=2 DSE=1**
6	Farming Sys & Org. Far (2+1) (Core-35)	Geo Info, NanoTech. & Prec. Far(1+1) (Core-36)	Practical Crop Prod -II(0+1) (SEC-7)	Mngt. of Beneficial Insects (1+1) (Core-37)	Protected Cultivation & Sec. Agri (1+1) (SEC-8)	Livestock & Poultry Mgmt. (2+1) (SEC-9)	Diseases of Hort. Crops (2+1) (Core-38)	Value Add. Of Fruits & Veg. (1+1) (SEC-10)	Comm. Skills & PD (1+1) (SEC-11)	Agri Chem / Comm. Pl. Breeding (2+1) (DSE-3)	33	23	**Core=4 SEC=5 DSE=1**
7	Rural Awareness Works Experience (SEC-12)					Agro-Industrial Attachment (DSE-4)					36	20	**SEC=5 DSE=1**
8	Ag. Experiential Learning Programme (SEC-13)					Ag. Experiential Learning Programme (SEC-14)					36	20	**SEC=2**
Total	**Legend: 1. Ability Enhancement Compulsory Course: 05 2. Generic Elective:02 3. Skill Enhancement Course:18 4. Core:38 5.Discipline Specific Elective:04**										**267**	**184**	

YEAR-WISE AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS
B.Sc. (Hons.) AGRICULTURAL SCIENCE & RURAL DEVELOPMENT
FIRST SEMESTER
ACADEMIC YEAR-2022-23 OF 2022-26 BATCH (CBCS)

Sl. No.	Part	Subject Code	Title of the Subject	Hours/ week	Duration of Exam (hrs.)	Marks			Credits
						Internal	External	Total	
THEORY									
1	I	EN18101	General English – I (AECC-1)	3	3	40	60	100	3
2	I	VE18101	Value Education & Personality Development (AECC-2)	2	3	40	60	100	2
3	II	AG18101	Fundamentals of Agronomy & Agricultural Heritage (Core-1)	2	3	40	60	100	2
4	II	AG18102	Fundamentals of Genetics (Core-2)	2	3	40	60	100	2
5	II	AG19103	Fundamentals of Crop Physiology (Core-3)	1	3	40	60	100	1
6	II	AG18104	Introduction to Plant Pathogens (Core-4)	2	3	40	60	100	2
7	II	AG18105	Fundamentals of Agricultural Economics (Core-5)	2	3	40	60	100	2
8	II	AG18106	Fundamentals of Horticulture (Core-6)	1	3	40	60	100	1
9	II	AG19107	Rural Sociology & Educational Psychology (Core-7)	2	3	40	60	100	2
10	II	AG19108	Elementary Mathematics (SEC-1)	2	3	40	60	100	2
PRACTICALS									
11	II	AG18109	Fundamentals of Agronomy & Agricultural Heritage (Core-1)	2	3	40	60	100	1
12	II	AG18110	Fundamentals of Genetics (Core-2)	2	3	40	60	100	1
13	II	AG19111	Fundamentals of Crop Physiology (Core-3)	2	3	40	60	100	1
14	II	AG18112	Introduction to Plant Pathogens (Core-4)	2	3	40	60	100	1
15	II	AG18113	Fundamentals of Horticulture (Core-6)	2	3	40	60	100	1
Total				**29**		600	900	1500	**24**

* Ability Enhancement Compulsory Course (AECC)

Bridge course : Agricultural Botany

YEAR-WISE AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS
B.Sc. (Hons.) AGRICULTURAL SCIENCE & RURAL DEVELOPMENT
SECOND SEMESTER
ACADEMIC YEAR-2022-23 OF 2022-26 BATCH (CBCS)

Sl. No.	Part	Subject Code	Title of the Subject	Hours/ week	Duration of Exam (hrs.)	Marks			Credits
						Internal	External	Total	
THEORY									
1	I	EN18201	General English – II (AECC-3)	3	3	40	60	100	3
2	I	IC19201	Indian Heritage &Culture (AECC-4)	2	2	40	60	100	2
3	II	AG18201	Meteorology & Climate Change (Core-8)	1	3	40	60	100	1
4	II	AG18202	Introduction to Forestry (Core-9)	1	3	40	60	100	1
5	II	AG18203	Agricultural Microbiology (GE-1)	1	3	40	60	100	1
6	II	AG18204	Fundamentals of Entomology (Core-10)	2	3	40	60	100	2
7	II	AG19205	Fundamentals of Soil Science (Core-12)	2	3	40	60	100	2
8	II	AG18206	Soil and water conservation Engineering (Core-13)	1	3	40	60	100	1
9	II	AG19207	Agricultural Informatics (SEC-2)	1	3	40	60	100	1
10	II	AG18208	Fundamentals of Plant Bio Chem.& Bio Tech(Core-11)	2	3	40	60	100	2
PRACTICALS									
11	II	AG18209	Meteorology & Climate Change (Core-8)	2	3	40	60	100	1
12	II	AG18210	Introduction to Forestry (Core-9)	2	3	40	60	100	1
13	II	AG18211	Agricultural Microbiology (GE-1)	2	3	40	60	100	1
14	II	AG18212	Fundamentals of Entomology (Core-10)	2	3	40	60	100	1
15	II	AG19213	Fundamentals of Soil Science(Core-12)	2	3	40	60	100	1
16	II	AG18214	Soil and water conservation Engineering (Core-12)	2	3	40	60	100	1
17	II	AG19215	Agri-Informatics(SEC-2)	2	3	40	60	100	1
18	II	AG18216	Fundamentals of Plant Bio Chem.& Bio Tech(Core-11)	2	3	40	60	100	1
19	III	PL18001	PLANET * (Outreach)						1
Total				**32**		720	1080	1800	**24**

* Ability Enhancement Compulsory Course (AECC) * Generic Elective (GE)
* Skill Enhancement Course (SEC)
* Programme of Loyola Academy for Neighborhood Empowerment & Transformation (PLANET)

YEAR-WISE AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS
B.Sc. (Hons.) AGRICULTURAL SCIENCE & RURAL DEVELOPMENT
THIRD SEMESTER
ACADEMIC YEAR-2022-23 OF 2021-25 BATCH (CBCS)

Sl. No.	Part	Subject Code	Title of the Subject	Hours/ week	Duration of Exam (hrs.)	Marks			Credits
						Internal	External	Total	
THEORY									
1	II	G19AG1T	Generic Elective (GE-2) (ID)	2	3	40	60	100	2
2	II	AG19301	Crop Production – I (Kharif crops) (Core-14)	2	3	40	60	100	2
3	II	AG19302	Water Management (Core-15)	1	3	40	60	100	1
4	II	AG19303	Fundamentals of Plant Breeding (Core-16)	2	3	40	60	100	2
5	II	AG20304	Insect Ecology & IPM (Core-17)	2	3	40	60	100	2
6	II	AG19305	Farm Management & Production Economics (Core-18)	2	3	40	60	100	2
7	II	AG19306	Farm Power & Machinery (Core-19)	1	3	40	60	100	1
8	II	AG19307	Prin. Of Food Science. & Nutrition (Core-21)	2	3	40	60	100	2
9	II	AG19308	Production Technology of Vegetables & Spices (Core-20)	1	3	40	60	100	1
PRACTICALS									
10	II	G19AG1P	Generic Elective (GE-2) (ID)	2	3	40	60	100	1
11	II	AG19309	Crop Production – I (Kharif crops) (Core-15)	2	3	40	60	100	1
12	II	AG19310	Water Management (Core-16)	2	3	40	60	100	1
13	II	AG19311	Fundamentals of Plant Breeding (Core-17)	2	3	40	60	100	1
14	II	AG 19312	Insect Ecology & IPM (Core-17)	2	3	40	60	100	1
15	II	AG19313	Farm Management & Production Economics (Core-19)	2	3	40	60	100	1
16	II	AG19314	Farm Power & Machinery (SEC-2)	2	3	40	60	100	1
17	II	AG19315	Production Technology of Vegetables & Spices (Core-21)	2	3	40	60	100	1
18	II	AG19316	Practical Crop Production (SEC-1)	2	3	40	60	100	1
Total				**31**			1020	1700	**23**

* Generic Elective (GE) *Inter-Departmental/Inter-Disciplinary (ID)

YEAR-WISE AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS B.Sc. (Hons.)
AGRICULTURAL SCIENCE & RURAL DEVELOPMENT
FOURTH SEMESTER
ACADEMIC YEAR-2022-23 OF 2021-25 BATCH (CBCS)

Sl. No.	Part	Subject Code	Title of the Subject	Hours/ week	Duration of Exam (hrs.)	Marks			Credits
						Internal	External	Total	
THEORY									
1	I	ES18201	Environmental Studies & Gender Sensitization **(AECC-5)**	3	3	40	60	100	3
2	II	AG19401	Crop Production.-II(Rabi crops) (Core-22)	2	3	40	60	100	2
3	II	AG19402	Prin. Of Seed Tech& IPR (Core-23)	2	3	40	60	100	2
4	II	AG19403	Manures, Fertilizers & SFM (Core-24)	2	3	40	60	100	2
5	II	AG19404	Prin. Of Pl. Pathology(Core-25)	2	3	40	60	100	2
6	II	AG19405	Agricultural-Finance, Cooperation. & Marketing. (Core-26)	2	3	40	60	100	2
7	II	AG19406	Production technolgy for Ornamental. Crops, MAP & Landscaping (Core-27)	1	3	40	60	100	1
8	II	AG19407	Statistical Methods(SEC-4)	1	3	40	60	100	1
9	II	AG19408	Fund. Of Agricultural Extension education (Core-28)	2	3	40	60	100	2
10	II	AG21510 A	Micro-Propagation (DSE-1)	2	3	40	60	100	2
		AG19409 B	Agri Business Management & E.D (DSE-1)						
PRACTICALS									
11	II	AG19410	Crop Production.-II (Rabi crops) (Core-22)	2	3	40	60	100	1
12	II	AG19411	Prin. Of Seed Tech & IPR (Core-23)	2	3	40	60	100	1
13	II	AG19412	Manures, Fertilizers & SFM (Core-24)	2	3	40	60	100	1
15	II	AG19413	Agri-Finance,Cooperation .& Marketing (Core-26)	2	3	40	60	100	1
16	II	AG19414	Production technology for Ornamental. Crops, MAP & Landscaping (Core-27)	2	3	40	60	100	1
17	II	AG19415	Statistical Methods(SEC-4)	2	3	40	60	100	1
18	II	AG19416	Fund. Of Agricultural Extension Education(Core-28)	2	3	40	60	100	1
19	II	AG21520 A	Micro-Propagation (DSE-1)	2	3	40	60	100	1
		AG19417 B	Agri- Business Management & E.D (DSE-1)						
Total				**35**			1140	1900	**27**

* Ability Enhancement Compulsory Course (AECC) *Skill Enhancement Course (SEC)
*Discipline-Specific Elective (DSE) Add on course : Agri waste Management

YEAR-WISE AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS B.Sc. (Hons.) AGRICULTURAL SCIENCE & RURAL DEVELOPMENT

FIFTH SEMESTER
ACADEMIC YEAR-2022-23 OF 2020-24 BATCH (CBCS)

Sl. No.	Part	Subject Code	Title of the Subject	Hours/ week	Duration of Exam (hrs.)	Marks			Credits	
						Internal	External	Total		
1	II	AG20501	Rainfed Agriculture.& Watershed Management (Core-29)	1	3	40	60	100	1	
2	II	AG20502	Crop Improvement –I Kharif crops (Core-30)	2	3	40	60	100	2	
3	II	AG20503	Entrepreneurship .Devpt. & Business. Communication. (Core-31)	1	3	40	60	100	1	
4	II	AG20504	Diseases of Field crops , Horticultural crops & their Management. (Core-32)	2	3	40	60	100	2	
5	II	AG20505	Principles of IPDM (Core-33)	1	3	40	60	100	1	
6	II	AG20506	Prod. Tech. Of Fruits & Plantation. Crops (Core-34)	1	3	40	60	100	1	
7	II	AG20507	Pests of Crops, stored grains & Their Management (Core-35)	2	3	40	60	100	2	
8	II	AG20508	Problematic Soils & their Management (Core 36)	1	3	40	60	100	1	
9	II	AG20509	Renewable Energy & Green Technology. (Core-37)	1	3	40	60	100	1	
10	II	AG20510 A	Weed Science.& their Management (DSE-2)	2	3	40	60	100	2	
		AG22510 B	Soil, water, Plant and Seed Testing (DSE-2)							
PRACTICALS										
11	II	AG20511	Rainfed Agriculture.& Watershed Management (Core-29)	2	3	40	60	100	1	
12	II	AG20512	Crop Improvement –I Kharif crops (Core-30)	2	3	40	60	100	1	
13	II	AG20513	Entrepreneurship .Devpt. & Business. Communication. (Core-31)	2	3	40	60	100	1	
14	II	AG20514	Diseases of Field crops , Horticultural crops & their Management. (Core-32)	2	3	40	60	100	1	
15	II	AG20515	Principles ofIPDM (Core-33)	2	3	40	60	100	1	
16	II	AG20516	Prod. Tech. Of Fruits & Plantation. Crops (Core-34)	2	3	40	60	100	1	
17	II	AG20517	Pests of Crops, stored grains & Their Management (Core-35)	2	3	40	60	100	1	
18	II	AG20518	Problematic Soils & their Management (Core 36)	2	3	40	60	100	1	
19	II	AG20519	Renewable Energy & Green Technology. (Core-37)	2	3	40	60	100	1	
20	II	AG20520 A	Weed Science.& their Management (DSE-2)	2	3	40	60	100	1	
		AG22520 B	Soil, Water, Plant and Seed Testing (DSE-2)							
Total				**34**		560	840	1400	**24**	

YEAR-WISE AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS B.Sc. (Hons.) AGRICULTURAL SCIENCE & RURAL DEVELOPMENT

SIXTH SEMESTER
ACADEMIC YEAR-2022-23 OF 2020-24 BATCH (CBCS)

Sl. No.	Part	Subject Code	Title of the Subject	Hours/ week	Duration of Exam (hrs.)	Marks			Credits
						Internal	External	Total	
1	II	AG20601	Farming Systems and Organic farmingFor Sustainable Agriculture (Core 38)	2	3	40	60	100	2
2	II	AG20602	Geo-informatics and Nano technologyFor Precision Farming (SEC -4)	1	3	40	60	100	1
3	II	AG20603	Management of Beneficial insects (Core 39)	1	3	40	60	100	1
4	II	AG18604	Protected Cultivation & Secondary Agriculture (Core - 40)	1	3	40	60	100	1
5	II	AG20605	Livestock, poultry and fisheries management (Core 41)	2	3	40	60	100	2
6	II	AG20606	Diseases of Horticulture crops - II & their Management. (Core-42)	2	3	40	60	100	2
7	II	AG20607	Post harvest Management & VA of Fruits and Vegetables. (SEC-6)	1	3	40	60	100	1
8	II	AG20608	Comm. skills and Personality. Development. (SEC-7)	1	3	40	60	100	1
9	II	AG19609 A	Agri chemicals (DSE-3)	2	3	40	60	100	2
		AG20609 B	Commercial Plant Breeding (DSE-3)						
PRACTICALS									
10	II	AG20610	Farming Systems and Organic farming For Sustainable Agriculture (Core 38)	2	3	40	60	100	1
11	II	AG20611	Geo-informatics and Nano technology For Precision Farming (SEC -4)	2	3	40	60	100	1
12	II	AG20612	Practical crop production -II (Rabi Crops) (SEC-5)	2	3	40	60	100	1
13	II	AG20613	Management of Beneficial insects (Core 39)	2	3	40	60	100	1
14	II	AG18614	Protected Cultivation & Secondary Agriculture (Core - 40)	2	3	40	60	100	1
15	II	AG20615	Livestock, poultry and fisheries management (Core 41)	2	3	40	60	100	1
16	II	AG20616	Diseases of Horticulture crops-II & their Management. (Core 42)	2	3	40	60	100	1
17	II	AG20617	Post harvest Management &VA of fruitsand vegetables . (SEC-6)	2	3	40	60	100	1
18	II	AG20618	Comm. skills and Personality. Development. (SEC-7)	2	3	40	60	100	1
19	II	AG19619 A	Agri chemicals (DSE-3)	2	3	40	60	100	1
		AG20619 B	Commercial Plant Breeding (DSE-3)						
Total				**33**		560	840	1400	**23**

YEAR-WISE AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS
B.Sc. (Hons.) AGRICULTURAL SCIENCE & RURAL DEVELOPMENT
SEVENTH SEMESTER
ACADEMIC YEAR-2022-23 OF 2019-23 BATCH (CBCS)

SECTION -A

Sl. No.	Part	Subject Code	Title of the Subject	Hours/ week	Duration of Exam (hrs.)	Marks			Credits
						Internal	External	Total	
1	II	AG18701	Rural Agricultural Work experience Program (SEC-5,6,7,8,& 9)	18	3	40	60	100	12
2		AG18702	Industry Internship (DSE-4)	12	3	40	60	100	8
				30		80	120	200	**20**

SECTION –B

Sl. No.	Part	Subject Code	Title of the Subject	Hours/ week	Duration of Exam (hrs.)	Marks			Credits
						Internal	External	Total	
1	II		Agricultural Experiential LearningProgramme (AELP)(DSE-5)	30	3	40	60	100	20
		AG 18803A	1. Mushroom cultivation Technology						
		AG 18803B	2. Raising of Commercial Nursery						
		AG 18803C	3.Vermi-Composting						
		AG 18803D	4.Organic Production Technology						
		AG 18803E	5.Food Processing						
				30		80	120	200	**20**

Self learning course : Agricultural Development Schemes In India

YEAR-WISE AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS
B.Sc. (Hons.) AGRICULTURAL SCIENCE & RURAL DEVELOPMENT
EIGTH SEMESTER
ACADEMIC YEAR-2022-23 OF 2019-23 BATCH (CBCS)

SECTION-A

Sl. No.	Part	Subject Code	Title of the Subject	Hours/ week	Duration of Exam (hrs.)	Marks			Credits
						Internal	External	Total	
1	II		Agricultural Experiential LearningProgramme (AELP)(DSE-5)	30	3	40	60	100	20
		AG 18803A	1.Mushroom cultivation Technology						
		AG 18803B	2.Raising of Commercial Nursery						
		AG 18803C	3.Vermi-Composting						
		AG 18803D	4.Organic Production Technology						
		AG 18803E	5.Food Processing						
				30		80	120	200	**20**

SECTION -B

Sl. No.	Part	Subject Code	Title of the Subject	Hours/ week	Duration of Exam (hrs.)	Marks			Credits
						Internal	External	Total	
1	II	AG18801	Rural Agricultural Work experience Program (SEC-5,6,7,8,& 9)	18	3	40	60	100	12
2	II	AG18802	Industry Internship (DSE-2) /	12	3	40	60	100	8
				30		80	120	200	**20**

YEAR-WISE AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS B.Sc. (Hons.) AGRICULTURAL SCIENCE & RURAL DEVELOPMENT FIRST SEMESTER ACADEMIC YEAR-2022-23 OF 2022-26 BATCH (CBCS)									
Sl. No.	**Part**	**Subject Code**	**Title of the Subject**	**Hours/ week**	**Duration of Exam (hrs.)**	**Marks**			**Credits**
						Internal	**External**	**Total**	
THEORY									
1	I	EN18101	General English – I (AECC-1)	3	3	40	60	100	3
2	I	VE18101	Value Education & Personality Development (AECC-2)	2	3	40	60	100	2
3	II	AG18101	Fundamentals of Agronomy & Agricultural Heritage (Core-1)	2	3	40	60	100	2
4	II	AG18102	Fundamentals of Genetics (Core-2)	2	3	40	60	100	2
5	II	AG19103	Fundamentals of Crop Physiology (Core-3)	1	3	40	60	100	1
6	II	AG18104	Introduction to Plant Pathogens (Core-4)	2	3	40	60	100	2
7	II	AG18105	Fundamentals of Agricultural Economics (Core-5)	2	3	40	60	100	2
8	II	AG18106	Fundamentals of Horticulture (Core-6)	1	3	40	60	100	1
9	II	AG19107	Rural Sociology & Educational Psychology (Core-7)	2	3	40	60	100	2
10	II	AG19108	Elementary Mathematics (SEC-1)	2	3	40	60	100	2
PRACTICALS									
11	II	AG18109	Fundamentals of Agronomy & Agricultural Heritage (Core-1)	2	3	40	60	100	1
12	II	AG18110	Fundamentals of Genetics (Core-2)	2	3	40	60	100	1
13	II	AG19111	Fundamentals of Crop Physiology (Core-3)	2	3	40	60	100	1
14	II	AG18112	Introduction to Plant Pathogens (Core-4)	2	3	40	60	100	1
15	II	AG18113	Fundamentals of Horticulture (Core-6)	2	3	40	60	100	1
Total				**29**		600	900	1500	**24**

* Ability Enhancement Compulsory Course (AECC)

GENERAL ENGLISH -I

Credits : 3 **Semester: I**
Subject Code : EN18101 **No.of lecture hours: 45**

Objective:

- To enhance the learners' communication skills by giving adequate exposure in reading, writing, listening and speaking skills and the related sub-skills.
- To develop oral and written communicative skills among the students so that their employability enhances and English becomes the medium of their livelihood and personality.

Outcome: Students will be able to improve on the usage & application of new words & phrases, especially new terminology. Identify and implement new linguistic skills and communication skills through role play and group discussion and improve language in a holistic way through application, differentiation, organization and creation of their own composition in writing skills.

Unit 1 Wit and Humor **9**

From the text "A Tea Party" by Ruth Prawer Jhabvala

- Explanation of the text 2
- Grammar----Nouns, Articles 2
- Vocabulary---Homonyms, homophones, homographs 2
- Writing Skill--- Note- Making 2
- Speaking Skill – Note-Making 1

Unit 2 Risk Management **9**

From the text "Deadly Factory Fires in India."
Explanation of the text 2

- Grammar----Tenses – The Present Tense 2
- Vocabulary ---Synonyms 2
- Writing Skill--- Information Transfer 2
- Speaking Skill--- 1

UNIT 3 Human Values **9**

From the text" India's Contribution to World Unity"

- Explanation of the text 2
- Grammar--- Tenses- The Past Tense 2
- Vocabulary ---- Adjective and Adverb Suffixes 2
- Writing Skill--- Formal Letters. Curriculum Vitae 2
- Speaking Skill--- JAM 1

UNIT 4 The Cyber Age **9**

From the text "Polymer Bank Notes"

- Explanation of the text 2
- Grammar----Concord or Subject Verb Agreement 2
- Vocabulary -----Word Formation. Collocations. 2
- Writing Skill---- References and Bibliographies. 2
- Speaking Skill--- Presentations 1

UNIT 5 Sports **9**

From the text "Sachin Tendulkar"

- Explanation of the text 2
- Grammar------Adjectives, Comparison of Adjectives 2
- Vocabulary—Common Errors, Commonly Mispelt Words, Commonly Confused Words 2
- Writing Skill- Technical Reports, Project Reports 2
- Speaking Skill----Group Discussions 1

Text Book

Skills Annexe – Functional English for Success. Orient Black Swan.

REFERENCE

1. Balasubramaniam, M. 1985. *Business Communication*. Vani Educational Books, New Delhi.
2. Krishna Mohan and Meera Banerjee, 1990. *Developing Communication Skills*. Macmillan India Ltd. New Delhi.
3. Krishnaswamy. N. and Sriraman, T. 1995. *Current English for Colleges*. Macmillan India Ltd. Madras
4. Narayanaswamy, V.R. 1979. *Strengthen Your Writing*. Orient Longman, New Delhi
5. Sharma, R.C. and Krishna Mohan. 1978. *Business Correspondence*. Tata McGraw-Hill Publishing Co., New Delhi.

VALUE EDUCATION & PERSONALITY DEVELOPMENT

Credits : 2 **Semester: I**
Subject Code : VE18001 **No.of lecture hours: 30**

Objective:
Outcome: Students will be able to share incorporate and synthesize sound values like love, sharing, integrity, concern and respect for others.

UNIT- I **6**

INTRODUCTION TO ETHICS
- Why Value Education?
- Reasons to have Ethics for Life
- Accepted Norms and Counter Values
- Dimensions of Human Development: Physical, Intellectual, Emotional, Moral, Spiritual and Social

UNIT-II **6**

APPROACH TO LIFE
- Conscience and Pseudo-Conscience
- Happiness as Life-goal
- Values revealed and lived in Religions
- Experience of God
- Love: The three components of Love
- Some of the basic stages and issues of Life: Family, Love, Sex, Marriage

UNIT-III **6**

CONCERN FOR OTHERS
- Self and Another
- Human Context
- Moral Problems of a Society / True Society : Social Desire, Social Fear, Social Silence, Social Indifference

UNIT-IV **6**

TRANSFORMATION OF SELF
- Definitions of personality
- Characteristics of personality
- Elements of personality
- Traits of good personality
- Self-Identity, self concept
- Self-Discovery, self-acceptance
- Self-Esteem

WORK SHEET (1): Self Estimation

UNIT-V **No of hours: 6**

LIFE ENRICHMENT SKILLS

- Purpose of life - Goal setting
- Characteristics of Goals
- Building Relationships
- Time Management
- Stress Management
- Emotional Management
- Conflict Management
- Team Management (Group Dynamics)

WORK SHEETS (1) & (2): 1) Anger Management
2) Team Management

TEXT BOOKS:

1. Human Values - Development Programme - AIACHE
2.In Harmony

FUNDAMENTALS OF AGRONOMY & AGRICULTURAL HERITAGE

Credits : 2 **Semester: I**
Subject Code : AG18101 **No.of lecture hours: 30**

Objective: To impart knowledge on Agricultural Heritage & Fundamentals of Agronomy

Outcome: Students will be able to gain knowledge on Agricultural Heritage and various concepts of agronomy, various agro-climatic zones of India, Telangana and Andhra Pradesh.

Course Outcomes:

- Classify agroclimatic zones of India and Telangana, explain various methods of sowing and tillage.
- List of various methods of weed control and irrigation
- Classify manures and fertilizers and explain plant ideotypes
- Explain various practices of indigenous technology
- Describe agricultural heritage, different civilizations and history of agriculture development

UNIT-I **6Hrs**

- Definition of Agriculture-Meaning and Scope of Agronomy. 1
- Agro climatic zones of India- Soils, land use pattern, major sources of irrigation and ground water potential. 1
- Agro climatic zones of Telangana- Soils, land use pattern, major sources of irrigation and ground water potential. 1
- Tillage and tilth- Objectives of tillage- characteristic of ideal seed bed- Effect of tillage on soil properties-pore space, structure bulk density, particle density and colour of the soil. 1
- Types of tillage-preparatory tillage- factors effecting preparatory cultivation, after cultivation, puddling. 1
- Sowing- methods of sowing- time and depth of sowing for major agricultural crops- Cereals, Pulses and Oil seeds. 1

UNIT-II **6Hrs**

- Crop Stand establishment- Factors effecting optimum stand establishment. 1
- Crop density – Planting geometry – Competition – Types of competition, intra and inter plant competition- 1
- plant population- effect of plant population on growth and yield- Optimum plant density and planting pattern. 1
- Soil fertility- soil fertility and soil productivity – fertility losses- maintenance of soil fertility- soil organic matter- uses of organic matter. 1
- Weed Control-Definition of weed-losses and uses of weeds- weed influence on crop production-methods of weed control. 1
- Irrigation management – importance of irrigation- Objectives of irrigation-methods of irrigation- drainage and its advantage. 1

UNIT-III **6Hrs**

- Crop nutrition- Essential elements – Importance of major , secondary and micro nutrients. 1
- Manures and fertilizers- Classification – Nutrient content- Nutrient use efficiency – Factors effecting nutrient use efficiency. 1
- Growth and development of crops- factors effecting growth and development. 1
- Plant ideotypes- Characteristics of ideal ideotypes of crops – adaptation and distribution- Definition and principles of crop rotation- cropping systems- mixed , inter , relay, ratoon, sequence and multi stored cropping – sole cropping. 1
- Crop management technologies in problematic areas. 1
- Harvest maturity symptoms – Harvesting and threshing of major agricultural crops. 1

UNIT- IV **6Hrs**

- Agricultural heritage- Introduction- Early history: Archeological and historical facts, Geology of Indian subcontinent. Development of human culture- Stone age- Bronze age- Iron age- and beginning of agriculture. 1
- Indus civilization – vedic civilization- Current debate – Civilization in other parts of India- Developments in Agriculture. Status of farmers in society- advice by Sages to kings on their duties towards farmers. 1
- Kautilya's Artha- Sastra, agriculture, animal husbandry , commodity trade etc.,- features of village. 1
- Agriculture and telugu literature. 1
- Astronomy- Prediction of monsoon rains, Parashara, Varahamithra, Panchanga, comparison with modern methods. 1
- Soil classification- maintenance of soil productivity, water management- water harvesting- storage-distribution and relevance to modern agriculture. 1

UNIT-V **6Hrs**

- Plant protection-(ITK)- harvesting- threshing and storage. 1
- Crops- indigenous and introduced- history of rice, sugarcane and cotton. 1
- Gardening in ancient and medieval period- arbori horticulture- orchards, vegetable farming- floriculture-perfumes. 1
- Heritage of medicinal plants and their relevance today. Seed health in ancient and medieval history and its relevance to present day agriculture. 1
- Role of cattle and other domestic animals- management of cattle for draft and milk-indigenous breeds. 1
- Description of Indian civilization and agriculture by travelers from China, Europe and USA and our journey in agriculture, green revolution and its impact and concern, vision for the future. 1

SUGGESTED READING

1. Yellamanda Reddy.T & Sankara Reddi.G.H.2010, Principles of Agronomy, Kalyani Publishers, Ludhiana.
2. S. R. Reddy, 2000, Principles of Agronomy, Kalyani Publishers, Ludhiana.
3. B. Chandrasekharan, K. Annadurai, E.Somasundaram, 2014, Text book of Agronomy, New age international (P) Limited Publishers, Delhi.

4. Balasubramaniyan, P. Palamiappan S.P. 2009, Principles and Practices of Agronomy, Agribios publishers, Jodhpur.
5. Panda, S.E.2012, Modern Concepts and advanced principles in crop production. Agribios (India) Publishers, Jodhpur.
6. Das.N.R.2009, Practical Manual on Basic Agronomy (with theory) scientific publishers (India), Jodhpur.
7. Ayachit, S.M. (Tr) 2002. Kashyapiya Krishisukti (A treatise on Agriculture by Kashyapa). Agri – History Billetin No. 4. Asian – Agri History foundation, Secundrabad.
8. Choudhary, S.L., Sharma, G.S. and Nene, Y.L. 2000. Ancient and medievel history of Indian agriculture and its relevance to sustainable agriculture in the 21st century.
9. Proceedings of the sumemr school held from 28 May to 17 June 1999. Rajasthan College of Agriculture, Udaipur, India
10. Nene, Y.L. and Choudhary, S.L. 2002. Agricultural heritage of India. Asian Agri – History foundation, Secundrabad.
11. Randhawa, M.S., 1980 – 86. A histroy of Agriculture in India. Vol. I, II, III and IV. Indian council of Agricultural Research, New Delhi.
12. Raychaudhuri, S.P. 1964. Agriculture in ancient India. Indian council of Agricultural Research, New Delhi.
13. Razia Akbar (Tr) 2000. Muskha Dar Fauni – Falahat (The art of agriculture). Agri – History Bulletin No. 3. Asian Agri. History foundation, Secundrabad.
14. Sadhale Nalini (Tr) 1996. Surapala's Vrikshayurveda (The science of plant life). Asian. History Bulletin No. 1. Asian – Agri – History foundation, Secundrabad.
15. Sadhale, Nalini Tr) 1999. Krishi – Parashara (Agriculture by Parashara). Agri- Histroy Bulletin No. 2. Asian Agri – History foundation, Secundrabad, India

FUNDAMENTALS OF GENETICS

Credits : 2 **Semester: I**
Subject Code : AG18102 **No. of lecture hours: 30**

Objective: To impart knowledge on the fundamentals of genetics and their applications in plant breeding for improving agricultural productivity
Outcome: Students will be able to acquaint with the basic concepts of cell division, chromosomes, heredity, gene expression and their application in plant breeding

COURSE OUTCOMES:

- Express knowledge on Mendel's Laws
- Classify types of alleles
- Explain chromosomal abberations and solves problems on chi square
- Classify mutations and extra chromosomal inheritance
- Analyzes the structure and expression of gene

UNIT-I **6Hrs**

- Pre-Mendelian and Post-Mendelian Concepts of heredity 1
- Mendelian Principles of heridity- Law of Segregation 1
- Law of Independent assortment 1
- Exceptions to Mendels 1st law- Dominance relationships 1
- Exceptions to Mendels 2nd law-Law of Incomplete Dominance and Interaction of Factors
- Epistatic Gene Interactions with examples 2

UNIT-II **6Hrs**

- Cell division-cell cycle- Mitosis 1
- Meiosis 1
- Probability and Chisquare 1
- Multiple alleles- examples 1
- Blood group genetics,pleiotropism and pseudo alleles 1
- Sex determination mechanisms 1

UNIT-III **6Hrs**

- Sex linkage, sex limited and sex influenced traits 1
- Linkage-its estimation,2-point test cross 1
- Crossing –over mechanisms 1
- 3-point test-cross, chromosome mapping 1
- Structural changes in chromosomes- Deletions, Duplications and Inversions 1
- Translocations, examples of all structural alternations

- **UNIT-IV** **6Hrs**

- Mutations and classifications 1
- Mutagenic agents and induction of mutations 1
- CIB technique and induction of Mutations 1
- Qualitative and Quantitative traits 1

- Polygenes, continuous variations, Multiple factor hypothesis 1
- Cytoplasmic inheritance 1

UNIT-V **6Hrs**

- Genetic disorders 1
- Nature and structure of DNA and RNA 1
- Replication of Genetic material, DNA and RNA 1
- Protein synthesis, Transcription 1
- Translational mechanisms of genetic material, gene concept, gene structure 1
- Gene function and regulation. lac operon. 1

SUGGESTED READING

1. Gupta, PK. 1985. **Cytology, Genetics and Cytogenetics**. Meerut: Rastogi Publications.
2. Gupta, PK. 2007. **Genetics**. Meerut: Rastogi Publications.
3. Singh Pundhan. 2000. **Elements of Genetics**. Ludhiana: Kalyani Publishers.
4. Singh, BD. 2007. **Fundamentals of Genetics**. Ludhiana: Kalyani Publishers.
5. Strickberger, MW. 2004. **Genetics**. New Delhi: PHI Learning Pvt. Ltd.
6. Verma, PS. and Agarwal, VK. 2005. **Cell Biology, Genetics, Molecular Biology, Evolution and Ecology**. New Delhi: S. Chand and Co.

FUNDAMENTALS OF CROP PHYSIOLOGY

Credits : 1 **Semester: I**
Subject Code : AG19103 **No. of Lecture hours: 15**

Objective:
1. To impart knowledge on different plant metabolic processes and their functions in plants
2. To study the growth and development of plants.
3. To study the effect of nutrients and growth regulators and their applications in agriculture.
4. To understand the physiology of seeds and fruit ripening.

Outcome: Students will be able to gain knowledge on the growth and development of plants, effect of nutrients and plant growth regulators and their applications in agriculture and understand the physiology of seeds and fruit ripening.

COURSE OUTCOMES:
- Explain the importance of crop physiology , crop water relations and seed germination
- Apply the knowledge of photosynthesis and respiration in increasing crop productivity
- Apply the knowledge of nutrio-physiology and flowering physiology in increasing crop productivity
- Explains the role of plant growth regulators in agriculture and horticulture
- Analyze growth and development of major crops

UNIT-I **3Hrs**
- Introduction – definition of crop physiology, importance in agriculture and horticulture. 1
- Crop water relations – Physiological importance of water to plants- uptake of water (active and passive) - Measurement of water status in plants.
- Transpiration – definition- significance - Structure of stomatal complex in monocots and dicots- role of stomata in transpiration. 1
- Seed germination – definition- process and types (epigeal and hypogeal) -Factors affecting germination. 1

UNIT-II **3Hrs**
- Photosynthesis – energy synthesis – importance -Light reaction-cyclic and non-cyclic photo phosphorylation - CO_2 fixation - C_3 pathway. 1
- C_4 and CAM pathways – Differences between C_3, C_4 and CAM plants.-. Factors affecting photosynthesis- Photorespiration – definition-- significance 1
- Respiration – definition - importance – respiratory cycles (Glycolysis, Kreb's cycle and ETS) - Factors affecting respiration – growth and maintenance respiration 1

UNIT-III **3Hrs**
- Nutriophysiology – definition – essential nutrients- classification-Arnon's criteria of essentiality of elements. Physiology uptake of nutrients by plants (active and passive mechanism) 1
- Functions and deficiency symptoms of nutrient elements(macro and micro) - 1
- Flowering physiology – Photoperiodism – definition - importance- classification of plants based on photoperiodic response .Veralisation – definition - conditions required- significance. 1

UNIT –IV **3Hrs**

- Plant growth regulators – definition and classification of PGR - Physiological roles of Auxins, Gibberillins and Cytokinins. 1
- Physiological roles of ABA and Ethylene – Novel plant growth regulators-Commercial applications of plant growth regulators in agriculture and horticulture. 1
- Senescence and abscission – definition – causes - physiological and biochemical changes during senescence –significance of senescence. 1

UNIT-V **3Hrs**

- Growth and development – definition - types of growth-growth curve -factors affecting 1
- Measurement of growth- physiological aspects of growth and development of major crops 1
- Growth analysis : definition-– advantages - growth parameters with mathematical formulae- 1

SUGGESTED READING

1. Salisbury, FB. and Ross, CW. 2005. **Plant Physiology**. New Delhi: CBS publishers.
2. Gardner, FP., Pearce, RB. and Mitchell, RL. 1985. **Physiology of Crop Plants**. Jodhpur: Jodhpur scientific publications.
3. Devlin, RM. and Witham, FS. 1986. **Plant Physiology**. New Delhi: CBS Publishers
4. Noggle, GR. and Fritz, TG. 1994. **Introduction to Plant Physiology**. New Delhi: Prentice Hall of India.
5. Bidwell, RGR. 1995. **Plant Physiology**. New York: McMillan Pub. Co.
6. Taiz, L. and Zeiger, E. 2006. **Plant Physiology**. Sinauer associates Inc. Publishers.

INTRODUCTION TO PLANT PATHOGENS

Credits : 2 **Semester: I**
Subject code : AG18104 **No.of lecture hours: 30**

Objective:
- To impart knowledge to the students on pathogens that causes diseases in plants.
- To impart knowledge on the principles of plant disease Management.

Outcome: Students will be able to gain knowledge on different pathogens causing plant diseases and acquaint themselves with morphological characters and taxonomic keys associated with identification of pathogens.

COURSE OUTCOMES:
- Illustrates pathogenic fungi and types of reproduction in fungi
- Classify Kingdom Fungi into phylum, sub phylum and orders
- Recognizes phylum Ascomycota and Basidiomycota with examples
- Differentiates Rust, Smut and Bunt Fungi
- Illustrates various plant parasitic viruses and nematodes

UNIT-I **6Hrs**
- Introduction to Plant Pathology - Definition of Plant Pathology 1
- Important plant pathogenic organisms with one or two examples of important plant diseases caused by them- fungi 1
- Important plant pathogenic organisms with one or two examples of important plant diseases caused by them (contd)- algae (red rust), phanerogamic plant parasites 1
- General characteristics of fungi, fungus definition. Somatic structures - types of fungal thalli - plasmodium, unicellular and filamentous. Types of fungi based on reproductive structures - eucarpic, holocarpic. Modifications of mycelium (rhizomorphs, sclerotium, stroma, haustorium, rhizoids and appressorium).Ultra structure of fungal cell. Fungal nutrition - groups of fungi based on mode of nutrition 1
- Reproduction in fungi - asexual reproduction (mitospores) 1
- Sexual reproduction – Phases in sexual reproduction, (meiospores 1

UNIT-II **6Hrs**
- Taxonomy - Nomenclature, Binomial system of nomenclature, rules of nomenclature, Classification of fungi as per Kirk et al (2008)- Key to phylum, subphyla, classes, orders and families. 1
- Major characteristic features of Kingdom Fungi, Chromista and Protozoa. Characteristics of Phyla Chytridiomycota, Zygomycota, Ascomycota, Basidiomycota and Mitosporic fungi (Anamorphic fungi) in Kingdom Fungi. 1
- Kingdom Fungi – Phylum Chytridiomycota, Class Chytridiomycetes - important characteristics of Order Chytridiales – Family Synchytriaceae – disease caused by Synchytrium endobioticum (potato wart). 1
- Phylum Zygomycota – Subphylum Mucoromycotina – Order Mucorales – Family Mucoraceae, Genus Rhizopus, Example of disease caused by Rhizopus arrhizus 1
- 12 Phylum Ascomycota - important characteristics of the phylum. Different types of ascocarps. Stile structures in ascocarps. 1
- Phylum Ascomycota, subphylum Taphrinomycotina (=Archiascomycetes) 1

UNIT-III **6Hrs**

- Phylum Ascomycota Subphylum Pezizomycotina 1
- Phylum Ascomycota, Subphylum Pezizomycotina 1
- Phylum Basidiomycota – important characteristics 1
- Phylum Basidiomycota-Subphylum 1
- Macrocyclic, microcyclic, demicyclic rusts; Autoecious and Heteroecious rusts with examples. Life cycle of Puccinia graminis tritici. 1
- Phylum Basidiomycota – Subphylum 1

UNIT- IV **6Hrs**

- Differences between rust and smut fungi. Differences between smuts and bunts Phylum Basidiomycota – Subphylum 3. Agaricomycotina Class Agaricomycetes - Incertae sedis (no sub class) Order Polyporales- Family Ganodermataceae -Genus Ganoderma (coconut root rot and wilt). 1
- Anamorphic Fungi (Mitosporic fungi = Fungi Imperfecti) Characteristics. Acervular Imperfect Fungi – Colletotrichum 1
- Kingdom Chromista: Characteristics of Phylum Oomycota. 1
- Order Peronosporales- Family -Peronosporaceae 1
- Characteristics of Class Plasmodiophorea in Kingdom Protozoa. Important characteristics of Order Plasmodiophorida, Family Plasmodiophoraceae - differences in the characteristics of Plasmodiophora (club root ofcabbage) and Spongospora (potato powdery scab). 1
- Prokaryotes – Characteristics of phytopathogenic bacteria, Classification (2nd Edition of Bergey's Manual of Systematic Bacteriology, 2004). 1

UNIT-V **6Hrs**

- Class Betaproteobacteria -Order -Burkholdariales -Family -Burkholdariaceae Genus Ralstonia (bacterial wilt of solanaceous crops). 1
- Phylum Firmicutes. -Class Bacilli -Order -Bacillus -Family -Bacillaceae -Genus - Bacillus (Class Mollicutes Order Entomoplasmatales -Family -Spiroplasmataceae -Genus Spiroplasma (Corn stunt). 1
- Viruses and viroids - important characteristics of plant viruses and viroids - multiplication - classification of viruses based on nucleic acid (single stranded (ss) RNA, double stranded (ds) RNA, ssDNA and dsDNA). Taxonomy based on ICTV (2005). 1
- Methods of transmission of plant viruses with examples of vector transmitted virus diseases. Examples of important viroid diseases - potato spindle tuber viroid and coconut cadang cadang. 1
- Nematodes-Economic importance in agriculture - General characters of plant parasitic nematodes – classification. 1
- Nematodes- symptoms and nature of damage caused by plant nematodes (Heterodera, Meloidogyne, Anguina, Ditylenchus, Tylenchorhynchus, Aphelenchoides etc.) 1

SUGGESTED READING

1. Singh, RS. 1984. **Introduction to Principles of Plant Pathology**. New Delhi: Oxford & IBH Publishing Co.
2. Agrios, GN. 1988. **Plant Pathology**. New York: Academic Press.
3. Mehrothra, RS. 1980. **Plant Pathology**. New Delhi: Tata McGraw Hill Publishing Co. Ltd.,
4. Mehrothra, RS. and Aneja, KR. 1996. **An introduction to Mycology**. New Delhi: Wiley Eastern, Ltd.
5 Alexopoulus, CJ. 2003. Introductory Mycology. New Delhi: Mims & Wiley Eastern Ltd.

6 Sarma, O.P. 1989. **Text Book of Fungi**. New Delhi: Tata McGraw Hill Publishing Company Ltd.
7 Nene, YL. and Thapliyal, PN. 1993. **Fungicides in Plants disease control**. New Delhi: Oxford & IBH Publishing Co Ltd.
8 Ilanchet, 2001. **Biotechnology in plant disease control**. Wiley publishers.

FUNDAMENTALS OF AGRICULTURAL ECONOMICS

Credits : 2 **Semester: I**
Subject Code : AG18105 **No. of lecture hours: 30**

Objective: To impart knowledge on the basic principles of agricultural economics, to understand basic concepts in economics, understand the market forces i.e. demand and supply, know the market structure and its classification, understand macro-economic concepts like national income and its measurement.

Outcome: Students will be able to get knowledge on basic concepts in Macro Economics, production analysis, market forces (demand and supply), market structure and its classification, Macro Economics concepts.

COURSE OUTCOMES:

- Explain basic concepts in micro economics
- Distinguish consumer behaviour analysis, IC analysis and demand analysis
- Interrelate among production, cost concepts , supply and market structure
- Illustrate the functions of money and national income
- Apply various economic systems in daily life

UNIT-I **6Hrs**

- Economics-Meaning, subject matter, scope and definitions of economic-consumption-production-exchange and distribution. 2
- Basic concepts: Goods and services, classification of goods, characteristics of goods and services, demand, utility, cardinal and ordinal utility, forms of utility. 2
- Utility theory: Law of diminishing marginal utility – statement, assumptions of law – explanation, limitations, importance. 2

UNIT-II **6Hrs**

- Law of equi-marginal utility – meaning, assumptions, explanation – consumer surplus - meaning, assumptions, explanation 2
- Ordinal approach – consumer's equilibrium, indifference curves – indifference map, properties of IDC and budget line 2
- Demand – meaning, definition, types of demand – Demand schedule – demand curve – law of demand – contraction and extension – increase and decrease in demand, determination of demand – elasticity of demand – types of elasticity of demand. 2

UNIT-III **6Hrs**

- Production – meaning – creation utility – factors of production – law of variable proportions and law of returns to scale. 2
- Cost: cost concepts, short run and long run cost curves – supply – meaning – definition – law of supply – determinants of supply – supply schedule – supply curve – increase and decrease in supply – extension and contraction of supply – elasticity of supply – types 2
- Market structure: meaning and types of market, basic features of perfectly competitive market and basic theory of imperfect markets (monopoly, oligopoly market and monopolistic markets) 2

UNIT-IV **6Hrs**

- National income: meaning and definitions – concepts of national income 2
- Methods of measuring national income – product method – income method – expenditure method – value added method – importance of national income 2
- Money: Barter system – functions of money 2

UNIT-V **6Hrs**

- Inflation – types of inflation – causes and control of inflation 2
- Taxation: meaning – types – Economic planning – NITI Ayog role and functions 2
- Economic systems – concept of economy – important features of capitalism – socialism and mixed economic system 2

REFERENCES

1. Dewett, K.K. and Chand, A. 1979. **Modern Economic Theory**. S. Chand and Co., New Delhi
2. Dewett, K.K. and Varma, J.D. 1986. **Elementary Economics**. S. Chand and Co., New Delhi
3. Jhingan, M.L. 1990. **Advanced Economic Theory**. Vikas Publishing House, New Delhi.
4. Subba Reddy, S., Raghu Ram, P., Sastry, T.V.N. and Bhavani Devi, I. 2009. **Agricultural Economics**. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
5. Dewett, K.K. and Varma, J.D. 2003. *Elementary Economic Theory.* S. Chand and Co., New Delhi.
6. Dewett, K.K and Chand, A. 2009. *Modern Economic Theory.* S.Chand and Co., New Delhi.

FUNDAMENTALS OF HORTICULTURE

Credits :1 **Semester: I**
Subject Code :AG18106 **No. of lecture hours15**

Objective: To impart knowledge on Fundamentals of Horticulture.

Outcome: Students will be able to gain knowledge on Fundamentals of Horticulture.

COURSE OUTCOMES:

- Define various branches.
- Distinguish methods of Propagation.
- Identify and explain various vegetative propagation Method
- Distinguish and differentiate growth regulators and effects
- Classify and compare irrigation and fertilizer application methods

UNIT-I **3Hrs**

1. Horticulture – Definition - Divisions of Horticulture with suitable examples & Scope and importance of Horticulture - Importance of Horticulture in terms of income, employment generation, industry, religious, aesthetic, food & nutritive value and export.
2. Horticultural classification based on soil, climate and botanical classification. Climate for Horticultural crops - Influence of environmental factors on Horticultural crop production – Temperature, humidity, wind, rainfall and solar radiation. Soil for horticultural crops- Influence of soil factors – Soil types
3. Principles of orchard establishment – Points to be kept in mind while selecting site for the establishment of orchards - Principles and steps in orchard establishment - Layout of orchards – Systems of planting - Square, rectangle, quincunx, hexagonal and contour systems of planting- their merits and demerits

UNIT-II **3 Hrs**

4. Plant propagation- Definition - Methods - Sexual and asexual –advantages and dis advantages, Asexual Propagation by cuttings – Definition of cutting – Stem cuttings (Hard wood ,semi hard wood , soft wood and herbaceous -example for each type , Leaf cuttings
5. Seed germination – Dormancy – Reasons for seed dormancy, methods to overcome seed dormancy
6. Propagation by Layering - Definition -Types of layering (tip, simple, compound, mound, trench, air layering) with examples .

UNIT-III **3 Hrs**

7. Grafting – definition - Grafting methods – Attached scion methods of grafting, simple or approach grafting, detached methods of grafting (side grafting - Veneer grafting, - epicotyl grafting, double, soft wood grafting.
8 .Budding – Definition - Methods of budding – T-budding, inverted T-budding, patch budding and ring budding .
9. Training – Definition- objectives - methods of Training of fruit crops - Open centre, closed centre and modified leader systems their merits and demerits.

UNIT-IV **3Hrs**

10. Definition of pruning- objectives and methods of pruning of fruit crops (Thinning out, trimming , heading back , pollarding , pinching , dis budding , deblossoming).

11. Juvenility and flower bud differentiation – Methods for shortening juvenility - Application of growth regulators (Gibberellins, Auxins, cytokinins, Abscissic acid, Ethylene

12. Unfruitfulness – causes (environmental , Nutritional , biological , & Cultural) and remedies .

UNIT-V **3 Hrs**

13. Irrigation methods in horticulture crops - Different methods followed in horticultural crops (check basin, furrow, ring basin, basin, flood, pitcher, drip and sprinkler).

14. Fertilizer application- Different methods of application to horticultural crops Broad casting, top dressing, localized placement, contact placement Band placement, row placement, pellet, foliar application, starter solution, fertigation.

15 . Plant propagation structures - Green house , lath house , hot bed , cold frame & other propagating frames .

SUGGESTED READING :

1. Kumar, N. 1997. Introduction to Horticulture. Oxford and IBH Publishing Co. Pvt. Ltd . New Delhi Chadha, K.L. 2001. Handbook of Horticulture. ICAR, New Delhi.
2. Jitendra Singh, 2012. Basic Horticulture. Kalyani Publishers. Ludhiana.
3 George Acquaash. Hortculture- Principles and practices . PHI Learning Pvt . Ltd . New Delhi.
4 .Edmond , J . B ., Senn, T.L and Andrews ,F.S. Fundamentals of Horticulture. Mc Graw Hill Book Co New York.
5 . Sharma , R.R. Propagation of Horticultural crops – Principles and practices . Kalyani Publishers. Ludhiana

RURAL SOCIOLOGY AND EDUCATIONAL PSYCHOLOGY

Credits : 2 **Semester: I**
Subject Code : AG19107 **No. of lecture hours: 30**

Objective: To impart knowledge on sociological and psychological aspects of rural people and to acquaint with some important features of rural society.

Outcome: Students will be able to gain knowledge on sociological and psychological aspects of rural people and acquaint themselves with important features of rural society.

COURSE OUTCOMES:

- Describe the importance of rural sociology in agriculture extension.
- Explain different concepts in rural sociology like social stratification, culture, social institutions, social change and social ecology.
- Explain the concept of rural development in India.
- Explain the importance of educational psychology in agricultural extension with s pecial emphasis on leadership, personality and motivation.
- Apply various theories of motivation, intelligence, process of teaching and learning with special reference to extension teaching.

UNIT-I **6 Hrs**

- Sociology, Rural Sociology, Extension education and Agricultural extension- Meaning and definitions and importance of rural sociology in agricultural extension and their inter relationship. 1
- Characteristics of Indian rural society 1
- Differences and relationships between rural and urban societies. 1
- Social Groups- Meaning and Classification, Rural Social Groups and Role of Social Groups in Agricultural Extension 3

UNIT-II **6 Hrs**

- Social Stratification – Definition, meaning and forms – Class & Caste system and influence of social stratification on extension 1
- Culture: Meaning, Definition, Types, different cultural concepts and their role in Agricultural Extension. 2
- Social Institutions: Meaning, types and their role in agricultural extension 1
- Social Change and Development– Definition and meaning 1
- Social Ecology– Definition and meaning 1

UNIT-III **6 Hrs**

- Rural Development- Concept, meaning, definitions and problems 1
- Extension efforts in pre-independence Era- Srinikethan, Marthandam, Firka Development and Gurgaon 1
- Extension efforts in post-independence Era- Etawah pilot project, Nilokheri experiment and Extension system in India- Four lines of extension 1
- Community Development - Meaning, definition, concept, principles and philosophy 1
- Extension programmes of GoI- IADP, IAAP and HYVP and Frontline extension programmes of ICAR - IVLP, ORP and ND 1

- Central and State Government Schemes related to Agriculture and Farmers' Welfare – PMKSY, PMFBY, RKVY, Mission Kakatiya, Agriculture Investment Support Scheme and Farmer's Insurance 1

UNIT-IV **6 Hrs**

- Psychology and Educational psychology- Definition, meaning, scope and importance of educational psychology in Agricultural Extension and Behavior- Definition, meaning and types and its effect on agricultural extension work 1
- Rural Leadership- Definition, meaning, concept, theories and types/classification of leaders in rural concept 1
- Roles of a leader and different methods of selection and training of lay and professional leaders 2
- Personality – Meaning, types, factors and importance in Agricultural Extension 1
- Motivation – Meaning, types of motives and importance of motivation in agricultural extension 1

UNIT-V **6 Hrs**

- Demotivators, Techniques of motivation and theories of motivation 2
- Intelligence – Meaning, types, factors and importance in Agricultural Extension 1
- Learning and Teaching – Meaning and definition of learning, teaching, learning experience and learning situation and Elements of learning situation and their characteristics. 1
- Principles of learning and their implications in teaching 1
- Steps in extension teaching. 1

SUGGESTED READING

1. Adivi Reddy, A. 2001. **Extension Education**. Bapatla: Sree Lakshmi Press.
2. Chitamber, J.B. 1997. **Introductory Rural Sociology**. New Delhi: Wiley Eastern Limited.
3. Daivadeenam, P. 2002. **Educational Psychology in Agriculture**. Udaipur: Agrotech Publishing Academy.
4. Mangal, S.K. 2000. **Educational Psychology**. Ludhiana: Prakash Brothers.
5. Ray, G.L. 2006. **Extension Communication and Management**. Kolkata: Naya Prakashan.
6. Vidyabhushan and Sach Dev, D.R. 1998. **An Introduction to Sociology**. Allahabad: Kitab Mahal Agencies.

ELEMENTARY MATHEMATICS

Credits : 2 **Semester: I**
Subject Code : AG19108 **No. of lecture hours: 30**

Objective: To impart knowledge on elementary mathematics

Outcome: Students will be able to gain knowledge on matrices, logarithmic differentiation, coordinate geometry and trigonometry.

COURSE OUTCOMES:

- Define matrices and various operations involved with matrices
- Distinguish between differentiation and integration and their applications
- Apply integrals to find area under simple curves
- Analyze the dimensional figures like straight lines and circles.
- Analyze operations related to two dimensional figures parabola and ellipse

UNIT-I **6 Hrs**

- Definition of matrices, order of a matrix - Type of matrices- Addition- Subtraction - Multiplication - Transpose of matrix - Minor.
- Define Co-factor of matrix - A Inverse matrix up to 3rd order - Definition of determinants and properties of determinants up to 3rd order and their evaluation Cramer's rule and simple problems based on it.

UNIT-II **6 Hrs**

- Differentiation of xn - ex - sin x and cos x by first principle - Derivatives of sum Difference product and quotient of two functions - Differentiation of functions of functions (Simple problems based on it).
- Logarithmic differentiation (simple problems based on it) - Differentiation by substitution simple problems) -
- Define Maxima and Minima with simple problems.

UNIT-III **6 Hrs**

- Integration of functions - Integration of product of two functions - Integration by substitution method.

Definite Integral (simple problems based on it)

UNIT-IV **6 Hrs**

- Introduction to Co-ordinate geometry and give distance formula - Section formula with examples.
- Define straight line and write different types of straight line forms with examples. Solve the angles between two straight lines - Area of triangle and quadrilateral.

UNIT-V **6Hrs**

- Definifion of standard and general equation of circle - Equation of circle passing through three given points.
- Tangent and normal to a given circle at given point (simple problems)

SUGGESTED READINGS

1. MVSL DN Raju and Dr. K .V. Ramana – Engineering Mathematics-1
2. MVSL DN Raju and Dr. K .V. Ramana – Engineering Mathematics-2
3. Text Book for A.P Intermediate Mathematics – Paper (IA & IIB).
4. MVSL DN Raju and K.V. Ramana - Agricultural Mathematics.

FUNDAMENTALS OF AGRONOMY & AGRICULTURAL HERITAGE PRACTICALS

Credits : 1 **Semester: I**
Subject code : AG18109 **No.of lecture hours: 30**

Objective: To Identify different seeds, manures, fertilizers, herbicides and to participate in all agricultural operations from sowing to harvesting.

Outcome: Students will be able to identify different seeds, manures, fertilizers, herbicides and participate in all agricultural operations like ploughing, sowing, application of fertilizers, harvesting etc.

1. Visit to the crop museum
2. Study of primary tillage implements
3. Study of secondary tillage implements
4. Participation in ongoing field operations
5. Participation in ongoing field operations
6. Study of seeding equipment & different methods of sowing
7. Computation of seed rate of different crops
8. Study of different inter cultivation implements
9. identification of manures, fertilizers and crop seeds
10. calculation of fertilizer requirement of different crops
11. Different methods of fertilizer application
12. Identification of weeds in field crops
13. Herbicide label information and precautionary measures
14. Study of yield attributing characters and yield estimations
15. Identification of harvest maturity symptoms of various crops

FUNDAMENTALS OF GENETICS

Credits : 1 **Semester: I**
Subject Code : AG18110 **No. of practical hours: 30**

Objective: To gain practical knowledge on cell organelles, Mendelian inheritance, gene interactions and chi-square (c^2) analysis.

Outcome: Students will be able to apply chi-square (c^2) test for testing the fitness of data, construct linkage maps based on test cross data.

1. Study of Microscope and cell structure
2. Study of cell organelles
3. Study of cell organelles
3. Experiments on Monohybrid.
4. Experiments on Di-hybrid.
5. Test cross, back cross,
6. Experiments on gene interactions (monohybrid).
7. Experiments on gene interactions (di-hybrid)
8. Experiments on epistatic gene interactions
9. Experiments on probability.
10. Experiments on Chi-square test.
11. Determination of Linkage and cross-over analysis through 2-point test cross data.
12. Determination of Linkage and cross-over analysis through 3-point test cross data.
13. Sex-linked inheritance in Drosophila
14. Study of models on DNA structure
15. Study of models on RNA structure

FUNDAMENTALS OF CROP PHYSIOLOGY
PRACTICALS

Credits : 1 **Semester: I**
Subject Code : AG19111 **No. of practical hours: 30**

Objective: To impart various plant metabolic processes occurring at different stages of plant growth which lead to development.

Outcome: Students will be able to gain knowledge on various metabolic processes occurring at different stages of plant growth and development and to apply it for crop production.

Practicals

1. Preparation of solutions
2. Imbibition of seed.
3. Optimum conditions for seed germination.
4. Measurement of leaf area by various methods.
5. Measuring water status in plants
6. Seperation of Chloroplast Pigments by chromatography.

7-8 Growth analysis – calculation of growth parameters

9 Leaf anatomy of C-3 and C-4 plants

10. Measurement of Stomatal frequency and index

11 Preparation of PGR solutions and their effects on plant growth

12 Breaking of seed dormancy.

13 Seed vigor test and Seed viability test.

14 Study and identification of nutrient deficiency symptoms in crop plants.

15. Yield Analysis.

INTRODUCTION TO PLANT PATHOGENS
PRACTICALS

Credits : 1 **Semester: I**
Subject Code : AG18112 **No. of practical hours: 30**

Objective: To identify the plant pathogens and to know the modes of transmission of viruses and different methods of application of fungicides.

Outcome: Students will be able to identify different pathogens causing diseases and gain knowledge on fungicide applications and bio-control agents.

1-3 Study of Powdery Mildew, Downy Mildew, Rust and Smut Fungi (Scraping Method/ Section Cutting).
4. Study of Ascocarps of *Erysiphae, Phyllactenia, Uncinula, Podosphaera and Microsphaera*.
5. Study of imperfect fungi- *Alternaria, Colletotrichum, Fusarium, Drechslera, Pyricularia and Cercospora*.
6. Study of virus transmission (Sap-transmission).
7. Study of Symptoms produced by fungi, bacteria & viruses.
8. Study of different groups of fungicides.
9. Preparation of Bordeaux mixture, Bordeaux paste.
10. Preparation of Cheshnut Compound.
11. Preparation of lime sulphur & study of proprietary inorganic and organic sulphur fungicides.
12. Calculations related to fungicidal concentrations.
13. Methods of application of fungicides- seed, soil and foliar.
14-15. Field visit to study different diseases during the semester.

FUNDAMENTALS OF HORTICULTURE PRACTICALS

Credits : 1 **Semester: I**
Subject Code : AG18113 **No. of practical hours: 30**

Objective: To impart knowledge on various cultural operations involved in raising of orchards.

Outcome: Students will be able to identify various tools and implements used in horticulture, learn about nursery raising and various propagation techniques.

1. Study of Horticultural tools and implements

2. Identification of Horticultural crops.

3 .Preparation of potting mixture, potting .

4. Preparation of nursery bed (raised and flat beds) and sowing of seeds.

5. Vegetative propagation by corms , bulbs , rhizomes
6 . Vegetative propagation by cuttings .
7. Vegetative propagation by layerings.

8. Vegetative propagation by Grafting .

9. Vegetative propagation by Budding

10. Layout of different planting systems.

11. Preparation of Growth regulators – powder , solution and lanolin paste.

12.Training and pruning of fruit trees.

13 . Methods of Fertilizer application in different crops.
14 . Visit to college orchard
15 . Visit to commercial Nursery

Bridge Course

Agricultural Botany

Semester:I

No. of lecture hours: 15

Objective: To impart knowledge on basic concepts of Agriculture to students of Agricultural polytechnic and CBSE students.

Outcome: Students will be able to gain knowledge on Plant morphology, physiology, cell biology and Microbiology

Topics:

1. Terminology related to Agricultural Botany
2. Binomial Nomenclature and classification of plants
3. Morphology of Flowering plants – Stem , Root and modifications (Monocots and Dicots)
4. Morphology of leaf – Functions and Modifications
5. Morphology of Flower- Inflorescence and types
6. Pollination, Fertilization , Seed structure (Monocots, Dicots) and germination
7. Cell Biology – cell organelles and their functions
8. Cell cycle and Cell division – Mitosis and Meiosis
9. Plant physiology –Plant water relations, Growth and development
10. Photosynthesis and Respiration
11. Biochemistry- Biomolecules (carbohydrates, Lipids and proteins) and their importance
12. Terminology and basic concepts in Plant Biotechnology- plant tissue culture, Genetic engineering
13. Terminology and basic concepts in Plant genetics – Mendel's Laws of heredity, Mono, di and Trihybrid ratios
14. Basic concepts of nucleic acids – DNA, RNA
15. Terminology and basic concepts in Economic Botany- Cereals, Millets, Pulses, Oil seeds and Fibre crops
16. Terminology and basic concepts in Microbiology

YEAR-WISE AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS
B.Sc. (Hons.) AGRICULTURAL SCIENCE & RURAL DEVELOPMENT
SECOND SEMESTER
ACADEMIC YEAR-2022-23 OF 2022-26 BATCH (CBCS)

Sl. No.	Part	Subject Code	Title of the Subject	Hours/ week	Duration of Exam (hrs.)	Marks			Credits
						Internal	External	Total	
THEORY									
1	I	EN18201	General English – II (AECC-3)	3	3	40	60	100	3
2	I	IC19201	Indian Heritage &Culture (AECC-4)	2	2	40	60	100	2
3	II	AG18201	Meteorology & Climate Change (Core-8)	1	3	40	60	100	1
4	II	AG18202	Introduction to Forestry (Core-9)	1	3	40	60	100	1
5	II	AG18203	Agricultural Microbiology (GE-1)	1	3	40	60	100	1
6	II	AG18204	Fundamentals of Entomology (Core-10)	2	3	40	60	100	2
7	II	AG19205	Fundamentals of Soil Science (Core-12)	2	3	40	60	100	2
8	II	AG18206	Soil and water conservation Engineering (Core-13)	1	3	40	60	100	1
9	II	AG19207	Agricultural Informatics (SEC-2)	1	3	40	60	100	1
10	II	AG18208	Fundamentals of Plant Bio Chem.& Bio Tech(Core-11)	2	3	40	60	100	2
PRACTICALS									
11	II	AG18209	Meteorology & Climate Change (Core-8)	2	3	40	60	100	1
12	II	AG18210	Introduction to Forestry (Core-9)	2	3	40	60	100	1
13	II	AG18211	Agricultural Microbiology (GE-1)	2	3	40	60	100	1
14	II	AG18212	Fundamentals of Entomology (Core-10)	2	3	40	60	100	1
15	II	AG19213	Fundamentals of Soil Science(Core-12)	2	3	40	60	100	1
16	II	AG18214	Soil and water conservation Engineering (Core-12)	2	3	40	60	100	1
17	II	AG19215	Agri-Informatics(SEC-2)	2	3	40	60	100	1
18	II	AG18216	Fundamentals of Plant Bio Chem.& Bio Tech(Core-11)	2	3	40	60	100	1
19	III	PL18001	PLANET * (Outreach)						1
Total				**32**		720	1080	1800	**24**

*Ability Enhancement Compulsory Course (AECC) * Generic Elective (GE)
* Skill Enhancement Course (SEC)
* Programme of Loyola Academy for Neighborhood Empowerment & Transformation (PLANET)

GENERAL ENGLISH -II

Credits : 3 **Semester: II**
Subject Code : EN18201 **No.of lecture hours: 45**

Objective:

- To enhance the learners' communication skills by giving adequate exposure in reading, writing, listening and speaking skills and the related sub-skills.
- To develop oral and written communicative skills among the students so that their employability enhances and English becomes the medium of their livelihood and personality.

Outcome: Students will be able to improve on the usage & application of new words & phrases, especially new terminology. Identify and implement new linguistic skills and communication skills through role play and group discussion and improve language in a holistic way through application, differentiation, organization and creation of their own composition in writing skills.

UNIT 1 Biography	**9**
From the text "Mokshagundam Visvesvaraya"	
Explanation of the text,	2
• Grammar –--- Conjunctions, Adverbs	2
• Vocabulary ----- Prefixes and Suffixes	2
• Writing Skill ------Paragraph Writing	2
• Speaking Skill—Role Plays	1
UNIT 2 Health	**9**
From the text "Three Days to See"	
Explanation of the text	1
• Grammar -------Usage of Modal Auxiliary Verbs	2
• Vocabulary --- Collective Nouns ,Technical Vocabulary	2
• Writing Skill ------Report Writing	2
• Speaking Skill -----Jam	1
UNIT 3 Short Story	**9**
From the text "Leela's Friend" by R.K.Narayan	
• Explanation of the text	2
• Grammar----Phrasal Verbs, Wh- Questions	2
• Vocabulary----Noun and Verb Suffixes	2
• Writing Skill------Writing a Narrative	2
• Speaking Skill --- Debates	1
UNIT 4 Inspiration	**9**
From the text "The Last Leaf" by O. Henry	
• Explanation of the text	2
• Grammar----- Prepositions	2
• Vocabulary-----Idioms	2
• Writing Skill----- Précis Writing	2
• Speaking Skill--- Presentations	1

UNIT 5 Human Interest **9**

From the text" The Convocation Speech"

Explanation of the text 2

- Grammar---- Active and Passive Voice 2
- Vocabulary-----One-word Substitutes 2
- Writing skill------ Essay Writing 2
- Speaking Skill---- Group Discussion 1

Text Book

Epitome of Wisdom, Maruthi Publications.

References

Krishna Mohan and Meera Banerjee, 1990. *Developing Communication Skills*. Macmillan India Ltd. New Delhi.

Krishnaswamy.N. and Sriraman, T. 1995. *Current English for Colleges*. Macmillan India Ltd. Madras

Narayanaswamy, V.R. 1979. *Strengthen Your Writing*. Orient Longman, New Delhi

Sharma, R.C. and Krishna Mohan. 1978. *Business Correspondence*. Tata McGraw-Hill Publishing Co., New Delhi.

INDIAN HERITAGE & CULTURE

Credits : 2 **Semester: II**
Subject Code : IC19201 **No.of lecture hours: 30**

Objective:

- To apprise the students with a sound background of Indian Culture.
- To equip the students with social & community problems of India.
- To prepare the student for civil service exams where Indian Heritage & Culture paper is compulsory for all the streams.

Outcome: Students will be able to understand the culture, tradition and the religious values of our country and it helps the student to write all kind of competitive exams conducted for government services special for civil services.

UNIT-I **No of hours: 6**

INTRODUCTION – IMPACT OF GEOGRAPHY ON INDIAN CULTURE:

- Meaning of culture – Characteristics of Indian Culture, Caste system
- Indus Valley Civilization and Vedic/Aryan Culture
- Golden Age of Indian Culture– Mauryas and Guptas, Satavahavas, Pallavas, Cholas.

UNIT-II **No of hours: 6**

MEDIEVAL INDIA – INFLUENCE OF ISLAM ON INDIAN CULTURE:

- Cultural Development under the Delhi Sultanate and Mughals
- Contribution of Sher Shah and Akbar to Indian Administrative System
- Cultural Achievements of Vijayanagara and Kakatiya rulers
- Fine Arts – Sculpture, Painting, Music and Dance

UNIT-III **No of hours: 6**

INDIAN RELIGION AND IMPACT OF WEST:

- Western Education – Socio Religious Reform Movement
- Rise of Indian National movement – Mahatma Gandhi – Non violence and Satyagraha – Eradication of untouchability
- Ishwara Chandra Vidyasagar and Veerasalingam – Emancipation of women and struggle against caste.
- Hinduism – Islam – Christianity – Sikhism – Zoroastrianism – Jainism and Buddhism

UNIT-IV **No of hours: 6**

CHILDREN AND YOUTH ISSUES:

- Child Abuse, Child Labour – Effects of Abuse on Children
- Youth Unrest – Important agitations and movements by Youth
- Terrorism – Causes and Consequences
- Alcoholism, Drug Addiction and other deviations

UNIT-V **No of hours: 6**

WOMEN, GENDER RELATED ISSUES AND RIGHTS

- Violence against Women – Transgender issues – LGBT

- Know your Rights – Classification of Rights and Importance

- Changing local and national politics – Making our world a better place

REFERENCE BOOKS:

1. Jha, Dr K.N. 2006. **Studies in ancient & Medieval India**. COSMOS Book hive Ltd: Gurgaon.
2. Mahajan, V.D. 2008. **Ancient India**. S.Chand, New Delhi.
3. Manasseh, Dr P. 2010. **An Overview of Indian Culture**. Gamaleil Publishers, Hyderabad.
4. Malpani, Madanlal & Malpani, Shamsunder. 2014. **Indian Heritage and Culture**. Kalyani Publishers, Ludhiana.
5. Mhaske, Dr R.H. 2012. **Human Rights, Social Justice and Political Challenges**. Chandralok Prakashau, Kanpur.
6. Singh, Gurdip & Ahuja, V.K. 2012. **Human Rights in 21st Century**. Universal Law Publisher, New Delhi.

METEOROLOGY & CLIMATE CHANGE

Credits : 1 **Semester: II**
Subject Code : AG18201 **No.of lecture hours: 15**

Theory
Objective: To impart knowledge on principles of agricultural meteorology.

Outcome: Students will be able to gain knowledge on various concepts of agricultural meteorology and climate change.

COURSE OUTCOMES:

- Define meteorology, climatology, Agrl. Meteorology, wind, types of wind and describe structure of atmosphere
- Explain solar radiation, factors affecting distribution of solar radiation, atmospheric temperature and its importance
- Differentiate between precipitation and condensation and identify their different forms
- Classify and explain characteristics of different clouds. Explain south west and north east monsoons
- Identify weather hazards and categorize types of weather forecasting

Unit-1 **3Hrs**

- Agricultural meteorology- Introduction- Definitions of meteorology, climatology and agricultural meteorology – Scope and practical utility of agricultural meteorology. 1
- Earth atmosphere- its composition, extent and structure- Atmospheric weather variables, atmospheric pressure its variation with heights. 1
- Wind, types of wind, daily and seasonal variation of wind speed, Cyclone, Anti cyclone, effect of wind on crops- movement of air and valley winds- land and seas breezes. 1

Unit-2 **3Hrs**

- Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, long wave and thermal radiation, net radiation, albedo. 1
- Physiological responses of different bands of incident radiation – Function of light, factors affecting distribution of solar radiation with in the plant canopy. 1
- Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature, cardinal temperature- importance of air temperature. 1

Unit-3 **3Hrs**

- Low air temperature and plant injury- high air temperature and plant injury- Soil temperature- importance of soil temperature. 1
- Atmospheric humidity, concept of saturation, vapor pressure, effect of humidity on crops. 1
- Precipitation and condensation – Definition- Different forms of precipitation and condensation – Cloud seeding (Artificial rain making). 1

Unit-4 **3Hrs**

- Clouds- clouds formation – Classification and characteristics- Worlds Meteorological Organization. 1
- Rainfall- importance of rainfall on crops- types of rain fall-Monsoon definition – origin and distribution of south west monsoon and North west monsoon-mechanism and importance in Indian agriculture. 1
- Weather hazards- drought , floods, frost, tropical cyclones. 1

Unit-5 **3Hrs**

- Weather hazards- extreme weather conditions such as heat weave and cold wave, wind, storms, hail storms, thunder storms, dust storms, tornadoes and defective insulations.1
- Agricultural and weather relations, modifications of crop micro climate, climatic normals for crop and live stock production. 1
- 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. 1

SUGGESTED READING

1. Radha Krishna Murthy.V. 2002, Basic Principles of Agricultural Meteorology, B.S.Publications, Hyderabad.
2. Radha Krishna Murthy.V. Yakadri.M and Prasad P.V.V.2006, Terminology and Agricultural Meteorology and Agronomy, B.S. Publications, Hyderabad.
3. Bisnoi, O.P. 2007, Principles of Agricultural Meteorology, Oxford Book Company, Jaipur.
4. Lenka D.2006, Climate weather and crops in India, Kalyani Publishers, Ludhiana.
5. Reddy .S.R.2014, Introduction to Agriculture and Agro meteorology, Kalyani Publishers, Ludhiana.
6. Prasad Rao.G.S.L.H.V.2015, Agricultural Meteorology, Eastern Economy Edition (PH1) Learning Pvt Limited Publishers, Delhi.
7. Smita . A and Elizabeth .M. 2010 climate change issue and concern. The IOP Publishers Agaratala.
8. Data.M.Singh N.P. and Das Choudari D. 2008. Climate change and food security. New India Publishing Agency, New Delhi.
9. Reddy .S.R.Reddy D.S. 2011, Agrometeorology, Kalyani Publishers, Ludhiana.
10. Nanjappa and Ramachandrappa, 2007, Manual on Practical Agricultural Meteorology, Agribios (India) publishers, Jodhpur.
11. Reddy.K.R. and Hudges, MF.2000, Climate Change and Global crop productivity, CAB publishing House, USA.
12. Sahu.D.D. Chopda.M.C and Kacha.HL, 2012, Practical Agrometeorology Agribios (India), Jodhpur.

INTRODUCTION TO FORESTRY

Credits : 1 **Semester: II**
Subject Code : AG18202 **No.of lecture hours: 15**

Theory
Objective: To impart knowledge on afforestation outside conventional forest area for the benefit of rural and urban communities

Outcome: The students will be able to gain knowledge on afforestation outside conventional forest area for the benefit of rural and urban communities and various agro forestry systems.

COURSE OUTCOMES:

- Defines various branches of forestry, silviculture and its classification
- Explain various forest policies and types of regeneration
- Describes different tending operations followed in forestry
- Explain importance of agro forestry in India
- Select suitable practices for raising Subabul and Eucalyptus

UNIT-I **3Hrs**

- Introduction- Introduction to Indian forest, target area, productivity - Definitions of basic terms related to forestry 1
- Definition and Objectives of silviculture – Parts and stages of development of a tree, plantation life history of tree cultivation 1
- Forest classification 1

UNIT-II **3Hrs**

- Salient features of Indian Forest Policies 1
- Forest regeneration, Natural regeneration – natural regeneration from seed and vegetative parts, coppicing, pollarding, root suckers; 1
- Artificial regeneration – objectives, choice between natural and artificial regeneration, essential preliminary considerations 1

UNIT-III **3Hrs**

- Crown classification 1
- Tending operations – weeding, cleaning, thinning – mechanical, ordinary, crown and advance thinning 1
- Forest mensuration – objectives, diameter measurement, instruments used in diameter measurement. 1

UNIT-IV **3Hrs**

- Instrumental methods of height measurement – tree stem form, form factor, form quotient, measurement of volume of felled and standing trees, age determination of trees 1
- Agroforestry – definitions, importance, criteria of selection of trees in agroforestry. 1
- Different agroforestry systems prevalent in the country 1

UNIT-V **3Hrs**

- Shifting cultivation, taungya, alley cropping, wind breaks and shelter belts. 3

- Cultivation practices of two important fast growing tree species of the region – Subabul and Eucalyptus. 3

SUGGESTED READING

1. Plantation forestry in India - Luna R K 1990. International book distributor, Dehradun
2. Forestry in India - Dwivedi A P 1980. Jugal Kishore and Company, Dehradun
3. Agroforestry hand book - Negi S S 1999. International book distributor, Dehradun
4. Some favourite trees for fuel and fodder - Ram Prakash and Drake Hocking 1986. International book distributor, Dehradun
5. Silviculture of Indian trees (Vol. II & III) - Troup R S 1986. International book distributor, Dehradun
6. Forestry Mensuration - Chaturvedi A N and Khanna L S 1982 International book distributor, Dehradun
7. Tree Farming - Singh S P 2002 Agrotech publishing academy, Udaipur
8. Favourite Agroforestry Trees - Singh S P 2002 Agrotech publishing academy, Udaipur

AGRICULTURAL MICROBIOLOGY

Credits : 1 **Semester: II**
Subject code : AG18203 **No.of lecture hours: 15**

Objective: To impart knowledge on the principles of Microbiology and role of microorganisms in improving agricultural production.

Outcome: Students will be able to recognize the role of microorganisms in different environment such as soil, water, food and recognize the importance of microorganisms in agriculture.

COURSE OUTCOMES:

- Describe various contributions of eminent scientists in microbial world.
- Explain morphological types of bacteria, bacteria cell structure microbial nutrition,metabolic pathways & growth cycle of bacteria.
- Explain bacterial genetics, role of microbes in fertility of soils and plant growth, cycle of major elements Co2, N2.
- Differentiate types of fermentation and identify PGPR organisms and biological nitrogen fixation.
- Prepare Biofertilizers, biopesticides, silage, biofuel, biogas, biomanures and their production technologies.

UNIT- 1 **3 Hrs**

- Introduction- Definition- Brief History of microbiology - Spontaneous generation theory Contributions of Antony Van Leeuwenhoek 1
- Role of microbes in fermentation-Contributions of Cagnaird Latour-Theodor Schwann, F.Kutzing- Louis Pasteur - Germ theory of disease 1
- Protection against infection-Contributions of Edward Jenner- F. Loeffler- Behirng Kitasasto- Louis Pasteur - Applied aspects of Microbiology- 1

UNIT- 2 **3 Hrs**

- Morphological types of Bacteria , Bacteria cell Structure- External and internal cell structures- Differences between Prokaryotes and Eukaryotes. 1
- Microbial Nutrition- Autotrophy - Chemoautotrophy- Photoautotrophy and Heterotrophy – Metabolic pathways-Glycolysis-HMP-ED-TCA cycle. 1
- Growth of Microorganisms - Cell Division - Growth cycle of bacteria [Lag phase, Log phase, Stationary and Death phase]- Generation time- Growth rate- Growth yield- Synchronous - Diauxic growth. 1

UNIT- 3 **3 Hrs**

- Bacterial genetics- Genetic recombination- Transformation- Conjugation- Transduction- Plasmids- Transposon. 1
- Role of microbes in fertility of soils and plant growth - Rhizosphere- Rhizoplane- Phyllosphere- Phylloplane - Microflora- Carbon cycle- Carbon dioxide fixation. 1
- Nitrogen cycle - Mineralisation- Immobilisation- Nitrification- Denitrification- Nitrogen Fixation - Phosphorus cycle, phosphorus solubilisation – Oxidation – Reduction - Sulphur cycle-Oxidation and reduction. 1

UNIT- 4 **3 Hrs**

- Biological nitrogen fixation - Symbiotic- Associative- Asymbiotic- Nitrogen fixation In *Azolla - Blue*

- *green algae* - Actinorhizal symbiosis - *Frankia*, Phosphate solubilising microorganisms - *Bacillus - Pseudomonas- Mycorrhiza* for Phosphorous uptake. 1
- PGPR Organisms - *Bacillus – Pseudomonas – Azotobacter – Azospirillum – Rhizobium* - Microbes in human welfare. 1
- Types of fermentations - Batch - Batch fed- Continuous - Solid State Fermentations, Common microbial fermentations-Alcohol- Lactic acid- Butyric acid- Formic acid Butanediol- Propionic Acid- Mixed Acid - Fermentation technology- Alcoholic beverages production. 1

UNIT- 5 **3 Hrs**

- Biofertilizers (Bacterial-Cyanobacterial-Fungal) production technology- Silage Production Technology. 1
- Biopesticides- Viruses (*Nucleo polyhedrosis virus - Granular viruses*) – Bacteria (*Bacillus thuringiensis, Bacillus papilliae*) - fungi (*Beauveria - Verticillium*) – Protozoa (*Malameba locustae-Mattesia Spp*)- Mode of action. 1
- Biofuel Production- Biodegradation - Biogas, Biomanures and Composting Technologies. 1

SUGGESTED READING

1 *Microbiology*. Pelczar, J.r., M.J.E.C.S.Chan and Krieg, N.R. (5th Ed.) 2015. McGraw Hill Publishers, New York.
2. *Microbiology.* Prescott, L.M., Harley, J.P. and Klein, D.A. (9th Ed.) 2014. McGraw Hill Publishers, New York.
3. *Brock Biology of Microorganisms.*Madigan, M.,Martinko, J.M and Parker, J. (14Ed.) 2015. Prentice hall of India Pvt Ltd., New Delhi.
4. *Soil Microbiology*: Subba Rao, N.S. (4th Ed.) 2014. Oxford and IBH Publishing Company Pvt. Ltd., New Delhi.
5. *Microbiology A Laboratory Manual:* James, C and Natile, S. (10th Ed.) 2014. Pearson India Education Services Pvt. Ltd., South Asia.
6. *Experiments in Microbiology, Plant Pathology and Biotechnology.* Aneja, K.R.2011. New Age International (P) Ltd., Publishers, New DelhI.

FUNDAMENTALS OF ENTOMOLOGY

Credits : 2 **Semester: II**
Subject Code : AG18204 **No.of lecture hours: 30**

Objective: The student will be able to understand the morphology and physiology of insects.

Outcome: Students will be able to gain knowledge on morphology and physiology of insects.

COURSE OUTCOMES:

- Explains the history, Scope and importance of entomology and insect body wall and body segmentation.
- Identify and recognize various structures and functions of insect antenna, legs, wings and different types of larval and pupal forms of insect.
- Illustrates various physiological systems of insect body.
- Describes the characters of insects belongs to the orders Orthoptera, Isoptera. Thysanoptera, Lepidoptera and develops ability to identify various insects.
- Identify the characters of insects belongs to the orders Coleoptera, Hymenoptera, Diptera, Hemiptera and develops ability to identify various insects.

UNIT-I **6Hrs**

- History of Entomology in India - Contributions of eminent entomologists – Locations and year of establishment of entomological institutions - Arthropoda – Mention of insects in scripts – Contributions of Aristotle, J.C. Fabricius, J.G. Koenig, Carolius Linnaeus, Cramer, Dury, Dr. Kerr, Rev Hope Rothney, Ronald Ross, L De Niceville, H.M Lefroy, T.B.Fletcher, E.P. Stebbing, T.V. Ramakrishna Ayyar, B.V. David, Y.Ramachandra Rao, M S Mani, S Pradhan, H.S. Pruthi, M.R.G.K. Nair and S. Pradhan 2
- Contributory factors for abundance of insects – Major structural characters, developmental characters and protective characters (Morphological, physiological, behavioural and construction of protected niches) of Insecta in Animal Kingdom. Classification of Phylum Arthropoda up to Classes. 1
- Structure and functions of body wall and moulting, Moulting – Apolysis, ecdysis and sclerotization. 1
- Body segmentation of the insects – Head) – Procephalon and gnathocephalon, types of head, sclerites and sutures of insect head - Thorax – Segments and appendages (wings and legs). 1
- Abdomen – Segments, pre and post genital appendages (Furcula, cornicles, tracheal gills and pseudo ovipositor. 1

UNIT-II **6Hrs**

- Antenna – Structure of typical antenna and its modifications in different insects with Examples. 1
- Mouthparts – Biting and chewing, sucking (Piercing and sucking, Rasping and sucking, Chewing and lapping, Sponging and Siphoning/ Simple sucking), mask and degenerate types with examples. 1
- Legs – Structure and modifications , Wings – Venation, margins and angles – Types of wings and wing apparatus with examples. 1

- Types of Metamorphosis and diapause – Metamorphosis. 1
- Types of larva and pupa 1
- Digestive system , Circulatory system 1

UNIT-III **6Hrs**

- Excretory system, Respiratory system 1
- Nervous system 1
- Reproductive system – Structure of male and female reproductive systems – Structure and types of ovarioles and structure of follicle. 1
- Secretory (endocrine) system – Structure and functions of neurosecretory organs (neuro secretory cells of bbrain, corpora cardiaca, corpora allata, prothoracic glands. 2
- Sense organs – Compound eyes – Structure of ommatidium. 1

UNIT-IV **6Hrs**

- Taxonomy – Importance - History – Binomial nomenclature - Holotype, allotype and paratype – Suffixes of tribes, subfamily, family and superfamily. Apterygota and Pterygota 2
- Orthoptera – General characters - Gryllidae, Acrididae, Tettigonidae and \ Gryllotalpidae – Characters with examples. 1
- Isoptera – General characters –Termitidae –Characters with examples – 1
- Order Thysanoptera – General characters –Thripidae –Characters with examples. 1
- Lepidoptera- General characters - Pyralidae, Crambidae, Gelechiidae, Lycaenidae,Arctiidae, Papilionidae, Saturniidae and Bombycidae - Characters with examples. 1

UNIT-V **6Hrs**

- Coleoptera - General characters – Scarabaeidae, Coccinellidae, Chrysomelidae, Bruchidae, Curclionidae, Cerambycidae. 2
- Hymenoptera - General characters – Tenthredinidae, Ichneumonidae, Braconidae, Chalcididae, Trichogrammatidae, and Apidae- Characters with examples 2
- Diptera -General characters - Culicidae, Cecidomyiidae, Muscidae, Tachinidae, Agromyzidae and Tephritidae - Characters with examples. 1
- Hemiptera – General characters - Sub order Heteroptera – Characters - Cimicidae - Miridae, Pentatomidae, Lygaeidae, Coreidae, Pyrrhocoridae - Characters with examples 1

SUGGESTED READING

1. Chapman, R.F. 1974. **Insects: Structure and Function**. E.L.B.S. Publishers.
2. Richard, O.W. and Davies, R.G. 1977. **Imm's General Text book of Entomology** (Vol I) London: Champion & Hill.
3. Srivastava, K.P. 1996. **Text Book of applied Entomology** (Vol I & II) 2nd Edition. Ludhiana: Kalyani Publications.
4. Metcalf, C.L. and Flint, W.P. 1995. **Destructive and Useful Insects**. New York: Wiley Inter Science Publishing.
5. Vasantharaj David, B. 2001. **Elements of Economic Entomology**. Chennai: Popular book Depot.

6. Tembhare, D.B. 1997. **Modern Entomology**. Himalaya Publishing house.

FUNDAMENTALS OF SOIL SCIENCE

Credits : 2 **Semester: II**
Subject Code : AG19205 **No. of lecture hours: 30**

Objective: To impart knowledge on the principles of soil science and to explain how different soils are formed and how does soil act as a medium for plant growth.

Outcome: Students will be able to gain knowledge on the principles of soil science, soil formation and soil as a medium for plant growth.

COURSE OUTCOMES:

- Defines soil and describes different soil forming processes, explains soil profile and differentiates surface soil and subsurface soil.
- Explain different Physical properties of soil and their influence on crop growth.
- Explain different chemical and biological properties of soil and its importance in agriculture.
- Differentiates and explains role of organic matter and humus. Describes carbon cycle and C:N ratio.
- Classify different soil groups of India, Telangana and A.P.

THEORY

UNIT-I **6Hrs**

- Introduction- Earth crust and composition - Soil- definition and concepts of soil- scope and branches of soil science.
- Soil components – mineral matter, organic matter, air, water and organisms.
- Rocks and minerals- definitions- classification based on origin, silica content.
- Weathering- definition- types- factors and processes(physical, chemical, biological)
- Soil formation- definition- factors- Pedogenic processes- humification-eluviation & illuviation, podzolisation, calcification, laterization and gleization.
- Soil profile- definition – description of theoritical soil profile- differences between soil and sub-soil.

UNIT-II **6 Hrs**

Soil physical properties – texture- definition- physical nature of soil separates- various textural classes- determination of texture- importance of texture.

- Soil structure- definition- types, classes and grades of structure- importance of soil structure and its management.
- Soil porosity- importance-bulk density and particle density-factors affecting- importance. Soil colour-components- importance- soil crusting and its importance- soil consistence-consistence of wet and dry soils- importance.
- Soil temperature- sources of heat- losses of soil heat- factors affecting-control of soil temperature- importance of soil temperature on crop growth.
- Soil aeration- importance- soil drainage- effects of ill drainage- significance.
- Soil water- forces of retention- classification of soil moisture. Movement of water in soil-Infiltration, percolation- permeability.

UNIT-III **6Hrs**

- Soil colloids-definition– nature- types- significance- properties of soil colloids.
- Adsorption of ions – ion exchange – types – cation and anion exchange – CEC and AEC of soil - factors affecting ion exchange capacity of soils – importance of CEC.
- Soil reaction – definition- pH scale – factors affecting- importance of soil pH- buffering capacity of soils.
- Soil acidity and alkalinity- acid, saline and alkali soils – characteristics- formation- reclamation methods.
- Soil biology – macro and microorganisms- classification- beneficial role of soil organisms in organic matter decomposition, mineralization-immobilization.

Nitrogen fixation- denitrification- solubilization of phosphorous-mobilization of nutrients by soil microorganisms- harmful activities of soil organisms.

UNIT-IV **6Hrs**

- Soil organic matter – various sources- composition of organic material.
- Decomposition of different constituents of organic material.
- Humus- definition- nature- composition- humification- properties and its influence on properties of soil, water and nutrient availability and plant growth.
- Role of organic matter and humus- differences between organic matter and humus
- Carbon cycle- carbon : nitrogen (C/N) ratio- definition- significance in soil fertility.

UNIT-V **6Hrs**

- Soil taxonomy – definition- objectives- systems of soil classification- current trends in soil classification.
- Soil taxonomy- order, sub- order- great group, family, series- nomenclature.
- Soil survey –definition- objectives and uses - types and methods- soil survey report.
- Soil groups of India ,Telangana and A.P. 2

SUGGESTED READING

1. Biswas, T.D. and Mukherjee, S.K. 1987. **Text book of Soil Science**. New Delhi: Tata McGraw Hill Pub.Co. Ltd.
2. Sahai, V.N. 1990. **Fundamentals of Soils**. Ludhiana-New Delhi: Kalyani Publications.
3. Brady, N. C. and Ray, R.Weil. 2002. **The Nature and Properties of soil**. New Delhi: Pearson Education Inc.
4. Kolay, A.K. 2000. **Basic Concepts of Soil Science**. New Delhi. New Age International Pub.
5. Raymond W. Miller and Roy L. Donahue. 1992. **Soils-An Introduction to Soils and Plant Growth**. New Delhi: Prentice Hall of India Pvt Ltd.
6. Ghildyal, B.P. and Tripathi, R.P. 1987. **Soil Physics**. New Delhi: Wiley Estern Ltd.
7. Baver, L.D., Gardner, W.H. and Gardner, W.R. 1972. **Soil Physics**. New Delhi: Wiley Eastern Ltd.

SOIL AND WATER CONSERVATION ENGINEERING

Credits : 1 **Semester: II**
Subject Code : AG18206 **No. of Lecture hours: 15**

Objective: To impart knowledge on basic soil and water engineering concept.

Outcome: Students will be able gain knowledge and skills on measurement of land different irrigation methods, pumping of water, soil and water engineering concepts, surveying and leveling.

COURSE OUTCOMES:

- Explain importance of soil and water conservation, water erosion
- Explain erosion control measures
- Explain irrigation water measurement techniques
- Describe irrigation pumps and discharge calculation
- Explain drip and sprinkler irrigation system

Theory

Unit-I **3Hrs**

- Introduction to soil and water conservation and causes of soil erosion. 1
- Definition and agents of soil erosion, water erosion - Forms of water erosion -Gully classification and control measures. 1
- Soil loss estimation by universal soil loss equation - Soil loss measurement techniques. 1

Unit-II **3Hrs**

- Principles of erosion control - Introduction to contouring, strip cropping. 1
- Contour bund - Graded bund and bench terracing. 1
- Grassed water ways and their design. 1

Unit-III **3Hrs**

- Wind erosion - Mechanics of wind erosion, types of soil movement - Principles of wind erosion control and its control measures. 1
- Introduction to irrigation - Classification of irrigation projects. 1
- Importance of irrigation water measurements - Volumetric, area velocity, discharge methods - Weirs, orifice, flumes. 1

Unit-IV **3Hrs**

- Open channel hydraulics - Discharge calculations. 1
- Types of wells - Water lifting devices - Classification of pumps, their capacity, power requirement and discharge calculations. 1
- Functional components and working principle of underground pipeline systems. 1

Unit-V **3Hrs**

- Functional components of micro irrigation systems and its design like drip,

sprinkler irrigation systems etc. 2

- Water harvesting techniques - Lining of ponds, tanks and canal systems. 1

SUGGESTED READING

1. Ghanshyam Das., 2012. Hydrology and Soil Conservation Engineering, including Watershed Management. Second edition, PHI Learning Private Limited, New Delhi - 110001
2. Murthy, V. V.N., 2004. Land and Water Management Engineering. Kalayani Publishers, New Delhi
3. Michael A.M., 2007. Irrigation Theory and Practice. Second edition. Vikas Publishing House Pvt. Ltd.
4. Mal, B. C. 1995. Introduction to Soil and Water Conservation Engineering. Kalayani Publishers, Rajinder Nagar, Ludhiana
5. Kanetakar, T. P. 1993. Surveying and Leveling. Pune Vidyarthi Griha, Prakashan, Pune
6. Suresh, R. 2008. Land and Water Management. Standard Publishers Distributors, Delhi.

AGRICULTURAL INFORMATICS

Credits: 1 **Semester: II**
Subject code: AG19207 **No. of lecture hours: 15**

Objective: To enhance the student's skill in software techniques like Memory Concepts, uses of DBMS in Agriculture, Smartphone mobile apps in Agriculture and Preparation of contingent crop-planning and crop
Calendars

Outcome: Students will be able to improve on the usage of programmes, Computer Models in Agriculture, creation of web, formation of development programmes, Soil Information Systems etc.

COURSE OUTCOMES:

- Explains MS – WORD and its applications.
- Explains MS- Excel and its applications.
- Explains Internet concepts and components.
- Explains Programming languages.
- Explains IT systems for Agri - management

UNIT-I **3 Hrs**

1. Introduction to computers- Advantages- Disadvantages- Applications - Anatomy of Computers- Input / output devices -Memory Concepts - Units of Memory - RAM – ROM – PROM – EPROM - EAPROM - Cache Memory.
2. Operating system - Definition and types - WINDOWS OS – Features – Desktop – Icons etc.
3. Applications of MS-Office - MS- Word - Creating - Editing and formatting a document.

UNIT-II **3 Hrs**

4. MS Word - Features of good word processor - Mail merge – Drop cap- Auto text- Track changes – Equation editor etc.
5. MS- Excel - Data presentation, Tabulation – Merging of cells and graph creation - Mathematical expressions.
6. MS- Excel - Data analysis tool pack – Pivot table and graph etc.,

UNIT-III **3 Hrs**

MS Access – Database - concepts and types
MS Access - creating database - Uses of DBMS inagriculture.
Internet and World Wide Web (WWW) – Concepts - Components

UNIT-IV **3 Hrs**

Programming languages: Concepts and standard input/output operations

e-Agriculture - Concepts and applications, use of information and communication technologies in Agriculture.

UNIT-V **3 Hrs**

IT application - Computer controlled devices (automated systems) for Agri-input management Smartphone mobile apps in Agriculture for farm advises - Market price - Postharvest management etc,.
Decision support systems – Concepts – Components –applications in Agriculture – Agriculture Information/Expert System -Soil Information Systems etc for supporting Farm decisions.

SUGGESTED READING:

1. John Walkenbach, Herb Tyson, Michael R. Groh, FaitheWempen, Microsoft Office, 2010 Bible
2. Bangia,Learning Ms Office 2010
3. Prof. Satish Jain and M. Geetha, MS-Office 2010 Training Guide
4. Johnson, Microsoft Office 2010.....on Demand
5. Kate Shoup, Microsoft Office 2010
6. Melanie Gass, It's All about You! Office 2010
7. Nancy Conner and Matthew MacDonald, Office 2010: The Missing Manual

FUNDAMENTALS OF PLANT- BIOCHEMISTRY AND BIOTECHNOLOGY

Credits : 1 **Semester: II**
Subject Code : AG18208 **No. of Lecture hours: 30**

Objective: To impart knowledge on basic concepts of biochemistry and biotechnology

Outcome: Students will be able gain knowledge and skills on bio technology and bio-chemistry.

COURSE OUTCOMES

- Identify the structures and importance of carbohydrates and lipids.
- Classify peptides, proteins and enzymes.
- Explain structure of nucleic acids and illustrate metabolism.
- Prepare nutrient media and use of various cultures.
- Analyze genetic engineering techniques.

UNIT-I 6Hrs

- Metabolism – factors affecting metabolism, Over all metabolic view of carbohydrates, proteins and lipids.
- Carbohydrates-Reducing and non-reducing sugar, Mutarotation, and Glycosidic bond
- Classification of carbohydrates (overview) – Monosaccharides (Glucose & Fructose), Oligosaccharides & Polysaccharides(Homopolysaccharides and Heteropolysaccharides)
- Glycolysis (General features, Significance and Energetics)
- TCA Cycle (General features, Significance and Energetics)
- Definition and functions of Lipids
- Classification of lipids – Simple, Complex & Derived (overview)
- Even and odd chain fatty acids with examples
- Saturated & unsaturated fatty acids with examples
- essential and non-essential fatty acids with examples

UNIT-II 6Hrs

- Properties of Lipids – Acid value, saponification number, iodine number
- Beta oxidation - degradation of Palmitoyl Co A
- Amino acids – Structures – Classification, Zwitterions
- Proteins Importance Classification - Simple, Complex & Derived(overview) Properties of proteins –Isoelectric P_H ,Denaturation
- Protein sequencing – Edman degradation method
- Proteins – Structural organization – Primary, secondary, tertiary and quaternary structures and forces involved in stabilizing proteins
- Enzymes, active site, factors affecting enzyme activity, Classification of enzymes , Allosteric enzymes and coenzymes.

UNIT-III 6Hrs

- Biotechnology , Scope , Importance and Applications of plant biotechnology.
- Introduction to plant tissue culture – History, Terminology

- Steps in general tissue culture

- Types of sterilization and nutrient media
- Callus culture and multiplication
- Organogenesis and embryogenesis
- Micropropagation , Anther and pollen culture Problems – Advantages – Limitations
- Embryo culture – Ovule culture – Problems – Advantages – Limitations

UNIT-IV **6 Hrs**

- Somatic embryogenesis Synthetic seeds and its applications
- Protoplast isolation and fusion – Somatic hybridization – Cybrids
- Somaclonal variations and applications in crop improvement
- Secondary metabolites production
- Cryo preservation
- Introduction to genetic engineering
- Restriction enzymes and classification
- Gene cloning - Vectors.

UNIT-V **6 Hrs**

- Gene transfer methods – Indirect methods (Agrobacterium) and direct methods
- with case studies / examples.
- Transgenic plants , Present status , Applications in crop improvement and limitations
- Biotechnology regulations.
- Polymerase chain reaction (PCR) – Procedure and applications.
- Markers - Morphological, biochemical and molecular markers (RFLP, RAPD and SSR)
- Marker assisted selection for crop improvement.

SUGGESTED READING:

1. David L. Nelson, Michael M.Cox; W.H. Freeman.Lehninger *Principles of Biochemistry*, 6th Edition
2. *Biochemistry,* Dr.U.Satyanarayana, Dr.U. Chakrapani, Books and Allied(P) Ltd, Kolkata
3. *Biochemistry,* S.N.Gupta, Rastogi Publications, First Edition, 2011
4. *Introduction to Plant Biotechnology* by HS Chawla (3rd Edition), Oxford & IBH Publishing Co. Pvt Ltd., New Delhi.
5. *Introduction to Plant Biotechnology* by B.D.Singh, Kalyani publishers, New Delhi.
6. *GeneCloning*byT.ABrown

METEOROLOGY & CLIMATE CHANGE
PRACTICALS

Credits : 1 **Semester: II**
Subject Code : AG18209 **No. of lecture hours: 30**

Objective: To impart knowledge on various meteorology instruments.

Outcome: Students will be able to gain knowledge on recording of weather parameters.

1. Visit to Agro meteorology Observatory
2. Site selection & layout for Observatory
3. Study of Campbell – stokes sunshine recorder.
4. Measurement of maximum and minimum Air temperature, its tabulation, trend and variation analysis
5. Measurement of Soil temperature
6. Determination of Relative humidity
7. Measurement of atmospheric pressure
8. Measurement of Wind Speed and direction
9-10. Measurement of Rainfall and its tabulation
11. Measurement of Evaporation
12. Measurement of Dew - Dew Gauge
13. Weather forecasting, types and its importance in agriculture
14. Use of Synoptic chart and weather reports
15. Climatic variability and analysis of its impact on agriculture.

INTRODUCTION TO FORESTRY
PRACTICAL

Credits : 1 **Semester: II**
Subject Code : AG18210 **No. of lecture hours: 30**

Objective: To impart techniques of raising of nurseries and establishment of forest trees and identification of forest products.

Outcome: Students will be able to learn different nursery beds, identify and know about major and minor forest products and their utilization in day-to-day life.

Practical

1. Identification of tree species suitable for Timber, Fuel wood and Fodder
2. Identification of tree species suitable for Roadside plantation, Field bunds, Windbreaks and for Wastelands
3. Identification of Minor forest tree species, trees for Beautification purpose and Nitrogen fixing tree species and other species suitable for Agroforestry
4. Identification of seeds of Important tree species

5-6. Collection, Extraction and Storage of tree seeds

7. Application of Pre-sowing Seed Treatment to tree seeds.
8. Biomass estimation in Energy plantations.
9. Cost of cultivation of Commercial trees in wastelands: Bamboo.
10. Diameter measurements using calipers and tape, diameter measurements of forked, buttressed, fluted and leaning trees.
11. Height measurement of standing trees by Shadow method, Single pole method and Hypsometer.
12. Volume measurement of logs using various formulae.
13. Forest plantations and their management.
14. Visits of nearby forest based industries.
15. Visit to AICRP on Agroforestry

AGRICULTURAL MICROBIOLOGY
PRACTICALS

Credits : 1 **Semester: II**
Subject Code : AG18211 **No. of practical hours: 30**

Objective: To isolate bacteria from different environments and to maintain pure cultures in the laboratory.

Outcome: Students will be able to grow bacteria in different media and quantify microbial population in cultures.

1. Introduction to microbiology laboratory and its equipments.
2. Microscope- Parts, principles of microscopy, resolving power and numerical aperture.
3. Micrometry-Measurement of size of microorganisms.
4. Methods of sterilization.
5. Bacterial staining procedures-Simple staining - Gram's staining and Endospore staining.
6. Nutritional media and their preparations.
7 & 8. Enumeration of microbial population in soil- Bacteria, fungi and actinomycetes.
9. Methods of isolation, purification and maintenance of microbial cultures.
10. Isolation of *Rhizobium* from legume root nodule.
11. Isolation of *Azotobacter.*
12. Isolation of phosphate solubilising bacteria/Phosphate solubilizing fungi PSB/ PSF.
13. Isolation of *Azospirillum* from roots.
14. Staining and microscopic examination of biofertilizer organisms.
15. Isolation *of VAM* from soil by wet sieving and decantation technique.
16. Determination of *VAM* root colonization by staining the infected roots

FUNDAMENTALS OF ENTOMOLOGY

Credits : 1 **Semester: II**
Subject Code : AG18212 **No. of lecture hours: 30**

Practicals

1 Methods of collection and preservation of insects including immature stages.
2 External features of Grasshopper / Blister beetle.
3 Study of types of mouthparts – Biting and chewing, piercing and sucking, rasping and sucking, chewing and lapping, sponging and siphoning.
4 Study of different types of insect antennae and legs.
5 Study of wing venation, types of wings and wing coupling mechanisms.
6 Study of different types of insect larva and pupa.
7 Dissection of digestive system in insects (Grasshopper).
8 Dissection of female and male reproductive systems in insects (Grasshopper).
9 Study of characters of Orders - Orthoptera, Dictyoptera and their families and Odonata.
10 Study of characters of Orders - Isoptera and Thysanoptera and their families.
11 Study of characters of Orders -Hemiptera and its sub order Heteroptera and their families.
12 Study of characters of Sub Order - Homoptera and its families.
13 Study of characters of Order- Neuroptera and Lepidoptera and their families.
14 Study of characters of Order- Coleoptera and its families.
15 Study of characters of Order- Hymenoptera and its families.
16 Study of characters of Order - Diptera and its families.

FUNDAMENTALS OF SOIL SCIENCE
PRACTICALS

Credits : 1 **Semester: II**
Subject code : AG19213 **No.of lecture hours: 30**

1. Methods of chemical analysis, principles, techniques and calculations.
2. Study of soil sampling tools, collection of representative soil sample, its Processing and storage.
3. Description of soil profile in the field.
4. Study of soil forming rocks and minerals
5. Determination of texture by feel and bouyoucos methods.
6. Determination of bulk density and particle density of soil and porosity.
7. Determination of soil moisture content by gravimetric method.
8. Determination of infiltration rate.
9. Determination of soil pH
10. Determination of EC of soil.
11. Determination of soil colour & study of soil map.
12. Determination of cation exchange capacity of soil.
13. Preparation of soil water extract and determination of chlorides in soil water extract
14. Determination of carbonates and bicarbonates and soil water extract
15. Estimation of organic carbon content in soil.

SOIL AND WATER CONSERVATION ENGINEERING

PRACTICAL

Credits : 1 **Semester: II**
Subject code : AG18214 **No. of lecture hours: 30**

Practical

1. Practicing survey - Principles and educating to use pacing technique for measurement.
2&3. Area calculations through chain survey - GPS demo for tracking and area measurement.
4. Estimation of soil loss and calculation of erosion index.
5. Leveling concepts and practical utility in agriculture.
6. Preparation of contour maps.
7. Concept of vegetative water ways and design of grassed water ways.
8. Construction of contour and graded bunds.
9. Wind erosion and estimation process.
10&11. Water discharge measurements lab exercises for computing discharge.
12&13. Different irrigation pumps and their constructional differences.
14. Farm pond construction and its design aspects.
15. Farm pond and canal lining and its procedures.
16. Visit to nearby farm pond.

AGRI-INFORMATICS

PRACTICAL

Credits: 1 **Semester: II**
Subject code: AG19215 **No. of lecture hours: 30**

PRACTICAL

1. Booting of computer and its shut down - Practicing Windows operating system - Use of mouse -Title bar – Minimum, maximum and close buttons - Scroll bars - Menus and tool bars.
2. Windows explorer- Creating folder - Copy and paste functions - Control panel- Notepad -Wordpad etc.
3. MS word - Creating a document, saving and editing
4. Use of options from tool bars – Format - Insert and tools (Spelling and Grammar)- Alignment of paragraphs and text.
5. Creating a table - Merging of cells - columns and row width - Formats etc.
6. MS- Excel - Creating a spreadsheet - Alignment of rows - columns and cells usingformat tool bar.
7. Entering formula expression through formula tool bar and use of in-built functions Sum – Average – Stdev –Maximum and minimum.
8. Data analysis using inbuilt tool packs test of significance.
9. Data analysis using inbuilt tool packs correlations and regressions.
10. Creating graphs and saving with and without data.
11. MS- Power Point - Creating slides, layouts, action buttons, multimedia features.
12. MS- Access - Creating a data base, structuring with different types of fields.
13. Use of query facility for accessing the information.
14. Transforming the data of word - Excel and Access to other formats.
15. Internet concepts - Creating Email - Search Engines - Website designing.

FUNDAMENTALS OF PLANT BIOCHEMISTRY AND BIOTECHNOLOGY PRACTICAL

Credits : 1 **Semester: II**
Subject code : AG18216 **No. of lecture hours: 30**

1. Qualitative tests for carbohydrates.
2. Qualitative tests for amino acids.
3. Paper chromatography of amino acids
4. TLC of plant pigments.
5. Requirements for plant tissue culture laboratory.
6. Sterilization techniques.
7. Collection , preparation and sterilization of various explants
8. Composition of various tissues culture media and preparation of stock solutions for MS nutrient medium.
9. Callus induction from various explants.
10. Micropropagation, sub culturing and hardening.
11. Anther culture and regeration
12. Somatic embryogenesis (Atificial seed production)
13. Somatic hybridization(Protoplast culture)
14. Demonstration of isolation of DNA and of gel electrophoresis technique.
15. Demonstration of PCR Technique and demonstration of DNA finger printing

YEAR-WISE AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS
B.Sc. (Hons.) AGRICULTURAL SCIENCE & RURAL DEVELOPMENT
THIRD SEMESTER
ACADEMIC YEAR-2022-23 OF 2021-25 BATCH (CBCS)

Sl. No.	Part	Subject Code	Title of the Subject	Hours/ week	Duration of Exam (hrs.)	Marks			Credits
						Internal	External	Total	
THEORY									
1	II	G19AG1T	Generic Elective (GE-2) (ID)	2	3	40	60	100	2
2	II	AG19301	Crop Production – I(Kharif crops) (Core-14)	2	3	40	60	100	2
3	II	AG19302	Water Management (Core-15)	1	3	40	60	100	1
4	II	AG19303	Fundamentals of Plant Breeding (Core-16)	2	3	40	60	100	2
5	II	AG20304	Insect Ecology & IPM (Core-17)	2	3	40	60	100	2
6	II	AG19305	Farm Management & Production Economics (Core-18)	2	3	40	60	100	2
7	II	AG19306	Farm Power & Machinery (Core-19)	1	3	40	60	100	1
8	II	AG19307	Prin. Of Food Science. & Nutrition (Core-21)	2	3	40	60	100	2
9	II	AG19308	Production Technology of Vegetables & Spices (Core-20)	1	3	40	60	100	1
PRACTICALS									
10	II	G19AG1P	Generic Elective (GE-2) (ID)	2	3	40	60	100	1
11	II	AG19309	Crop Production – I (Kharif crops) (Core-15)	2	3	40	60	100	1
12	II	AG19310	Water Management (Core-16)	2	3	40	60	100	1
13	II	AG19311	Fundamentals of Plant Breeding (Core-17)	2	3	40	60	100	1
14	II	AG 19312	Insect Ecology & IPM (Core-17)	2	3	40	60	100	1
15	II	AG19313	Farm Management & Production Economics (Core-19)	2	3	40	60	100	1
16	II	AG19314	Farm Power & Machinery (SEC-2)	2	3	40	60	100	1
17	II	AG19315	Production Technology of Vegetables & Spices (Core-21)	2	3	40	60	100	1
18	II	AG19316	Practical Crop Production (SEC-1)	2	3	40	60	100	1
Total				**31**			1020	1700	**23**

PRINCIPLES OF ORGANIC FARMING (GE)

Credits : 2 **Semester: III**
Subject Code : G19AG1T **No. of lecture hours: 30**

Objective:-

- To impart knowledge on principles and practices of organic farming and its impact on indiscriminate usage of chemicals.
- To impart knowledge on preparation of bio fertilizers and botanical pesticides.

Outcome :-

- Students will be able to gain knowledge on importance and various concepts of organic farming.

Course outcomes:

- Analyse the need of Organic farming
- Understand the steps in Organic farming
- Understand the need of cultivation practices
- Classify the types of manures and fertilizers
- Illustrate the types of bio-fertilizers

UNIT-I **[6 hrs]**

- Introduction to Organic Farming- definition, principles
- Need of organic farming, difference between organic farming and modern chemical farming
- Detrimental effects of currently chemical dependent farming
- Demand for organic farming and health benefits of organic foods.
- Characteristics of modern and organic farming

UNIT-II **[6 hrs]**

- Types of organic farming
- Advantages and limitations of organic farming
- Basic steps in organic farming
- Components of organic farming

UNIT-III **[6 hrs]**

- Diverse crop rotation,
- Soil fertility management,
- Irrigation water management and Weed control
- Natural pests and disease control.

UNIT-IV **[6 hrs]**

- Plant nutrients, classification and their importance in crop production
- Sources of nutrients for organic agriculture – organic manures
- Differences between manures and fertilizers
- Preparation and application of FYM, Compost and Concentrated Manures.

UNIT-V **[6 hrs]**

- Animal waste and Vermicompost
- Green manures- definition, types and benefits and method of application
- Biofertilizers-definition, types, examples and benefits
- Application methods of Biofertilizer

SUGGESTED READING

1. Basics of organic farming. MamtaBansal, 2017, CBS Publishers & Distributors pvt Ltd.
2. Fundamental approaches in sustainable Agriculture. Jag Paul Sharma, 2006, Kalyani publishers.
3. This is organic agriculture, RajanyaJaisingh, 2005, Jain brothers.
4. Sustainable through organic farming. Mukund Joshi, T.K. Prabhakarasetty, 2006, kalyani publishes.
5. Farming systems and sustainable agriculture, S.R. Reddy, Kalyani publishers.
6. Organic farming-principles, prospects and problems, Suresh N. Deshmukh, 2012, Agrobios publishers.

CROP PRODUCTION TECHNOLOGY -1 (Kharif crops)

Credits : 2 **Semester: III**
Subject Code : AG19301 **No. of lecturehours: 30**

Objective: To impart knowledge on production of cereals, millets, pulses and fodder crops, Origin, Geographic distribution, Adaptation, Area, Production, and Productivity in India and Andhra Pradesh, Economic importance, Soil and Climatic requirements, Cultural practices, Cropping systems, Yield attributes, and Yield of following Cereals, Millets, Pulse and Fodder crops.

Outcome: Students will be able to gain knowledge on various crop production techniques from sowing to harvest.

Course Outcomes:

- Explains various crop production techniques from sowing to harvest for Rice and wheat
- Explains various crop production techniques from sowing to harvest for maize and sorghum
- Explains various crop production techniques from sowing to harvest for pearl millet, Finger millet, foxtail millet, Kodo millet, proso millet, little millet
- Explains various crop production techniques from sowing to harvest for Red gram, Bengal gram, green gram, black gram, cowpea, horse gram
- Explains various crop production techniques from sowing to harvest for different forage crops

UNIT-I **6hrs**

Origin, Geographic distribution, Adaptation, Area, Production, and Productivity, Economic importance, Soil and Climatic requirements, Cultural practices, Cropping systems and Yield attributes, and yield of

Rice 4
Maize 2

UNIT-II **6hrs**

Origin, Geographic distribution, Adaptation, Area, Production, and Productivity, Economic importance, Soil and Climatic requirements, Cultural practices, Cropping systems and Yield attributes, and yield of

Sorghum 2
Pearl millet 1
Finger millet 1
Minor millets- Foxtail, Kodo millet, common millet and little millet 2

UNIT-III **6hrs**

Origin, Geographic distribution, Adaptation, Area, Production, and Productivity, Economic importance, Soil and Climatic requirements, Cultural practices, Cropping systems and Yield attributes, and yield of

Red gram 1
Soybean 1
Green gram & black gram 1
Cowpea, Horse gram 2

UNIT-IV **6hrs**

Origin, Geographic distribution, Adaptation, Area, Production, and Productivity, Economic

importance, Soil and Climatic requirements, Cultural practices, Cropping systems and Yield attributes, and yield of

Sesamum	1
Castor	1
Cotton	2
Jute	2

UNIT-V **6hrs**

Origin, Geographic distribution, Adaptation, Area, Production, and Productivity, Economic importance, Soil and Climatic requirements, Cultural practices, Cropping systems and Yield attributes, and yield of

Maize, Jowar,	1
Bajra, Cowpea	1
Napier hybrid	1
Para grass, Guinea grass,	1
Sunhemp, Pillipesara	1

SUGGESTED READING:

1. Singh Chidda. 1983. **Modern Techniques of Raising Field Crops**. New Delhi: Oxford & IBH Publishing Co.
2. Chatterjee, BN. and Maiti, S. 1985. **Cropping Systems Theory & Practice**. New Delhi: IBH 3.
3. Reddy, SR. 2004. **Agronomy of Field Crops**. Ludhiana: Kalyani Publishers.
4. Bose Subhash Chandra, M.andBalakrishnan, V. 2001. **Forage Production**. New Delhi: Asian Publishers.
5. Prasad Rajendra. 2002. **Text Book of Field Crop Production**. New Delhi: Technical Editor, ICAR.
6. Singh, SS. 1988. **Crop Production Management**. Ludhiana: Kalyani Publishers.
7. Pal Mahendra, DekaJayanta and Raj, RK. 1996. **Fundamentals of Cereal Crop Production**. New Delhi: Tata McGraw Hill Publishing Co.

WATER MANAGEMENT

Credits : 1 **Semester: III**
Subject Code :AG19302 **No. of lecture hours: 15**

Objective: To impart knowledge on principles and practices of irrigation water management for efficient utilization of irrigation water and to increase productivity of crops
Outcome: Students will be able to acquaint with the knowledge on water resources of India, Telangana and Andhra Pradesh, soil-water relations, soil-plant relations and different methods of irrigation.

Course outcomes:

- Classify major, medium and minor irrigation projects
- Solve sample problems on available soil moisture and explain various soil moisture constants
- Differentiate Net and Gross Irrigation requirements and sub divide indirect methods of soil moisture estimation
- Judge different approaches of scheduling irrigation and different methods of irrigation
- Explain various micro irrigation methods and quality of water

UNIT-I **3Hrs**
Irrigation –, Importance, Definition & Objectives.Water Resources of India – Surface & Ground water resources – Irrigation Development in India – Important major irrigation projects.

Water Resources of Telangana – Surface & Ground water resources- Important major irrigation project in Telangana- Command Area Development & Water Management.
Soil-water relations - Physical properties of soil.Effective root zone depth – Moisture extraction pattern – Moisture sensitive periods of important crops.

UNIT – II **3 Hrs**
Water retention in soil – Adhesion & cohesion – Soil moisture tension - pF - Soil moisture characteristic curves.Water movement in soils – infiltration – Percolation – Hydraulic conductivity – Saturated & Unsaturated water flow.Kinds of water in soil – Gravitational Water - Capillary water - Hygroscopic water.
Soil moisture constants - Saturation capacity - Field capacity – Permanent wilting point – Available soil moisture – Hygroscopic coefficient – Theories of soil water availability – Moisture retentive capacity (FC, PWP & ASM) of different soils
Measurement of soil moisture – Direct methods – Gravimetric & Volumetric method - Infra-red moisture balance method – Spirit burning method.

UNIT – III **3 Hrs**
Measurement of soil moisture - Indirect methods –Soil moisture probe – Tensiometer - Resistance blocks - Pressure plate and pressure membrane apparatus – relative merits and demerits.

Evaporation- transpiration. – Factors influencing evapotranspiration, - Daily, seasonal and peak period consumptive use. Reference crop evapotranspiration – Soil plant atmospheric continuum

Crop co-efficient – crop co-efficient curve - Water requirement – Irrigation requirement – Net & Gross irrigation requirement – Irrigation interval – Irrigation period – Seasonal water requirement of important crops

UNIT – IV **3 Hrs**

Scheduling of irrigation – Different criteria - Soil water regime approach - Feel and appearance method, Soil moisture tension and Depletion of available soil moisture method. Climatological approach – IW/CPE ratio method

Scheduling of irrigation – Plant indices approach –Visual plant symptoms, Soil-cum-sand mini plot technique, Growth rate, Relative water content, Plant water potential, Canopy temperature, Indicator plants & Critical growth stages.

Surface irrigation methods – Wild flooding, Check basin, Ring basin, Border strip, Furrow & Corrugations – Advantages and disadvantages.

Water use efficiency (WUE) – Crop water use and Field water use efficiency – factors influencing WUE

UNIT – V **3 Hrs**

Micro irrigation - Sprinkler, drip irrigation method – Definition - Advantages & disadvantages.- fertigation scheduling in drip irrigation method. Recommended water soluble fertilizers

Quality of water – Salinity hazard, Sodicity hazard, Residual sodium carbonate and Boron toxicity - Criteria and threshold limits – Management practices for using poor quality water.

Agricultural drainage – Surface and Sub-surface drainage systems – Relative merits and suitability to different soils.

SUGGESTED READING

1. Dastane N G 1967. A Practical manual for Water Use Research, Navbharat Publications, Poona.
2. Misra R.D and Ahmed M. 1998, Manual on Irrigation Agronomy, Oxford and IBH Publishing Co., Ltd., New Delhi.
3. Water requirement of crops in India. Monograph 4, 1977, IARI, ICAR publication, New Delhi.
4. Israelsen O W and Hansen V E 1962. Irrigation – Principles & Practices, John Willey and Sons, Inc, U.S.A.
5. Reddy G H S and Reddy T Y 2006, Efficient Use of Irrigation Water, Kalyani Publishers, Ludhiana.
6. S.R. Reddy, 2007. Irrigation Agronomy, ,Kalyani Publishers, Ludhiana.
7. D.K. Majumdar, 2002. Irrigation Water Management: Principles & Practices, Prentice hall of India Private Limited, New Delhi.
8. Michael A M, 2006. Irrigation – Theory & Practice. Vikas publishing house private ltd.
9. Sivanappan R k Padma Kumari O and Kumar, V 1987. Drip Irrigation –. Keerthi Publishing House Pvt., Ltd., Coimbatore.
10. Tiwari K N T 2006. Manual on pressurized Irrigation Scientific Publication No: PFDC, ITT, Kharagpur.

FUNDAMENTALS OF PLANT BREEDING

Credit : 2 **Semester: III**
Subject code : AG19303 **No. of lecture hours: 30**

Objective: To impart knowledge on the principles and procedures of plant breeding in self and cross pollinated crops to develop the high yielding varieties / hybrids

Outcome: Students will be able to acquaint with the various breeding methods for crop improvement.

Course outcomes:

- Recognizes the benefits of plant breeding and crop genetic resources
- Interpret the methods of breeding and to illustrate the methods
- Explain the importance of different breeding methods
- Compare the methods of population improvement
- Formulate special breeding methods

UNIT-I **6**

- Definition-aims-objectives & scope of plant breeding
- History & development-scientific contribution of eminent plant breeders
- Landmarks in plant breeding-Indian plant breeders-significant achievements
- Genetics in relation to plant breeding
- Modes of reproduction: Asexual &Sexual classification
- Mechanisms promoting self & cross pollination-male sterility &self-incompatibility
- Methods of plant breeding-methods for self-pollinated, cross pollinated & asexually propagated species-brief account of breeding method

UNIT-II **6**

- Plant introduction-purpose & procedure –Merits &demerits
- Biometrical genetics- Qualitative and quantitative characters
- Components of Genetic variance- Additive, Dominance and Epistatic
- Methods of breeding-selection-natural & artificial
- Mass selection- methods, merits & demerits-achievements
- Johanson's pureline theory-concept & significance
- Genetic basis of pureline selection-advantages & limitations

UNIT-III **6**

- Hybridization –aims & objectives-handling of segregation generation
- Pedigree method-merits & demerits
- Bulk method-procedure &merits
- Backcross method-merits, demerits & achievements
- Population genetics and Hardy Weinberg law
- Wide hybridization

UNIT-IV **6**

- Heterosis-hybrid vigour-genetic basis of heterosis
- Inbreeding depression-development of inbred lines
- Synthetics & composites-production procedure
- Population improvement & recurrent selection
- Methods of breeding vegetatively propagated crops-clones-achievements & limitations
- Polyploidy breeding-auto & allopolyploids-limitation & achievements

UNIT-V **6**

- Mutation breeding-utility, achievements & limitations
- Breeding for resistance to abiotic stress (Drought, Salinity, cold tolerance)
- Breeding for insect & disease resistance mechanisms
- Use of biotechnology in plant breeding
- Procedure for release of new varieties

SUGGESTED READING

1. Singh, B.D. 2006. **Plant Breeding: Principles and Methods**. New Delhi: Kalyani Publishers.
2. Phundan Singh 2006. **Essentials of Plant Breeding**. Ludhiana: Kalyani Publishers.
3. Poehlman, J.M. and Borthakur, D. 1995. **Breeding Asian Field Crops**. New Delhi: Oxford & IBH Publishing Co. Pvt. Ltd.
4. Sharma, J.R. 1994. **Principles and Practice of Plant Breeding**. New Delhi: Tata McGraw-Hill, Publishing Co. Ltd

INSECT ECOLOGY AND IPM

Credits : 2 **Semester: III**
Subject Code : AG 20304 **No. of Lecture hours: 30**

Objective: To impart knowledge on basic concepts of insect ecology and pest management practices.

Outcome: Students will gain knowledge on ecology of insect and integrated management practices of pests.

Course Outcomes:

- Identify the importance of biotic and abiotic factors in the life of insects
- Explains the concepts of biological and chemical control
- Classify insecticides based on mode of action
- Describes the recent techniques of pest control
- Explains other insect and non-insect pests

UNIT-I **6Hrs**

- Introduction - autecology and synecology – population, community - importance of insect ecological studies in Integrated Pest Management (IPM) - environment and its components – soil, water, air and biota.
- Abiotic factors – Temperature- its effect on the development, fecundity distribution, dispersal and movement of insects - adaptations of insects to temperature - thermal constant
- Moisture- adaptation of insects to conserve moisture. - humidity- its effect on development, fecundity and colour of body - rainfall - its effect on emergence, movement and oviposition of insects
- Light – phototaxis - photoperiodism - its effect on growth, moulting activity or behaviour, oviposition and pigmentation - use of light as a factor of insect control .Atmospheric pressure and its effect on behavior. Air currents - effect on dispersal of insects – edaphic factors – water currents.
- Biotic factors – Food - classification of insects according to nutritional requirements - other organisms – Parasitoids, Predators & Pathogens

UNIT II **6Hrs**

- Biological control - types of biological control – introduction, augmentation and conservation – parasite – parasitoid - parasitism.
- Grouping of parasitoids based on nature of host, stage of host, site of parasitisation, durationof attack, degree of parasitisation and food habits – Kinds of parasitism – qualities/attributes of an effective parasitoid to be successful one.
- Biological control - Predators – predatism – qualities of insect predator – differences between predator and parasitoid
- Concept of balance of life – biotic potential and environmental resistance normal coefficient of destruction - factors contributing to increase or decrease of population - causes for outbreak of pests in agro-ecosystem – explanation for these causes.
- Chemical control - importance and ideal properties of insecticide - classification of insecticides based on origin, mode of entry, mode of action and toxicity - toxicity evaluation of insecticides

- LC50 (Lethal Concentration), LD50 (Lethal Dose), ED50 (Effective Dose), LT50 ((Lethal time), KD50 (Knockdown Dose) and KT50 (Knock Down Time)

UNIT-III **6Hrs**

- Formulations of insecticides - dusts, granules, wettable powders, water dispersible granules, solutions, emulsifiable concentrates, suspension concentrates, concentrated insecticide liquids, fumigants, aerosols, baits and mixtures of active ingredients. Inorganic insecticides - arsenic Compounds - fluorine and sulphur
- Synthetic organic insecticides – chlorinated hydrocarbons – toxicity and mode of action. Organo phosphates - systemic, non-systemic and translaminar action of insecticides with examples – brief mode of action – toxicity. Carbamates - mode of action – toxicity. Synthetic pyrethroids - brief mode of action – toxicity.
- Novel insecticides – nicotinoid insecticides - brief mode of action – toxicity. Macro cyclic lactones – Oxadaizines – Thioureas - Pyridine azomethines - Pyrroles -. Formamidines – Ketoenols b -Diamides brief mode of action – toxicity.
- IGR - Chitin synthesis inhibitors – brief mode of action - toxicity;Juvenile hormone (JH) mimics – brief mode of action - toxicity, ;Anti JH or precocenes, Ecdysone agonists - brief mode of action – toxicity, formulations.

UNIT-IV **6Hrs**

- Recent methods of pest control- repellants (physical and chemical) and antifeedants - importance of antifeedants and limitations of their use – attractants - sex pheromones - list of synthetic sex pheromones - use in IPM - Insect hormones – gamma irradiation – genetic control – sterile male technique.
- Application techniques of spray fluids - high volume, low and ultra low volume sprays - phytotoxic effects of insecticides - advantages and limitations of chemical control
- Safe use of pesticides. Symptoms of poisoning - first aid and antidotes for important groups of insecticides; Insecticide resistance-insect resurgenceinsecticide residues – importance - Maximum Residue Limits (MRL) – Average Daily Intake (ADI) – waiting periods – safety periods - Insecticides Act 1968 – important provisions.

UNIT V **6 Hrs**

- Rodents- Important major rodent sps.- Nature of damage- management - Rodenticides – zinc phosphide, aluminum phosphide, bromodilone; Fumigants - aluminum phosphide
- Mites- Importance - morphology and biology of mites. Mites- Classification- characters of important families tetranychidae, tenuipalpidae, tarsonimidae and eriophyidae- host range - Management
- Other non-insect pests - Mollusc pests, vertebrate pests and their management.

REFERENCES :

1. Vasanthrai David, B. 2003. Elements of Economic Entomology. Popular Book Depot, Coimbatore.
2. Nair KK, Anantha Krishnan TN and BV David 1976. General and applied entomology, Tata McGraw Hill publishing co. Ltd, New Delhi
3. Yazdani, S.S and Agarwal,M.L.1979. Elements of Insect Ecology. Narosa Publishing House,New Delhi.

FARM MANAGEMENT AND PRODUCTION ECONOMICS

Credits : 2 **Semester: III**
Subject code : AG 19305 **No. of Lecture hours: 30**

Objective: To impart knowledge on the principle of agricultural production and farm management economics. To learn the basic production relationships between input and output in agricultural production, understand the application of economic principles to the organization and operation of farm business, have an exposure to the management and administration of various farm supplies and prepare farm plans and budgets.

Outcome: Students will be able to gain knowledge on relationships between input and output in Agricultural production, farm management and preparing farm planning and budget.

Course Outcomes:

- Analyze laws of returns and factor product relationship
- Judge input output relationship in agricultural production
- Apply cost analysis in agricultural production
- Make up law of equi-marginal returns in agricultural production
- Distinguish types and systems of farming

UNIT-I **6**

- Agricultural production economics – introduction – nature and scope – subject matter 2
- Laws of returns – law of constant returns – law of increase returns – law of decrease returns 2
- Factor-product relationships – proportionality relationship – scale relationships 2

UNIT-II **6**

- Factor-factor relationship – iso-quants and their characteristics – marginal rate of technical substitution (MRTS) – types of factor substitution – iso-cost line 2
- Least cost combination of resources – expansion path – isoclines – ridge line – product-product relationships – iso-revenue line – production possibility curve – marginal rate of product substitution 2
- Types of enterprise relationships – joint products – complementary products – supplementary products 2

UNIT-III **6**

- Cost concepts – cost curves – input-output relationships in the short period and long period – cost minimization and profit maximization techniques 2
- Returns to scale – resource productivity – resource use efficiency in agriculture – distinction between risk and uncertainty – sources of risks uncertainty 2
- Production and technical risks – prices or market risk – financial risk – methods of reducing risk 2

UNIT-IV **6**

- Farm management economics – meaning – definitions of farm management – scope of farm management 2
- Relationship with other sciences – economic principles applied to the organization farm management 2

- Law of equi-marginal returns – opportunity cost principle – principle of comparative advantage – time comparison principle. 2

UNIT-V **6**

- Types of farming – specialization, diversification, mixed farming – systems of farming – co-operative farming, capitalistic farming, collective farming, state farming, contract farming and peasant farming 2
- Farm planning – meaning – need for farm planning – types of farm plans – simple farm plan and whole farm plan – characteristics of a good farm plan – basic steps in farm planning 2
- Farm budgeting – meaning – types of farm budgets – enterprise budgeting – partial budgeting and whole farm budgeting – linear programming – meaning – assumptions – advantage and limitations. 2

SUGGESTED READING

1. Johl, S.S. and Kapur, J.R. 2004. **Fundamentals of Farm Business Management**. Ludhiana: Kalyani publishers.
2. Sankhayan, P.L. 1983. **Introduction to Farm Management**. New Delhi: Tata McGraw-Hill Publishing Co. Ltd.
3. Singh, I.J. 1977. **Elements of Farm Management Economics**. New Delhi: Affiliated East-West Press Pvt. Ltd.
4. Subba Reddy S. Raghuram, P., NeelakantaSastry, T.V. and Bhavani Devi, I. 2009. **Agricultural Economics**. New Delhi: Oxford & IBH Publishing Co. Pvt. Ltd.

FARM POWER AND MACHINERY

Credits : 1 **Semester: III**
Subject code : AG 19306 **No. of lecture hours: 15**

Objective: To impartknowledge on the significance, use and maintenance of farm power and improved farm equipment through various media including demonstrations.

Outcome: Students will be able to gain knowledge on two stroke and four stroke engines, farm tractors, various ploughs, harrows, seeding and harvesting implements.

Course outcomes:

- Generalizes types of engines and solves problems related to mechanical power
- Explain fuel system, cooling system and solves problems on tractor power
- Differentiates types of ploughs and their parts
- Classify various harrows, cultivators and other implements
- Sketches various fertilizer and seeding equipments

UNIT-I **3**

Introduction – Source of farm power, merits and demerits of different forms of power.
Mechanical power – Engines, types of engines, principle and working of I.C. engine,
Four stroke and two stroke cycle engines.
Working of petrol and diesel engine and comparison of diesel with petrol engines,
Measurement of engine power – Terminology connected with engine power.
Calculation of power and problems related to mechanical power.

UNIT-II **3**

Engine systems – Fuel supply system of diesel and petrol engines,
Lubrication, purpose of lubrication, methods of lubrication
Cooling purpose of cooling in an IC engine and methods of cooling systems.
Transmission system
Farm tractors – types, classification, selection of tractors, Repairs and maintenance of tractor.
Estimating the cost of tractor power and problems related to that.

UNIT-III **3**

Tillage – definition, objectives, types of tillage Operations, Types of animal and tractor drawn implements. Wooden plough – uses, parts and working, adjustments required to regulate the depth of ploughing.
Mould board plough – advantages, construction and function of principal parts, plough accessories, plough adjustments, terms used and maintenance.
Disc plough – Types, advantages, disadvantages, parts, terminology and adjustment of disc plough differences between M.B. plough and disc plough
standard and vertical disc plough, care and maintenance of disc plough.

UNIT-IV **3**

Harrows – types, uses of disc harrow, classification, parts, and adjustments, spike
tooth harrow and spring type harrows, operation and parts.
Cultivators – function – classification. Rigid and spring loaded cultivators
Other implements and hoes – Puddler, Bund former, Ridger, Soil scoop, Green manure trampler,

paddy, weeder

UNIT-V **3**

Seeding and fertilizer equipment – sowing, methods of sowing, seed drill – functions, seed-cum-fertilizer drills,
Seed meeting mechanisms, calibration of seed drills – cultivation with seeding adjustments – care and maintenance and problems.
Transplanters – manual and power operated rice transplanter.
Harvesting – Definition related terms in connection with harvesting – sickles – mowers, alignment and registration of mover.
Plant protection equipment : Operation, care and maintenance.

SUGGESTED READING

1. JagadishwarSahey. 1992. **Elements of Agricultural Engineering**. Patna: Agro Book Agency.
2. Michael, A.M. and Ojha, T.P. 1993. **Principles of Agriculture Engineering** (Vol. I). New Delhi: Jain Brothers.

PRINCIPLES OF FOOD SCIENCE AND NUTRITION

Credits : 2 **Semester: III**
Subject code : AG 19307 **No. of lecture hours: 30**

Objective: This course enables the students to learn the concepts of food microbiology, methods of food processing and preservation, new trends in food science and nutrition

Outcome: The student will be able to gain knowledge on Concepts of Food Science, Food and nutrition, Food microbiology, Malnutrition and new trends in food science and nutrition

Course outcomes:

- Define food and explain the composition of food
- Classify vitamins, minerals and other compounds
- Explain the concept of food microbiology
- Explain preservation of food by various methods
- Analyze nutritional disorders

UNIT-I **6 Hrs**

Concepts of Food Science- definitions- Food, nutrition, health, nutritional classification of foods.
Different measurements used in food science- density, phase change, pH, osmosis, surface tension, colloidal systems etc.
Water-composition, distribution of water in the body, functions, requirements
Carbohydrates- composition, classification, functions, requirements and sources
Proteins- composition, classification, functions, requirements and sources
Fats- composition, classification, functions, requirements and sources

UNIT-II **6 Hrs**

Vitamins- classification, functions, requirements, sources
Minerals- functions, requirements, sources
Flavours -Flavour compounds, types and classification
Colours -Natural and synthetic
Miscellaneous bioactives compounds-Antioxidants, Phytochemicals and important reactions of food components
Food microbiology- bacteria- general characteristics of bacteria, important bacteria in foods.

UNIT-III **6 Hrs**

Food microbiology- yeast- general characteristics of yeast, important yeasts in foods.
Food microbiology- molds- general characteristics of molds, important molds in foods.
Microbial spoilage of fresh and processed foods – Causes of spoilage, classification of foods by ease of spoilage, Factors affecting kinds and numbers of microorganisms in food,
Microbial spoilage of fresh and processed foods-Factors affecting the growth of microorganisms in food, Chemical changes caused by microrganisms
Production of fermented foods- principle, types, importance
Principles and methods of food processing and preservation- Asepsis, removal of microorganisms and maintenance of anaerobic conditions

UNIT-IV **6 Hrs**

Preservation of foods with heat (high temperature)-Pasteurization, Sterilization and Canning
Preservation of foods with low temperature -Refrigeration and Freezing
Preservation of foods with chemical –-Sulphur dioxide and Benzoic acid
Preservation of foods with radiation –principle and methods of radiation
Preservation of foods with drying –principle and methods of drying
Food and nutrition - role of nutrients in health and nutrition

UNIT-IV **6 Hrs**

Malnutrition (Over and under nutrition) - definition – causes – symptoms
Nutritional disorders- carbohydrates deficiency, protein deficiency, fats deficiency,
Nutritional disorders- vitamin deficiency, mineral deficiency
Balanced and modified diets - importance in health and diseases
Menu planning- importance, menu planning based on physical activity, menu planning based on health status
New trends in food science and nutrition-Genetically modified foods, Neutraceuticals, Organic foods, Functional foods, Probiotics

References

1. Sumati R. Mudambi, Shalini M. Rao and M.V. Rajagopal. 2006. *Food Science*, 2nd Ed. New Age International (P) Limited, New Delhi.
2. Martin Eastwood. 2003. *Principles of Human Nutrition.* Blackwell Science Ltd., Oxford.
3. Norman N. Potter. 1998. *Food Science*, 5th Ed. Springer Science+ Business Media, New York.
4. Michael J. Pelczar Jr., E.C.S. Chan and Noel R. Krieg. 1998. *Microbiology,* 5th Ed. Tata McGraw-Hill Education, New Delhi.
5. William C. Frazier and & Dennis C. Westfoff. 1987. *Food Microbiology,* 4th Ed. Tata McGraw-Hill Education, New Delhi.
6. L.E. Casida Jr. 1968. *Industrial Microbiology.*New Age International Publishers, New Delhi.
7. P. Fellows. 2000. *Food Processing Technology: Principles and Practice*, 2nd Ed. CRC Press, Boca Raton, FL, USA.
8. Marcus Karel and Darvl B. Lund.2003.*Physical Principles of Food Preservation,* 2nd Ed. Marcel Dekker, Inc., NY, USA.
9. Gerald Wiseman. 2002. *Nutrition and Health.* Taylor & Francis, London.
10. *An Introduction to Nutrition*, v. 1.0

PRODUCTION TECHNOLOGY OF VEGETABLES AND SPICES

Credits : 1 **Semester: III**
Subject code : AG 19308 **No. of lecture hours: 15**

Objective: To impart knowledge to the students on production technologies of Vegetables, aromatic, medicinal crops.

Outcome: Students will be able to get knowledge on various vegetable crop production practices.

Course outcomes:

- Describe various production techniques in Solanaceous vegetables
- Apply various cultural operations to produce cruciferous and
  - leguminous vegetables
- Explain different cultivation practices in Cole, bulb and root crops
- Explain different cultivation practices in tuber crops, leafy vegetables and
  - perennial vegetables
- Explain different cultivation practices in Spice crops.

UNIT –I **3 Hrs**

Olericulture – definition - importance of vegetables in human nutrition and national economy-Types of vegetable gardens

Tomato – origin, climate, soil, improved varieties, cultivation practices, such as time of sowing, transplanting, planting distance, fertilizer requirements, irrigation, weed management, harvesting, yield and physiological disorders

Brinjal – Importance – varieties – climate & soil, cultivation practices, such as time of sowing, transplanting, planting distance, fertilizer requirements, irrigation, weed management, harvesting, yield

UNIT –II **3Hrs**

Chilli and Capsicum – importance – varieties – climate and soil seeds and sowing – manuring-Irrigation – intercultivation – harvesting – yield

Cucurbits- cucumber – gourds – Ridge gourd, Botte gourd , Snake gourd , Bitter gourd and Ash gourd –Melons – Water melon , musk melon – importance – varieties – climate and soil seeds and sowing – manuring-irrigation – intercultivation – harvesting – yield

Beans – French bean and cluster bean – peas , cow pea and dolichos bean – introduction – importance – varieties –seeds and sowing – manuring -irrigation – intercultivation – harvesting – yield

UNIT -III **3Hrs**

Cole crops –Cabbage – Cauliflower – Knol-Kohl- introduction – importance – varieties – climate and soil seeds and sowing – manuring-irrigation – intercultivation – harvesting – yield – physiological disorders

Bulb crops - onion and garlic – climate, soil, improved varieties, cultivational practices, such as time of sowing, transplanting, planting distance, fertilizer requirements, irrigation, weed management, harvesting, curing, yield, Physiological disorders

Root crops – carrot, Radish, Beetroot – introduction – importance – varieties – climate and soil

seeds and sowing – manuring -irrigation – intercultivation – harvesting – yield

UNIT –IV **3Hrs**

Tuber crops – Potato – colocasia - introduction– importance – varieties – Propagation – planting – manuring -irrigation – intercultivation – harvesting – yield

Leafy vegetables – Amaranthus,Palak – introduction – importance – varieties – climate and soil seeds and sowing – manuring -irrigation – intercultivation – harvesting – yield

Perennial vegetables – Drumstick, curry leaf, Coccinia - introduction– importance – varieties – Propagation – planting – manuring -irrigation – intercultivation – harvesting – yield

UNIT –V **3Hrs**

Turmeric – scientific name – family – plant parts used – origin and distribution – importance – Botany – varieties – propagation – climate – soil – preparation of land – systems of planting – Planting seasons – seed rate – spacing – sowing – mulching – irrigation – manuring – intercultural operations – provision of shade – intercropping – rotations – harvesting – processing – preservation of seed material

Ginger – Botanical name – family – plant parts used – varieties – propagation – climate – soil – preparation of land – systems of planting –Planting seasons – seed rate – spacing – sowing – mulching – irrigation – manuring – intercultural operations – provision of shade – intercropping – rotations – harvesting – processing – preservation of seed material

Coriander, Cumin and Fenugreek – Botanical name – family – plant parts used – origin and distribution –economic part – varieties – propagation – climate – soil – preparation of land –Season-seed rate – sowing – irrigation – manuring – intercultivation – Harvesting and yield

SUGGESTED READING

1. Vegetable crops in India, bose, T.K. and som, T.K.1986 Nayaprakash, Calcutta
2. Production technology of vegetable crops – Shanmugavelu, K.G.1985 Oxford and IBM publishing Co.Pvt.Ltd,New Delhi
3. Vegetables – Thompson , I.C.C and Kelley, W.C.1957. Tata McGraw-Hill, Publishing co.Ltd, Mumbai
4. Spices and plantation crops – Shanmugavelu, K.G and Madhava Rao, V.N.1977 Popular book depo., Chennai
5. Spices – purseglove, J.W.E.G., Brown Gren, C.L. and Robbins S.R.J.1980 Academic press New Delhi

PRINCIPLES OF ORGANIC FARMING (GE)
PRACTICAL

Credits : 1 **Semester: III**
Subject Code : G19AG1P **No. of lecture hours: 30**

- Identification of manures and bio-fertilizers
- Preparation of FYM
- Preparation of Compost
- Preparation of Vermicompost
- Application of Biofertilizers
- Preparation of Jeevamrutham and its application
- Plant protection in organic farming - botanical pesticides-
- preparation of Beejamrutham
- Preparation of Panchagavya and its application
- Preparation of Neemastram and its application
- Preparation of Brahmastram and its application
- Organic cultivation of crops – Cereals, Millets, Pulses and Vegetables.
- Cost of organic cultivation of crops
- Certification of organic produce- need of certification, procedure, quality standards.

CROP PRODUCTION-1
PRACTICAL

Credits : 1 **Semester: III**
Subject Code :AG19309 **No. of lecturehours: 30**

Objective: To experience practically the constraints in crop production by raising a crop in the field.

Outcome: Students will be able to learn various crop production techniques starting from land preparation to harvest**.**

1. Identification of crops, crop seeds and forage crops.
2-3 Allotment of individual fields for land preparation and sowing crops.
4. Calculation of seed rate and fertilizer requirements.
5. Rhizobium inoculation and seed treatment.
6. Thinning, Weeding, Gapfilling, and recording the germination Percentage.
7. Identification and management of weeds.
8. Recording the biometric observations.
9-10 Methods of raising rice nurseries.
11. Study of agronomic characters of rice varieties.
12. Study of agronomic characters of Sorghum and maize varieties and millet crop varieties.
13. Study of agronomic characters of pulse crop varieties.
14-15. Harvesting of crop in individual fields and recording yield.

WATER MANAGEMENT
PRACTICALS

Credits : 1 **Semester: III**
Subject Code : AG19310 **No. of practical hours: 30**

Objective: To develop skills in estimation of soil moisture content and different methods of irrigation.

Outcome: Students will be able to gain knowledge in estimation of soil moisture content by different methods and operation and maintenance of sprinkler and drip irrigation systems.

1. Determination of bulk density
2. Determination of soil moisture content by gravimetric and volumetric methods
3. Installation and working of tensiometer in a cropped field
4. Installation and working of resistant block in a cropped field
5. Determination of field capacity by field method
6. Determination of permanent wilting point by field method
7. Measurement of irrigation water through flumes, weirs and water meters.
8. Scheduling of irrigation by IW/CPE ratio method
9. Measurement of plant water status using Pressure bomb apparatus/ porometer
10. Calculation of irrigation water needs (problems)
11. Determination of infiltration rate
12. Demonstration of surface methods of irrigation (basin, check basin and furrow)
13. Demonstration of drip irrigation system (filter cleaning, flushing of laterals) and calculation of crop water requirement.
14. Component, operation and maintenance of sprinkler irrigation system
15. Fertigation scheduling in important crops

FUNDAMENTALS OF PLANT BREEDING PRACTICALS

Credits :1 **Semester: III**
Subject code: AG19311 **No. of practical hours: 30**

Objective: Toimpart emasculation and crossing techniques in various field crops.
Outcome: Students will be able to study the floral biology, anthesis, selfing and emasculation techniques of various field crops.

1. Study of megasporogenesis and microsporogenesis, fertilization and life cycle of an angiospermic plant
2. Plant Breeder's kit for hybridization
3. Floral biology, anthesis, pollination, selfing and crossing techniques in Rice.
4. Floral biology, anthesis, pollination, selfing and crossing techniques in maize.
5. Floral biology, anthesis, pollination, selfing and crossing techniques in Millets – Sorghum and pearl millet.
6. Floral biology, anthesis, pollination, selfing and crossing techniques in oilseeds – Groundnut and sunflower.
7. Floral biology, anthesis, pollination, selfing and crossing techniques in Sesame.
8. Floral biology, anthesis, pollination, selfing and crossing techniques in pulses .
9. Floral biology, anthesis, pollination, selfing and crossing techniques in vegetable crops-Tomato, Chilly and Brinjal.
10. Floral biology, anthesis, pollination, selfing and crossing techniques in cotton &Bhendi
11. Basic statistics, commonly used in plant breeding – Mean, range, variance, Phenotypic Coefficient of Variation (PCV), Genotype Coefficient of Variation (GCV), Heritability and genetic advance.

12&13.Calculation of heterosis, heterobeltiosis, standard heterosis and inbreeding depression.

14. Calculation of general combining ability, specific combining ability, variances and effects
15. Visit to RARS / local research station / ICAR institute to acquaint about the handling of segregating generations – pedigree, bulk and back cross methods – PYT, AVT and other methods.

FARM MANAGEMENT AND PRODUCTION ECONOMICS PRACTICALS

Credits : 1 **Semester: III**
Subject code : AG19313 **No. of practical hours: 30**

Objective: To collect data independently on cost of cultivation of crops and livestock enterprises and compute costs and returns from farm operations.

Outcome: The students will be able to gain practical exposure on cost of cultivation of crops and live-stock and enterprises and workout the farm budget.

1. Visit to farm households – collection of data on cost of cultivation of crops and livestock enterprises-I.
2. Visit to farm households – collection of data on cost of cultivation of crops and livestock enterprises-II.
3. Visit to farm households - collection of data on cost of cultivation of crops and livestock enterprises-III.
4. Determination of optimum input and optimum output.
5. Determination of optimum combination of products.
6. Computation of seven types of costs – I
7. Computation of seven types of costs - II
8. Computation of cost concepts related to farm management
9. Farm inventory
10. Methods of computing depreciation
11. Farm financial analysis – preparation of net worth statement and its analysis – I
12. Farm financial analysis – preparation of net worth statement and its analysis – II
13. Preparation of farm plans and budgets – enterprise and partial budget – I
14. Preparation of farm plans and budgets – enterprise and partial budget – II
15. Visit to college farm – preparation of college farm plan and budget
16. Preparation of farm household particulars in detail.

FARM POWER AND MACHINERY
PRACTICALS

Credits : 1 **Semester: III**
Subject code : AG19314 **No. of practical hours: 30**

Objective: To gain skills on farm power management and use of equipment.

Outcome: Students will be able to gain knowledge on working of two stroke and four stroke petrol engines and different farm equipment**.**

1. Study of different components of an I.C. engine.
2. Study of fuel system.
3. Study of Lubrication system.
4. Study of cooling system
5. Study of transmission system of Tractor, Maintenance and operator of tractor.
6. Study of indigenous plough, M.B. plough.Study of disc plough.

7-8. Study of harrows cultivators and other implements.

9-10. Study of seed – cum – fertilizer drills – furrow openers – seed metering mechanisms.

11-13. Study of plant protection equipment – sprayers and dusters.

14-15. Visit to research institutes like CRIDA, ICRISAT and ANGRAU where research in farm implements and machinery is being conducted.

PRODUCTION TECHNOLOGY OF VEGETABLES AND SPICES PRACTICALS

Credits: 1 **Semester: III**
Subject code:AG19315 **No. of practical hours: 30**

Objective: To impart skills in identifying different varieties, cultivation practices of Vegetable crops and spices

Outcome: Students will be able to identify different fruits, spices and plantation crops and acquaint with production technology and processing techniques.

1. Identification of vegetables and their seeds
2. Identification of spices and their seeds
3. Raising of vegetable nurseries
4. Direct seed sowing and transplanting
5. Study of morphological characters of different vegetables
6. Study of different characteristics of different species
7. Fertilizer application
8. Harvesting and preparation for market
9. Economics of spices cultivation
10. Economics of vegetable cultivation
11. Harvesting indices of different vegetable crops
12. Grading and packing of vegetables
13. Visit to commercial vegetable fields
14. Intercultural operations in vegetable crops
15. Processing of spices
16. Visit to spice garden

PRACTICAL CROP PRODUCTION-I
PRACTICAL

Credits: 1 **Semester: III**
Subject code: AG19316 **No. of practical hours: 30**

PRACTICAL

1. Crop planning in multiple cropping systems.
2. Field preparation and layout of experiment plots.
3. Seed treatment and nursery raising in paddy.
4. Sowing of crops in individual plots.
5. Time and method of fertilizer application for *kharif* crops.
6. Recording bio-metric observations
7. Water management for different *kharif* crops.
8. Study of weed control methods in *kharif* crops (Rice, redgram, , cotton etc.)
9. Study of plant protection measures in *kharif* crops (Rice, cotton, etc,)
10. Methods of harvesting, yield recording and post-harvest care.
11. & 12. Visit to seed production farm.
13. Visit to Integrated Farming system unit.
14. Visit to farm mechanization unit.
15. Preparation of Balance sheet.

YEAR-WISE AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS B.Sc. (Hons.) AGRICULTURAL SCIENCE & RURAL DEVELOPMENT
FOURTH SEMESTER
ACADEMIC YEAR-2022-23 OF 2021-25 BATCH (CBCS)

Sl. No.	Part	Subject Code	Title of the Subject	Hours/ week	Duration of Exam (hrs.)	Marks			Credits
						Internal	External	Total	
THEORY									
1	I	ES18201	Environmental Studies & Gender Sensitization **(AECC-5)**	3	3	40	60	100	3
2	II	AG19401	Crop Production.-II(Rabi crops) (Core-22)	2	3	40	60	100	2
3	II	AG19402	Prin. Of Seed Tech& IPR (Core-23)	2	3	40	60	100	2
4	II	AG19403	Manures, Fertilizers & SFM (Core-24)	2	3	40	60	100	2
5	II	AG19404	Prin. Of Pl. Pathology(Core-25)	2	3	40	60	100	2
6	II	AG19405	Agricultural-Finance, Cooperation. & Marketing. (Core-26)	2	3	40	60	100	2
7	II	AG19406	Production technolgy for Ornamental. Crops, MAP & Landscaping (Core-27)	1	3	40	60	100	1
8	II	AG19407	Statistical Methods(SEC-4)	1	3	40	60	100	1
9	II	AG19408	Fund. Of Agricultural Extension education (Core-28)	2	3	40	60	100	2
10	II	AG21510 A	Micro-Propagation (DSE-1)	2	3	40	60	100	2
		AG19409 B	Agri Business Management & E.D (DSE-1)						
PRACTICALS									
11	II	AG19410	Crop Production.-II (Rabi crops) (Core-22)	2	3	40	60	100	1
12	II	AG19411	Prin. Of Seed Tech & IPR (Core-23)	2	3	40	60	100	1
13	II	AG19412	Manures, Fertilizers & SFM (Core-24)	2	3	40	60	100	1
15	II	AG19413	Agri-Finance,Cooperation . & Marketing (Core-26)	2	3	40	60	100	1
16	II	AG19414	Production technology for Ornamental. Crops, MAP & Landscaping (Core-27)	2	3	40	60	100	1
17	II	AG19415	Statistical Methods(SEC-4)	2	3	40	60	100	1
18	II	AG19416	Fund. Of Agricultural Extension Education(Core-28)	2	3	40	60	100	1
19	II	AG21520 A	Micro-Propagation (DSE-1)	2	3	40	60	100	1
		AG19417 B	Agri- Business Management & E.D (DSE-1)						
Total				**35**			1140	1900	**27**

* Ability Enhancement Compulsory Course (AECC) *Skill Enhancement Course (SEC)

*Discipline-Specific Elective (DSE) Add on course : Agri waste Management

Loyola Academy, Old Alwal, Secunderabad 500 010

ENVIRONMENTAL STUDIES &GENDER SENSITIZATION

Credits : 3 **Semester: IV**
Subject Code : ES18201 **No. of lecture hours: 45**

Objectives:

- To understand the importance of ecological balance for Sustainable Development
- To understand the impacts of developmental activities and mitigation measures
- To understand the environmental policies and regulations.
- To develop students sensibility with regard to issues of gender in contemporary India
- To provide a perspective on the socialization of men and women
- To expose the students to debate on the politics and economic works and on gender violence

Outcome:

- Students will gain knowledge on environmental aspects and involve themselves in acquiring a sustainable environment.
- Students will be sensitized towards gender issues in the society and the laws enforced for their protection.

Course outcomes:

- Understand the importance of Environmental education, conservation of natural resources & understand the importance of ecosystems and biodiversity
- Understand the pollution problems and apply the environmental science knowledge on solid waste management, disaster management
- Apply the environmental science knowledge to improve the resources and evaluate and understand the sustainable environmental conditions and control methods
- Identify the interactions and intersections of identities (e.g., gender, race, ethnicity, class, sexuality, and so on) and assess the ways in which they contribute to instances of privilege and power dynamics across cultures, space, and time and their problems
- Understand the gender problems and ways of addressing them, including interactions across local to global scales in communities and overcome inequalities with legislations

UNIT- I **9hrs**

Natural Resources, Ecosystems, & Biodiversity

- Definition, Scope and importance of environmental studies. Need for public awareness.
- Renewable & Non Renewable resources, Brief account on Forests, Water, Minerals and Energy (Solar, Wind, and Geo-thermal & Bio-energy).
- Definition of Ecosystem, Structure and functions—food chains, food webs, ecological pyramids, producers, consumers and decomposers.
- Energy flow and example ecosystems--- Forest, Desert, Aquatic ecosystems.
- Definition of Biodiversity, types (Genetic, Species, Ecosystem), India- mega diversity Nation.
- Hotspots, Threats to biodiversity, Conservation of biodiversity (In-Situ and Ex-Situ).

UNIT-II **9hrs**

Environmental Pollution

- Definition of Environmental pollution
- Brief account of causes, effects, prevention and control measures of
  (a) Air pollution
  (b) Water Pollution
  (c) Soil pollution
  (d) Noise pollution

(e) Marine Pollution

- Solid Waste Management: Causes, Effects & Control measures of urban and industrial wastes
- Disaster Management: floods, Earth quakes, and Cyclones.

UNIT-III **9hrs**

Social Issues and Environment

- Rain-Water Harvesting, Water-shed Management, and From Unsustainable to Sustainable Development.
- Global Warming, Ozone depletion, and Acid rains
- Environmental Legislation: Air Act, Water Act, Environmental Protection Act, Forest Act, Wildlife Act.
- Environmental & Human Health---- HIV/AIDS
- Welfare Programs---- Family, Women & Child Welfare, Population Explosion
- Role of Information Technology in Environmental Studies.

UNIT-IV **9hrs**

Gender Studies

- Why should we study gender issues?
- Socialization- Making women and making men
- Being together as equals-Through the lens of gender
- Missing women: Gender selection and its consequences
- Health issues of Women

UNIT-V **9hrs**

Gender & Labour -Gender Violence & Law

- House work : The invisible labour- my mother doesn't work "share the load"
- Sexual harassment – say no eve teasing – the caste based violence –Nirbhaya Act
- Domestic violence - Is home a safe place? - Blaming the victim.-Domestic violence Act
- Forums of justice-Hindu Inheritance Act(2005)

Field Visit for Environmental Studies:

1. Visit to a local Polluted site- Industrial effluent plant/ Polluted Lake/Agricultural Land
2. Visit to any Ecosystem

ESSENTIAL READING (for Gender Sensitization)

1. A. Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, VasudhaNagaraj, AsmaRasheed, GoguShyamala, DeepaSreenivas and Susie Tharu. 201. **Towards a World of Equals : A Bilingual Text on Gender**. Hyderabad: Telugu Akademi.

SUGGESTED READING

(for Environmental Studies)

1. Rajagopalan R. 2015. **Environmental Studies-from Crisis to Cure.** Third Edition. Chennai: Oxford University Press.
2. Dr D K Asthana and DrMeeraAsthana. 2014. **A Text Book of Environmental Studies** Revised Edition. New Delhi: S. Chand & Company.
3. AnubhaKaushik and C.P. Kaushik Published. 2016. **Perspectives in Environmental Studies.** Fifth Edition. New Delhi: New Age International.

(for Gender Sensitization)

4. Sen Amartya**More Than One Million Women Are Missing.** New York Review of Books 37.20 (20 December 1990). Print. **We Were Making History...Life Stories of Women in the TelanganaPeople's Struggle**. New Delhi: Kali for Women. 1998.

5. TriptiLahiri. **By the Numbers: Where Indian Women Work. Women's Studies Journal .(**14 November 2012). Available online at: <http://blogs.wsj.com/ India real time/2012/11/14/by – the numbers-where-Indian-women-work/>
6. K. Satyanarayana and Susie Tharu. Ed. **Steel Nibs Are Sprouting : New Dalit Writing From South India, Dossier 2: Telugu and Kanada** Code=3732.
7. Vimala. **Vantillu(The Kitchen)". Women Writing in India: 600 Bc to the Present. Volume II.**The 20th Century. Ed. SuiseTharu and K.Laltitha. Delhi: Oxford University Press, 1995.599-601.
8. Shatrughna, Veena. **Women's Work and its Impact on Child Health and Nutrition.**Hyderabad: National Institute of Nutrition, Indian Council of Medical Research .1993.

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CROP PRODUCTION TECHNOLOGY-II (RABI CROPS)

Credit : 2 **Semester: IV**
Subject code : AG19401 **No. of lecture hours: 30**

Objective: To impart knowledge on crop production techniques from sowing to harvest and to get knowledge about the soils and climatic requirements and various cropping systems.

Outcome: Students will be able to gain knowledge about the crop management techniques from sowing to harvest.

Course outcomes:

Explains various crop production techniques from sowing to harvest for various oilseed crops
Explains various crop production techniques from sowing to harvest for various cereal crops
Explains various crop production techniques from sowing to harvest for various legume crops
Explains various crop production techniques from sowing to harvest forfibre crops
Explains various crop production techniques from sowing to harvest for commercial crops

UNIT-I	**6**
• Agronomy of Groundnut	2
• Agronomy of Sunflower	1
• Agronomy of Safflower	1
• Agronomy of Rapeseed and Mustard	1
• Agronomy of Linseed and Niger	1
UNIT-II	**6**
• Agronomy of Wheat	1
• Agronomy of Barley	1
• Agronomy of Oats	1
• Agronomy of Quinoa	1
UNIT-III	**6**
• Agronomy of Chickpea	1
• Agronomy of Rabi Redgram	1
• Agronomy of Lentil	1
• Agronomy of Peas	1
• Agronomy of Rajmah	1
• Agronomy of Berseem & Lucerne	1
UNIT-IV	**6**
• Agronomy of Mesta – retting - fiber extraction – fiber quality characters	2
• Agronomy of Sunhemp	1
• Agronomy of Agave – retting- fiber extraction	1
• Agronomy of Tobacco.	1
• Tobacco – methods of curing – quality characters.	1
UNIT-V	**6**
• Agronomy of sugarcane.	2
• Sugarcane - ratoon crop management – Jaggery making.	1
• Agronomy of Sugar beet.	1
• Agronomy of Potato	2

SUGGESTED READING

1. Rao, I.S. 1964. **Crop Husbandry**. Bapatla, AndhraPradesh: Sri Lakshmi Press.
2. Chidda Singh.1983. **Modern Techniques of Raising Field Crops**. New Delhi: Oxford and IBH Publishing Co.
3. Rajendra Prasad (Tech.Editor). 2002. **Text Book of Field Crops Production**. New Delhi: ICAR.
4. Singh, S.S. 1988. **Crop Management**. Ludhiana: Kalyani Publishers.
5. Reddy, S.R. 2004. **Agronomy of Field Crops**. Ludhiana: Kalyani Publishers.
6. Singh, N.P. and Singh, R.A. 2002. **Scientific Crop Production.**Ludhiana: Kalyani Publishers.
7. Yadav, R.L. 1993. **Agronomy of Sugarcane - Principles and Practices**. Lucknow: International Book Distribution Co.

PRINCIPLES OF SEED TECHNOLOGY AND IPR

Credits : 2 **Semester: 1V**
Subject code : AG19402 **No. of lecture hours: 30**

Objective: To impart knowledge to the students on the seed production and seed science and Technology aspects in relation to seed act.

Outcome: The students will be able to acquaint with the varietal and hybrid seed production techniques of various field crops, seed certification procedure and intellectual property rights.

Course outcomes:

Describes concepts of seed quality and genetic purity
Interpret the varietal and hybrid seed production techniques of various crops
Generalize various techniques of hybrid seed production
Explains steps in seed processing and field inspection
Judges IPRs and their relevance in seed industry

UNIT-I **6 Hrs**

Introduction to seed technology-Role and goals- Seed and grain
Maintenance of genetic purity, crop deterioration and its prevention
Seed quality concepts - factors responsible for maintenance of quality seed
Nucleus, breeders, foundation and certified seed production procedures in self and cross pollinated crops.
Seed certification- procedure -Field inspection

UNIT-II **6 Hrs**

Foundation and certified seed production of cereal crops
Foundation and certified seed production of pulse crops
Foundation and certified seed production of oil seed crops
Foundation and certified seed production of fodder crops
Foundation and certified seed production of vegetables crops

UNIT-III **6 Hrs**

Seed drying- methods
Seed cleaning and grading,
Seed treatment – Importance
Seed storage
Seed marketing

UNIT – IV **6 Hrs**

Varietal identification through grow out test and electrophoresis.
Intellectual property-GATT, TRIPS , WTO and WIPO
Types of Intellectual property, patents, copyrights, trade secrets, Industrial design, Geographical indications, Integrated circuits
Patents act 1970, Patent system in India
Patenting- process, opposition and revocation

UNIT-V **6 Hrs**

Protection of plant varieties – UPOV and PPV and FR act of India

Plant breedersrights, researchers and farmers rights
Registration of plant varieties under PPV and FR
Convention on Biological Diversity , Traditional knowledge
ITPGRFA

SUGGESTED READING

1. Thomson, J.R. 1979. **An introduction to Seed Technology**. London: Leonard Hill.
2. Agrawal, P.K. and Dadlani. 1986. **Techniques in Seed Science and Technology**.New Delhi: South Asian Publishers.
3. Agarwal, P.K, 1994. **Principles of Seed Technology**. New Delhi: ICAR.
4. Agarwal, R.L. 1996. **Seed Technology**. New Delhi: Oxford & IBH Pub Co.
5. DhirendraKhare and Mohan S. Bhale, 2007.**Seed Technology**.Jodhpur(India): Scientific Publishers.

MANURES, FERTILIZERS AND SOIL FERTILITY MANAGEMENT

Credits : 2 **Semester: 1V**
Subject code : AG19403 **No. of lecture hours: 30**

Objective: To impart to the student thorough understanding of plant nutrients, soil fertility, nutrient management, manures and fertilizers so that he/she can describe influence of soil biological, physical and chemical properties and their interactions on nutrient availability to plants.

Outcome: Student will be able to identify soil, plant and nutrient management practices that maximize productivity and profitability using suitable manures and fertilizers while maintaining or enhancing the soil and environmental quality.

Course outcomes:

- Define and list out macro and micronutrient
- Differentiate and Classify Manures and Fertilizers and different composting methods
- Explain characteristics and manufacturing process of nitrogenous, phosphatic and potassic fertilizers.
- Differentiateand classify complex, mixed and bio-fertilizers
- Compare and judge various methods of soil fertility evaluation

UNIT – I **6 Hrs**

Introduction – Definition and importance of organic manures in improving soil properties – Differences between organic manures and fertilizers - Classification of organic manures. 1

Preparation of FYM (collection and storage) – Properties (nutrient contents) of FYM and factors affecting quality of FYM. 1

Compost – preparation of compost from agricultural wastes – urban compost preparation - Vermicompost – preparation and properties. 1

Green manuring – Green manuring *in situ* and Green leaf manuring – criteria for selection of crops – crops suitable – advantages – disadvantages. 1

Concentrated organic manures – preparation and nutrient contents of animal and plant origin manures. 1

Classification of fertilizers with examples - Nutrient content and properties of nitrogenous fertilizers - ammonia, ammonium hydroxide, ammonium sulphate. 1

UNIT – II **6 Hrs**

Nutrient content and properties of nitrogenous fertilizers - ammonium nitrate, calcium ammonium nitrate, urea. Urea super granules – slow release N fertilizers - coated urea –nitrification inhibitors. 1

Nutrient content and properties of phosphatic fertilizers – Rock phosphate, SSP, TSP, Basic slag – Nutrient content and properties of potassic fertilizers – MOP, potassium sulphate. 1

Secondary and micronutrient fertilizers – nutrient contents – Complex fertilizers – incomplete and complete complex fertilizers - properties and nutrient contents of MAP, DAP, UAP, nitrophosphates

and complete complex fertilizers. 1

Nano fertilizers – definition - fertilizers available – nutrient contents and properties.Amendments – amendments for acid soils and alkali soils – examples and mode of action. 1

Fate and effect of application of N, P, K fertilizers to soil with chemical reactions – Calculations for application of fertilizers and manures to soil for crops.

Biofertilizers – classification with examples – constraints for use in agriculture – biofertilizers used for different crops/situations. 1

UNIT – III **6 Hrs**

Introduction to soil chemistry & fertility–their importance in crop production–concept of soil fertility & soil productivity-Arnon's criteria of essentiality of nutrients. Essential, functional and beneficial elements – classification of essential nutrients- forms of nutrients in soils and ionic forms of nutrient uptake by plants. 1

Mechanisms of nutrient transport to plants – mass flow, diffusion, root interception, cation Exchange. 1

Nitrogen chemistry– functions, deficiency and toxicity symptoms of nitrogen in plants –corrective measures - nitrogen cycle. 1

Nitrogen transformations in soil – mineralisation – immobilization - ammonium fixation – nitrification – denitrification - nitrogen fixation. 1

Phosphorous chemistry - functions, deficiency and toxicity symptoms of phosphorous in plants – phosphorous cycle – phosphorous fixation in soils – forms and factors affecting phosphorous fixation in soils. 1

Potassium chemistry – functions and deficiency symptoms of potassium in plants -potassium fixation in soils – factors affecting potassium fixation in soils – luxury consumption of potassium. 1

UNIT – IV **6 Hrs**

Calcium and magnesium chemistry – functions and deficiency symptoms in plants corrective measures – factors affecting their availability to plants. 1

Sulphur chemistry – functions and deficiency symptoms in plants – corrective measures – sulphur transformation in soils – mineralisation, immobilization – factors affecting sulphur availability in soils. 1

Micronutrients – sources, forms and content in soils – critical limits in soils and plants -functions, deficiency and toxicity symptoms in plants for zinc, iron, manganese and copper– corrective measures. 1

Cationic micronutrient –chemistry- pools in soils- factors affecting their availability predisposing. factors for occurrence of micronutrient deficiencies in soils and plants. 1

Boron and Molybdenum -chemistry – content and forms in soils – critical limits in soils and plants – factors affecting availability - functions – deficiency and toxicity symptoms –corrective measures.Chlorine& beneficial nutrients–role in plant nutrition – sources of supply to plants. 1

UNIT – V **6 Hrs**

Soil fertility evaluation – approaches – using nutrient deficiency symptoms for evaluation –soil testing objectives – chemical methods of estimating available nutrients. 1

Plant analysis – rapid tissue tests – diagnosis and recommendation integrated system(DRIS) – indicator plants. 1

Biological methods of soil fertility evaluation – microbiological methods – Sacket and Stewart technique, Mehlich technique, *Cunninghamella*plaque method and Mulder'*Aspergillusniger*test, Pot culture test – Neubauer's seedling method – A value. 1

Fertilizer recommendation approaches–soil test based fertilizer recommendation-Integrated nutrient management-Definition & components–critical nutrient concept. 1

Nutrient use efficiency – soil, plant and management factors influencing use efficiency – improving nutrient use efficiency for NPKS and Zn fertilizers. 1

Source, method and time of nutrient application under irrigated and rainfed conditions. 1

SUGGESTED READINGS:

1. Manures and Fertilizers Yawalkar, K. S.,Agarwal, J.P. andBokde, S.1992 Agri.HorticulturalPublishingHouse, Nagpur.
2. Fertilizer Guide Tandon HLS 1994 Fertilizers DevelopmentConsultation Organization, New Delhi.
3. Handbook on fertilizer usage Seetharaman, S., Biswas, B.C., Yadav, D.S. and Matheswaran, S. 1996 Oxford and IBH Publishing Company, New Delhi
4. Fertilizer control order1985 The Fertiliser Association of India The fertilizer Association of India, 10, Shaheed Jit Singh Marg, New Delhi.
5. Fertilizers - A Text Book Ranjan Kumar Basak 2000 Kalyani publishers, New Delhi.
6. Soil fertility and Fertilizers Tisdale, S.L., Nelson, W.L. and Beaton, J.D. 1993 Macmillan Publishing Company, New York

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PRINCIPLES OF PLANT PATHOLOGY

Credit : 2 **Semester: 1V**
Subject code : AG 19404 **No. of lecture hours: 30**

Objective:
The subject covers the various principles involved in plant disease management, classification of fungicides, methods of application of fungicides and various bio-control agents used in the management of crop diseases .

Outcome:
The students will be able to understand the principles of plant disease management, plant protection and immunization methods.

Course outcomes:

- Understand theEpidemiology and Diagnosis of Plant Diseases
- Understand the principle of exclusion and avoidance
- Understand the principles of eradication of seed and planting material
- Explain the principles of plant protection
- Analyse the biotechnological aspects in crop protection

UNIT–I: 6 Hrs
Classification of plant diseases – Disease triangle, Disease Pyramid – Epidemiology of plant diseases – role of weather factors in disease development and spread – survival and dispersal of plant pathogens – Disease surveillance, assessment and forecasting – Diagnosis of plant diseases – Seed health tests – Chemodiagnosis, Serodiagnosis and Molecular detection of plant pathogens

UNIT–II: 6 Hrs
General Principles of Plant Diseases Management – Exclusion – Plant quarantine – Domestic, International and Embargo – Phytosanitary Certificate (PSC) – Quarantine in India. Exotic diseases introduced into India – Role of cultural practices in plant disease management.

UNIT–III: 6 Hrs
Eradication from Seed and Planting materials – Eradication of diseased plants – Surgery and Rouging – Eradication of Alternate and Collateral host – different methods of eradication – Mechanical, Physical, Chemical and Biological methods.

UNIT–IV: 6 Hrs
Protection of crops from air-borne, seed-borne, soil-borne and vector-borne plant diseases – Physical methods – Soil solarization, Hot water treatment, Incineration. Chemical control of plant diseases – fungicides – Different group of fungicides and antibiotics in plant disease management – Biological control of plant diseases – Plant products and Antiviral principles – method of application – plant protection appliances

UNIT–V: 6 Hrs
Immunization – cross protection and host plant resistance – Types of resistance – vertical and horizontal resistance – Resistant varieties. Mechanism of resistance – structural and bio-chemical resistance in plants – Biotechnological approaches for crop disease management.

REFERENCE BOOKS

1) Agrios, G. N. 2005. Plant Pathology.5th edition, Academic Press, New York.922 p.
2) Chaube, H.S. and Pundhir, V.S. 2005. Crop Diseases and their Management. PHI Learning pvt., Ltd., New Delhi.703 p.
3) Dale Walters. 2009. Disease Control in Crops, Biological and Environmentally – Friendly Approaches. Wiley – Blackwell.266 p.
4) Kapoor, A.S. andBanyal, D.K. 2012. Plant Disease Epidemiology and Management. Narendra Publishing House, New Delhi. 162 p.
5) Lainsbury, M.A. 2016. The UK Pesticide Guide 2016. BCPC and CAB International. 767p.
6) Narayanasamy, P. 2001. Plant Pathogens Detection and Disease Diagnosis.Marcel Dekker, Inc, New York.544 p.

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AGRICULTURAL FINANCE, COOPERATION& MARKETING

Credits : 2 **Semester: 1V**
Subject code : AG19405 **No. of Lecture hours: 30**

Objective: To impart knowledge on agricultural cooperation, finance and marketing. To understand the concepts of agricultural finance and cooperation, have an exposure to various schemes for financing weaker sections, have an exposure to higher financing agencies, have an exposure to principles of cooperation and cooperative movement in India, have an exposure to the role of commercial banks and cooperative credit institutions to improve the economic conditions of farmers. To know various marketing functions, marketing agencies and institutions involved in marketing agricultural products.

Outcome: The students will be able to acquire knowledge on agricultural cooperation, marketing and financial aspects.

Course outcomes:

- Analyse laws of returns and factor product relationship
- Judge input output relationship in agricultural production
- Apply cost analysis in agricultural production
- Make up law of equi-marginal returns in agricultural production
- Distinguish types and systems of farming

UNIT-I **6Hrs**

- Cooperation – meaning – scope – importance and definition – principles – objectives of cooperation 2
- Origin and history of Indian cooperative movement – progress of cooperative movement – lessons of cooperative movement 2
- Strengths – weakness – opportunities – threats of cooperative movement (SWOT-analysis). 2

UNIT-II **6Hrs**

- Classification of cooperative credit institutions – short term (ST), medium term (MT) and long term (LT) credit – primary agricultural cooperative credit societies (PACS) 2
- Farmers service societies (FSS) – multipurpose cooperative credit schemes (MPCS) and large sized adivasi multipurpose cooperative societies (LAMPS) – objectives and functions – reorganization of rural credit delivery system 2
- Central cooperative society – APEX cooperative bank – land development banks. 2

UNIT-III **6Hrs**

- Definition of agricultural finance – nature – scope – meaning – significance – credit needs in agriculture – meaning and definition of credit – classification of credit based on time & purpose 2
- Repaying capacity and risk bearing ability (3 Rs) – five Cs of credit – character, capacity, capital condition and common sense and seven Ps of credit – principle of productive purpose, principle of personality, principle of productivity, principle of phased disbursement, principle of proper utilization, principle of payment and principle of protection 2
- Role of NABARD and RBI in strengthening agricultural credit institutions. 2

UNIT-IV 6Hrs

- Market and marketing – meaning – definitions – components of a market – market structure – meaning – components – market conduct – market performance – agricultural marketing – meaning – definition – scope – subject matter – importance of agricultural marketing in economic development – classification of markets – on the basis of location – area of coverage 2

- Marketing functions – meaning – assembling – grading and standardization – transportation – storage – processing – packing – distribution – marketing intelligence – market functionaries – producers – middlemen – problems in marketing of agricultural commodities 2
- Regulated markets – definition – important features of regulated markets – functions – progress and defects – cooperative marketing – meaning – structure – functions of cooperative marketing societies – national agricultural cooperative marketing federation. 2

UNIT-V **6Hrs**

- Producers surplus – meaning – marketable surplus – marketed surplus – importance – factors influencing marketable surplus – marketing channels – definition – market integration – definition – types of market integration – horizontal, vertical and conglomeration 2
- Marketing efficiency – meaning – definitions – technical or physical or operational efficiency – pricing efficiency – marketing cost – margins – price spreads 2
- Characteristics of agricultural product prices – agricultural price stabilization – need for agricultural price policy – commission for agricultural cost and prices (CACP) – administered prices – minimum support price, procurement price and issue price. 2

SUGGESTED READING

1. Mukhi, H.R. 1983. **Cooperation in India and abroad**. New Delhi: New Heights Publishers.
2. Muniraj, P. 1987. **Farm Finance for Development**. New Delhi: Oxford & IBH Publishing Co. Pvt. Ltd.
3. Subba Reddy S. and Raghuram, P., 2005. New Delhi: **Agricultural Finance Management**. Oxford & IBH Publishing Co. Pvt. Ltd.
4. Subba Reddy S., Raghuram, P., Sastry, T.V.N. and Bhavani Devi, I. 2009. New Delhi: **Agricultural Economics**. Oxford & IBH Publishing Co. Pvt. Ltd.
5. Acharya S.S. and Agarwal, N.L. 2005. **Agricultural Marketing in India**. New Delhi: Oxford & IBH Publishing Co. Pvt. Ltd.
6. Kahlon, A.S. and Tyagi, D.S. 1983. **Agricultural Price Policy in India**. New Delhi: Allied Publishers Pvt. Ltd.
7. Memoria, C.B. and Joshi, R.L. 1995. **Principles and Practices of Marketing in India**. Allahabad: KitabMahal.
8. Memoria, C.B. 1973. **Agricultural Problems in India**. Allahabad: KitabMahal.

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PRODUCTION TECHNOLOGY FOR ORNAMENTAL CROPS, MAP AND LANDSCAPING

Credits : 1 **Semester: IV**
Subject code : AG19406 **No. of lecture hours : 15**

Objective: To impart knowledge on production technology of flower crops MAP , and ornamental gardening .

Outcome: The students will be able to gain knowledge on cultivation aspects of flower crops , MAP and various principles and components of landscaping.

Course outcomes:

- Describe various principles of landscaping and Ornamental gardening
- Explain different cultivation practices in Rose, Gerbera and Carnation
- Explain different cultivation practices in leguminous vegetables
- Explain different cultivation practices in Lilium, Tuberose and Chrysanthemum
- Explain the production technology and importance of medicinal plants

UNIT-I3Hrs

Importance and scope of ornamental crops, medicinal and aromatic plants and land scaping 1
Principles of land scaping, land scape use of treesshrubs and climbers 1
Features of ornamental gardening-Importance – features of ornamental gardening 1

UNIT-II3Hrs

Productiontechnology of Rose –under protected condition importance –types of roses
- Varieties – propagation – planting – pruning – manuring – irrigation – harvesting – yield 1
Production technology of **Gerbera** – under protected condition importance – climate and soil varieties – propagation – planting – manuring – irrigation – harvesting – yield 1
Production technology of **Carnation** – under protected conditions – importance – climate andSoil - varieties – propagation – planting – manuring – irrigation – harvesting – yield 1

UNIT-III 3Hrs

Production technology of **Lilium**and **orchids** – under protected conditions – importance – climate and Soil - varieties – propagation – planting – manuring – irrigation – harvesting – yield 1
Production technology of **Gladiolus** and **Tuberose** – under open condition- importance – climate and soil – classification based on petals – propagation – planting – manuring – irrigation – harvesting – yield 1
Production technology of **Chrysanthemum** – under open condition importance – climate and soil - classification – propagation – planting – manuring – irrigation – harvesting – yield 1

UNIT-IV 3Hrs

Production technology of Marigold – under open condition importance – climate and soil - classification – propagation – planting – manuring – irrigation – harvesting – yield 1

Production technology of Medicinal plants – **Ashwagandha , Asparagus** – introduction – botany – varieties – propagation – climate-soil – preparation of land – planting – irrigation – manuring – intercultivation – harvesting – yield 1

Production technology of **Aloe, Costus , Cinnamomum** – introduction – botany –varieties – propagation – climate-soil – preparation of land – planting – irrigation – manuring – intercultivation – harvesting – yield 1

UNIT-V3Hrs

Production technology of **Periwinkle and Isabgol** – introduction – botany –varieties – propagation – climate-soil – preparation of land – planting – irrigation – manuring – intercultivation – harvesting – yield 1

Production technology of Aromatic plants – **Lemon grass, Citronella , Palma Rosa , Ocinum , Geranium, Vetiver**– botanical name – family – origin – economic part – importance – botany - Varieties – climate soil – preparation of land – propagation and planting – manuring – irrigation – intercultivation – harvesting – yield 1

Processing and value addition in ornamental Crops, MAP s produce 1

SUGGESTED READING

1. Floriculture and landscaping,Bose, NayaPrakash, CalcuttaT.K.1999
2. Commercial flowers,Bose, T.K and NayaPrakash, CalcuttaYadav, L.P.1992
3. Floriculture in India-Randhawa, G.S. and Allied Publishers Pvt, Ltd,Mukhopdhyaya
4. Introduction to spices, plantation crops, Medicinal and aromatic plants Oxford and IBM publishing Co. Pvt.Ltd, NEW DELHI

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STATISTICAL METHODS

Credits : 1 **Semester: IV**
Subject code : AG19407 **No. of lecture hours : 15**

Objective: To impart knowledge on Measures of Central Tendency, Probability, Correlation, Regression and Chi-Square Test

Outcome: Thestudents will be able to acquaint with the statistical procedures and their implication in Agriculture.

Course outcomes:

- Explains the importance of concept of variability, measures spread or dispersion, understands and identity its cause to provide a basis for action, describes importance of normal distribution in statistics
- Interprets meaning of correlation co-efficient in context, identification of two variables technology to find 'r'
- Judges appropriate method and identify problem and apply test via p value and CI
- Judges appropriate chi-square test for independence and goodness of fit
- Analyzes the results of designed experiment in order to conduct the appropriate statistical analysis of data.

UNIT-I **3Hrs**

Introduction and various definitions of Statistics - Importance of Statistics in agriculture - limitations of statistics.

Frequency Distribution- Exclusive and inclusive methods - Discrete and continuous variables - Graphical representation of data

Central tendency-Definition - Measures of Central tendency - Study of Arithmetic Mean – Median - Mode in detail for ungrouped and grouped data.

Measures of Dispersion - Standard Deviation for ungrouped and grouped data- Coefficient of Variation (C.V) - Standard Error

UNIT-II **3Hrs**

Definition of Probability – Addition - Multiplication theorems - Binomial and Poisson distributions

Normal Curve and its properties expression for frequency function of Normal distribution

Testing of Hypothesis – Concept - Null hypothesis - Type I and Type II Errors Level of Significance - Critical region - General setup of testing - Large Sample Test with known and unknown

Small Sample test (t-test for one and two samples and Paired t- test) and F-test

UNIT-III **3Hr**

Chi-Square test for 2x 2 and m x n contingency Table - Yate's correction for Continuity

Correlation – Scatter diagram - Positive and negative correlation and its testing

Regression – Fitting of linear regression equation of Y on X and X on Y and the inter relation-ship with "r" and testing of regression coefficients

UNIT-IV **3Hrs**

Analysis of Variance (ANOVA) - Definition and assumptions –

ANOVA with One-way classification (CRD) layout and analysis with equal and unequal repetitions, Advantages and disadvantages

ANOVA with Two way Classification (RBD) - Layout and analysis, Advantages and disadvantages

UNIT-V **3Hrs**

ANOVA with three way classification (LSD) – Layout and Analysis - Advantages and disadvantages.

Introduction to Sampling - Sampling Vs Census - Purposive and Random Sampling

Simple Random Sampling - Method of selection - Estimates of population mean and total and the estimates of their variances and confidence limits.

SUGGESTED READING:

1. NageswaraRao, G 2007.*Statistics for Agricultural Sciences*. B S Publications, Hyderabad

2. Rangaswamy, R 1995. *A Text Book of Agricultural Statistics*. New Age International (P) Limited, Hyderabad.

3. Chandel SRS, *Hand Book of Agricultural Statistics.* AchalPrakashanMandir publications, New Delhi.

4. Agrawal, B .L. *Programmed Statistics.* 2nd Edition, New Age International Publishers, Hyderabad

FUNDAMENTALS OF AGRICULTURAL EXTENSION EDUCATION

Credits : 2 **Semester: IV**
Subject code : AG19408 **No. of lecture hours: 30**

Objective: The students will be acquainted with various extension programme planning and transfer of technologies

Outcome: The students will gain knowledge on various extension programmes and transfer of technologies

Course outcomes:

- Explain the importance of extension education in agriculture sector.
- Organize different agricultural extension methods with reference to group contact methods.
- Organize different agricultural extension methods with reference to mass contact methods.
- Apply the principles of journalism in Agricultural extension and prepare different types of Audio Visual aids
- Solving of the problems of villages by applying Participatory Rural Appraisal (PRA) technique

UNIT- I **6 HRS**

Extension education: Meaning, definition, types, scope & process.
Objectives & principles of extension education
Extension programme planning: meaning of programme planning &principles
Steps in programme development 1hr Interactive
Extension administration: Meaning, concept, principles & functions
Monitoring & evaluation of extension programmes:
Monitoring- definition & concept Evaluation- definition & types
Differences between monitoring &evaluation & importance of evaluation in agricultural extension

UNIT- II **6 Hrs**

Communication:Meaning, definition & elements of communication & their haracteristics. Models: Aristotle, Shannon &weaver, Schramm, Paul Leagans, Westley, Macclean& Litterer
Concepts of Communication: Empathy, redundancy, fidelity, frame of reference, entropy. Barriers to communication.
Extension teaching methods: Definition, functions, classification according to use & form- individual. Group & mass contact methods
Media mix, selection & combination of extension teaching methods.

UNIT- III **6 Hrs**

Agricultural journalism :Meaning Scope, importance, characteristics of news, factors determining news value, types and sources of news
Diffusion and adoption of innovation: Definition & meaning of diffusion & adoption, adoption process: 5 stage & 7 stage models
Classification of adopter categories &their characteristics
Concept of adoption, over adoption, rate of adoption. Innovation: meaning& attributes of innovation
Innovation decision process: Meaning, definition & stages
Factors influencing rate of adoption process

UNIT- IV **6 Hrs**

Transfer of technology: Concept &models with examples
Reforms in Agricultural Extension: ATMA, SREP
Gap Analysis
New trends in agricultural extension: Privatization of extension , meaning, factors influencing privatization of extension, merits &problems, strategies with examples
Cyber extension meaning, features, successful models

UNIT- V **6 Hrs**

Kisan call centers, farmers call centers: Meaning. Objectives, operational mechanism
Market led extension: Meaning, enhanced roles of agriculture extension personnel in light of market led extension, Difference between TOT & market led extension.
Indigenous Technical Knowledge: Meaning, Definition, Methods of Documentation of ITKs
Farmers led extension: Meaning, Examples.
Expert system in agriculture: Meaning, components, examples
Capacity building of extension personnel and farmers: training meaning, types of training: preservice, in-service, orientation, induction, refresher training
Training to farmers &farm women: time, duration & venue, short term, midterm & long term .FTC, KVK , DAATC: mandate &objectives
PRA: Meaning, techniques and importance in Agricultural Extension

SUGGESTED READING

1. Dahama, O.P. and Bhatnagar, O.P. 1980. **Education and Communication for Development**. New Delhi: Oxford & IBH Publishing Co. Pvt. Ltd.
2. Ganesh, R., Mohammad Iqbal, I. and Anandaraja, N. 2003. **Reaching the Unreached – Basics of Extension Education**. New Delhi: Associated Publishing Company.
3. Ray, G.L. 2006. **Extension Communication and Management**. Kolkata: NayaPrakashan.
4. Rayudu, C.S. 1997. **Communication**. Hyderabad: Himalaya Publishing House.
5. Reddy, A.A. 2005. **Extension Education**. Bapatla: Sree Lakshmi Press.
6. Rogers, E.M. 2003. **Diffusion of Innovations**. New Delhi: Free Press.
7. Somasundaram, T. 1977. **Producing Agricultural Information Materials**. USA and Hyderabad: Kansas State University and APAU.
8. Yella Reddy, N. 1998. **Audio-Visual Aids for Teaching, Training and Extension**. Hyderabad: Haritha Publishing House.

Loyola Academy, Old Alwal, Secunderabad 500 010

MICRO PROPAGATION

Credits: 1 **Semester: V**
Subject Code : AG21510 A **No. of lecture hours: 30 Hrs**

General Objective: To impart knowledge to the students on various techniques of plant tissue c

Outcomes: Students will be able to gain knowledge on Tissue culture techniques, micropropagation, somoclonal variation, pollen culture, embryo culture, endosperm culture, somatic embroyogenesis, artificial seed and synthetic seed production, somatic hybridization.

Theory

UNIT-I **6 Hrs**

- History of plant tissue culture – terminology used in plant tissue culture
- Plant cell and tissue culture – steps in general tissue culture techniques – merits and limitations – Applications of plant tissue culture in crop improvement
- Laboratory set up; Growth room chambers and instruments Different techniques used for sterilization in plant tissue culture.

UNIT-II **6 Hrs**

- Nutritional requirements of tissue culture – preparation and composition of Murashige and Skoog (MS) medium
- Types of media – solid and liquid media – advantages and limitations
- Totipotency– growth and differentiation in cultures Types of cultures – callus and suspension cultures.

UNIT-III **6 Hrs**

- Micro propagation – meristem culture – procedure – various approaches for shoot multiplication – Micro propagation –Problems – advantages and limitations
- Soma clonal variation – types – origin – advantages – limitations – achievements
- Anther / pollen culture – brief procedure – factors affecting and rogenesis – Haploids – Applications of haploids in crop improvement – limitations – achievements.

UNIT-IV **6 Hrs**

- Embryo culture – purpose – methods of embryo culture – procedure – applications – achievements. Ovule culture – ovary culture; Purpose and Procedure
- Endosperm culture – purpose – procedure – applications
- Somatic embryogenesis – stages of somatic embryo development – general procedure – Factors affecting somatic embryogenesis – applications – limitations.

UNIT-V **6 Hrs**

- Artificial seed / synthetic seed production – desiccated systems and hydrated systems of synthetic seed production – advantages and limitations
- Protoplast culture – methods of protoplast isolation – Advantages
- Somatic hybridization – Procedure, products of somatic hybridization – symmetric hybrids, asymmetric hybrids and cybrids – advantages and limitations of somatic hybridization.

REFERENCES

- Jha, T.B. and Ghosh, B. 2005. *Plant Tissue Culture*. University Press,Hyderabad.
- Razdan, M. K. 2002. *Introduction to Plant Tissue Culture*. Oxford and IBH Publishing Co., NewDelhi.
- H.S. Chawla (2003). Introduction to Plant Biotechnology. Oxford & IBH Publishing Co. NewDelhi
- E.F. Springer, 2007.Plant propagation by tissue culture:Vol 1

AGRI BUSINESS MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT

Credits : 2 **Semester: IV**
Subject code : AG 19409 - B **No. of Lecture hours: 30**

Objective: To impart knowledge on management functions and agribusiness management and international trade. To understand the concept of management functions and agribusiness management and its importance in Indian economy along with the functions of management – have an exposure to different types of working capital and financial management in agro-industries – acquire knowledge on agricultural projects and evaluations of agricultural projects through different economic analysis, Agri Entrepreneurship analysis, incubation and commercialization of business ideas.

Outcome: The students will be able to gain knowledge on management functions and agribusiness management, agro industries and agricultural projects.

Course outcomes:

- Explain structure of Agri-business management
- Prepare Balance sheet in Agri business
- Plan for financial management in Agri business
- Develop agro-based industries
- Appraise the role of international trade in agri-business

UNIT-I **6Hrs**

- Agribusiness – meaning – definition – structure of agribusiness (input sector, farm sector and product sector) – importance of agribusiness in Indian economy 3
- Agribusiness management – the distinctive features of agribusiness management – the importance of good management – definitions of management – planning – characteristics of sound plan – steps in planning. 3

UNIT-II **6Hrs**

- Organizing – meaning – purpose – staffing – definition – staffing process – directing – motivation – ordering – leading – supervision – communication and control 3
- Meaning and definitions – capital – meaning – working capital – gross working capital – net working capital – permanent working capital – temporary working capital – balance sheet working capital – cash working capital. 3

UNIT-III **6Hrs**

- Financial management – importance of financial statements – balance sheet – profit and loss statement – analysis of financial statements – liquidity ratios – turnover ratios – profitability ratios 3
- Agro based industries – importance – need – institutional arrangements for the promotion of agro based industries. 3

UNIT-IV **6Hrs**

- Procedure to be followed to set up agro based industries – constrains in establishing agro based industries – project – meaning – definition – project cycle – identification – formulation – appraisal – monitoring – evaluation 3
- project appraisal and evaluation techniques – undiscounted measures – payback period – proceeds per rupee of outlay – discounted measures – net present value (NPV) – benefit-cost ratio (BCR) – internal rate of return (IRR) – net benefit investment ratio (N/K ratio) 3

UNIT-V **6Hrs**

- Agri entrepreneurship – concept, need and scope. Assessing overall business environment in India Economy – entrepreneurship development programmes 3
- Entrepreneurial behavior and role of achievement motivation – factors affecting entrepreneurship development – generation – incubation and commercialization of business ideas. 3

SUGGESTED READING

1. Bhor, D. 1994. **GATT Agreement or Dunkel Draft Treaty-Its impact on Agriculture, Industry, TRIPS and TRIMS and Drug Industry**. New Delhi: Mittal Publications.
2. Gittenger Price, J. 1989. **Economic Analysis of Agricultural Projects**. London: John Hopkins University Press.
3. Harsh, S.B., Conner, U.J. and Schwab, G.D. 1981. **Management of the Farm Business.** New Jersey: Prentice Hall Inc.
4. Joseph, L. Massie. 1995. **Essentials of Management**. New Delhi: Prentice Hall of India Pvt. Ltd.
5. Omri Rawlins, N. 1980. **Introduction to Agribusiness**. New Jersey: Prentice Hall Inc.
6. Vaish, M.C. 1980. **International Economics**. New Delhi: Oxford & IBH Publishing Co. Pvt. Ltd.
7. Anil Kumar, S., Poornima, S.C., Mini, K., Abraham and Jayashree, K. 2003. **Entrepreneurship Development**. New Delhi: New Age International Publishers.

CROP PRODUCTION TECHNOLOGY-II (RABI CROPS) PRACTICALS

Credits : 1 **Semester: IV**
Subject code : AG19410 **No. of practical hours: 30**

Objective: To experience practically the constraints in crop production by raising a crop in the field.

Outcome: Students will be able to learn various crop production techniques starting from land preparation to harvest**.**

1. Identification of crops and seed material.
2-3 Allotment of individual plots for land preparation and sowing of crops.
4. Fertilizer application and sowing the crop
5. Observation for germination and gap filling in individual plots.
6-7 Inter cultural operations – Thinning and weeding.
8. Collection of biometric data - 1
9. Raising of tobacco nursery
10. Collection of biometric data on the crop-11
11. Harvesting of crops in individual plots and recording yield
12. Study of varietal characters of cereals and oil seed crops.
13. Study of varietal characters of Pulses and fiber crops.
14. Study of varietal characters of Sugarcane, potato and Tobacco.
15. Visit to nearby farmers' fields.

PRINCIPLES OF SEED TECHNOLOGY AND IPR
PRACTICALS

Credits : 1 **Semester: IV**
Subject code : AG19411 **No. of practical hours: 30**

Objective: To impart knowledge onvarious seed moisture, seed vigour, seed health and seed viability tests of various field and horticultural crops.

Outcome: Students will be able to demonstrate the various quality tests conducted in seed quality laboratories.

1. Seed sampling - principles and procedures
2. Physical purity analysis of field crops and horticultural crops.
3. Germination analysis of field crops and horticultural crops.
4. Seed moisture tests of field crops and horticultural crops..
5. Seed viability tests of field crops and horticultural crops..
6. Seed vigour tests of field crops and horticultural crops
7. Seed health tests of field crops and vegetable crops.
8. Seed dormancy and breaking methods.
9. Study of different seed treatment chemicals and equipment.
10. Identification of objectionable pests and diseases in seed production plots.
11. Grow out tests and electrophoresis for varietal identification.
12. Visit to seed production plots of field crops – rice, maize, bajra, sorghum.
13. Visit to seed production plots of sunflower, groundnut, castor, and pulses.
14. Visit to seed production plots of vegetable crops.
15. Visit to seed processing plants and seed testing laboratories.

MANURES, FERTILIZERS AND SOIL FERTILITY MANAGEMENT PRACTICALS

Credits : 1 **Semester: IV**
Subject Code : AG19412 **No. of practical hours : 30**

Objective: To collect representative samples of Soils, plants, organic manures and analyze their nutrient content.

Outcome:
At the end of the course, the student will be able to
1. Estimate the fertility status of soils,
2. Estimate the nutrient contents of plants
3. Estimate the nutrient contents in manures.

PRACTICALS
1. Introduction of analytical instruments and their principles – pH meter and Electrical Conductivity meter
2. Introduction of analytical instruments and their principles –flame photometer, colorimeter/spectrophotometer and atomic absorption spectrophotometer
3. Estimation of available nitrogen content of soils
4. Estimation of nitrogen content in organic manures
5. Estimation of available phosphorous content of soils
6. Estimation of available potassium content of soils
7. Estimation of available sulphur content of soils
8. Estimation of exchangeable calcium and magnesium in soils
9. Estimation of available micronutrients in soils
10. Collection of plant samples and digestion of plant samples
11. Estimation of nitrogen content of plants
12. Estimation of phosphorous content of plants
13. Estimation of potassium content of plants
14. Estimation of sulphur content of plants
15. Quick tests for soil and plant analysis and interpretation of analysis

AGRI. FINANCE, COOPERATION AND MARKETING PRACTICALS

Credits : 1 **Semester: IV**
Subject code : AG19413 **No. of practical hours: 30**

Objective: To impart procedural formalities followed in co-operative institutions, regional rural banks and to estimate scale of finance for various crops.

Outcome: The students will gain practical knowledge on functioning of agricultural cooperative institutions, banks and markets.

- 1-4 assessment of credit requirement in rural households.
- 5 study of functions of primary agricultural cooperative society
- 6 study of functions of district level cooperative bank
- 7-9 study of functions of regulated markets
- 10-11 study of cotton corporation in India and warehousing corporation of India
- 12-14 visit to Food Corporation of India, NAFED and APEDA.
- 15 collection of data on sources and quantum of agricultural finance
- 16 study of regional rural banks.

PRODUCTION TECHNOLOGY FOR ORNAMENTAL CROPS, MAP AND LANDSCAPING PRACTICALS

Credits : 1 **Semester: IV**
Subject code : AG19414 **No. of practical hours: 30**

Objective: To impart knowledge on identifying different flower crops used in landscaping.

Outcome: Students will be able to identify different flower crops and their cultivation practices and land scape techniques.

Identification of ornamental plants
Identification of medicinal plants
Identification of aromatic plants
Botanical description of aromatic plants
Nursery bed preparation and seed sowing
Propagation of ornamental plants
Propagation of aromatic plants
Training and pruning of ornamental plants
Planning and lay out of garden
Bed preparation and planting of MAP s
Intercultural operations in flowers
Intercultural operations in MAPs
Post-harvest handling of cut flowers and loose flowers
Processing of medicinal and aromatic plants
Protected structures care and maintenance
Visit to commercial flower and MAP unit

STATISTICAL METHODS

PRACTICALS

Credits : 1 **Semester: IV**
Subject code : AG19415 **No. of practical hours: 30**

Objective: To impart knowledge on Agricultural Statistics, Preparing frequency distribution, calculate the correlation coefficient and designs of experiments.

Outcome: The students will be able toprepare frequency distribution, learn concepts of A.M, Median and Mode, and statistical designs like CRD, RBD and LSD.

1. Preparing frequency distribution for ungrouped data by using inclusive and Exclusive methods and calculation of quartile - Deciles and Percentiles.
2. Preparing various graphs and charts.
3. Computation of A.M, Median and Mode for grouped and un-grouped data by Direct and deviation methods.
4. Problems on calculating skewness and kurtosis - S.D and CV% for grouped data
5. Problems on probability.
6. Problems on binomial and poison distributions.
7. Normal curve and its properties, identification of normality through data i.e., Criterion. etc., - Expression for frequency function of normal distribution.
8. Problems on Z- test for one Sample - Two sample with known and unknown Conditions.
9. Student's t-test for single sample - Two sample and paired t- test - F-test (Test for homogeneity of variances).
10. Problems on Chi-square test and Yates correction
11. Problems to calculate the correlation coefficient and its testing.
12. Fitting of Linear Regression and its testing.
13. Analysis of CRD with equal and unequal repetitions.
14. Analysis of RBD.
15. Analysis of LSD.

FUNDAMENTALS OF AGRICULTURAL EXTENSION

Credits : 1 **Semester: IV**
Subject code : AG19416 **No. of lecture hours : 30**

1. To get acquainted with university extension system/visit to the DAATCC/KVK centres of Agricultural University
2 &3.Organization of group discussions
4. Handling and use of Audio-Visual Aids
5. Preparation of extension literature-Leaflet, Booklet, folder, pamphlet
6 &7.Presentation skills – exercise
8. Microteaching exercise
9. A visit to the village to understand the problems being encountered by the villagers/problems through PRA exercise
10. To study organization and functioning ofDRDA and other development departments at district level
11. Visit to NGO and learning from their experience in rural development
12. Understanding PRA techniques and theirapplication in village development planning
13. Exposure to mass media: visit tocommunity radio and television studio forunderstanding the process of programme production
14. Planning and writing of scripts for radio
15 & 16.Planning and writing of scripts for print and electronic media

MICRO PROPAGATION

Credits : 1 **Semester: IV**
Subject code : AG21520 A **No. of lecture hours : 30**

Objective: To impart knowledge on Tissue culture techniques, media preparations, micro- propagation, callus induction, production of synthetic seeds, gel electrophoresis, DNA Isolation etc.,

Outcome: Students will be able to gain knowledge on Tissue culture techniques, media preparations, micro-propagation, callus induction, production of synthetic seeds, gel electrophoresis, DNA Isolation etc.,

PRACTICALS

1. Requirements for Plant Tissue Culture Laboratory
2. Media components and its importance
3. Preparation of liquid and solid MS Media
4. Sterilization techniques in PTC
5. Inoculation of various explants
6. Aseptic manipulation of various explants carrot, tobacco, Banana.
7. Micro propagation of important crops, through axillary bud and apical shoot bud proliferation.
8. Callus induction – plant regeneration of Anther culture
9. Hardening / acclimatization of regenerated plant
10. Production of synthetic seeds (Desiccated and hydrated systems)
11. Isolation of protoplast from tobacco leaf and Culturing of protoplast on CPW medium
12. DNA isolation by CTAB method
13. Gel electrophoresis and quantification of DNA
14. Confirmation by PCR (molecular method)
15. Visit to private tissue culture lab

AGRI BUSINESS MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT

PRACTICALS

Credits : 1 **Semester: IV**
Subject code : AG19417 - B **No. of practical hours: 30**

Objective: To impart knowledge on SWOT analysis, preparation of financial statements for agribusiness and project appraisal techniques.

Outcome: The students will be able to gain practical exposure on SWOT analysis, preparing independently the financial statements of an agri-business and project appraisal.

- Analysis of balance sheet
- Analysis of profit and loss statement
- Analysis of cash flow statement
- Break-even analysis / volume-cost analysis
- Financial ratio analysis
- Development of agri-business performance 'tracking system chart'
- Compounding and discounting techniques
- Project appraisal technique I
- Project appraisal technique II
- Project appraisal technique III
- Visit and study of profile of agro-based industries
- Formulation of project feasibility report of agribusiness entrepreneurship
- Preparation of business strengths weakness opportunities and threats (SWOT) analysis of agribusiness enterprises
- Study of agro-industries development corporation

ADD ON COURSE

AGRI-WASTE MANAGEMENT

Semester: IV

No. of lecture hours: 20

Objective: To impart knowledge on Nature and characteristics of agricultural waste and their impact on the environment, Kinds of wastes, Classification.

Outcome: The students will be able to identify the various sources of waste, utilization and recycling of agricultural wastes.

UNIT-I **4Hrs**

- Introduction to agricultural waste management: Definitions of agricultural waste, residues and agricultural waste management- Roles and responsibilities -Waste generation and types - Sources of wastes and their classification.
- Nature and characteristics of agricultural waste - Nature of agricultural waste - Definitions of waste characterization terms
- Impact of agricultural waste on the environment: Introduction- Major environment-related drivers for agriculture- Leaching of nutrients and eutrophication of waters-Water availability and increasing demand for water-Soil degradation and pollution-Greenhouse gas emissions to the air- Climate change
- Kinds of wastes–Problems of waste: List of wastes- Non-Hazardous-Hazardous-Agricultural waste fibers
- Agricultural waste-Classification: Animal-tissue waste-Plant-tissue waste-Animal faeces, urine and manure (including spoiled straw), effluent, collected separately and treated off-site- Wastes from forestry- Agrochemical waste containing hazardous substances
- Role of soil and plants in waste management

UNIT-II **4Hrs**

- Sources of waste (Cropped fields): Field residues- Process residues
- Sources of waste in allied sectors of agriculture
- Sources of waste in agro based industries: Rapeseed cake (RS), orange peel (OP), wheat bran (WB), spirulina powder (S)- Sugarcane: Molasses, Peals
- Sources of waste - Urban waste etc. and their management: Industrial effluents-Urban compost- Plastic- Sewage sludge- Municipal Waste-Garbage
- Impact of agricultural waste on soil quality – Mechanism of interaction of waste with soil: Definitions of soil fertility, soil productivity and soil quality- Effect of agricultural waste on soil physical and chemical properties-Mechanism of interaction of waste with soil- Soil degradation- On-farm management of crop residues- Effect of compost,FYM, green manures on soil quality
- Impact of agricultural waste on plant quality

UNIT-III **4Hrs**

- Biological processes of agricultural waste management

- Utilization of Agricultural waste (Paddy, wheat, sugar cane, cotton and mustard waste): Livestock feed- Compost making- Energy source- Bio-fuel and bio-oil production- Bio methanation- Gasification- Biochar production- Utilization of sewage- Mulches
- Recycling of Agricultural waste: Introduction- Significance of Recycling- Recyclable agricultural wastes- Methods of recycling- Incineration- Composting- Land application- Re feeding - Anaerobic digestion
- Potential of recyclable crop residues and their management: Availability of crop residues-Waste generated from different crops- Crop residues management strategies in different countries- Managing crop residues with conservation agriculture
- In-situ management of agriculture waste: Introduction- Waste management functions- Six basic functions: production, collection, storage, treatment, transfer, utilization- Waste management systems
- Composting (Types of composting and their suitability for different situations)

UNIT-IV **4Hrs**

- Vermicomposting for bio- conservation of biodegradable waste
- Biogas Technology
- Agricultural waste (influence on water resources)–Eutrophication
- Agricultural waste (influence on air resources) – Nitrous Oxide emissions and ammonia emissions from soil in relation to climate change effects
- Agricultural waste (influence on animal resources): Poultry waste- Goat and sheep waste- Penning- FYM
- Impacts of waste on human, animal health and environment: Impacts of solid waste on health- Diseases- The role of plastics- Occupational hazards associated with waste handling-Effect of heavy metal on health of humans and animals

UNIT-V **4Hrs**

- Effect of hazardous wastes on environment- Surface water contamination- Groundwater contamination- Air contamination- Soil contamination
- Management of bedding & litter in livestock management: Definitions-Types of bedding and litter materials- Case systems and types - Litter management practices- Moisture- litter re utilization- Litter amendments- Acidifiers- Other amendments- Disposal and reuse
- Wasted feed (types of feed from different by- products of agriculture): Feed definition- Types of feeds- Different crop by- products used as feed- Nutrient concentrations in different by - products- Left over feed and their utilization
- Run-off from feed lots and holding areas and waste water from dairy parlors: Water use on dairy farms- Open lot run off quality- Nutrient content of runoff water from dairy farms- Causes of runoff from feed lots- Primary and secondary stage lagoons- Settling basin and primary lagoon
- Agro-waste recycling through farming system

YEAR-WISE AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS B.Sc.
(Hons.) AGRICULTURAL SCIENCE & RURAL DEVELOPMENT

FIFTH SEMESTER
ACADEMIC YEAR-2022-23 OF 2020-24 BATCH (CBCS)

Sl. No.	Part	Subject Code	Title of the Subject	Hours/ week	Duration of Exam (hrs.)	Marks			Credits	
						Internal	External	Total		
1	II	AG20501	Rainfed Agriculture.& Watershed Management (Core-29)	1	3	40	60	100	1	
2	II	AG20502	Crop Improvement –I Kharif crops (Core-30)	2	3	40	60	100	2	
3	II	AG20503	Entrepreneurship .Devpt. & Business. Communication. (Core-31)	1	3	40	60	100	1	
4	II	AG20504	Diseases of Field crops , Horticultural crops & their Management. (Core-32)	2	3	40	60	100	2	
5	II	AG20505	Principles of IPDM (Core-33)	1	3	40	60	100	1	
6	II	AG20506	Prod. Tech. Of Fruits & Plantation. Crops (Core-34)	1	3	40	60	100	1	
7	II	AG20507	Pests of Crops, stored grains & Their Management (Core-35)	2	3	40	60	100	2	
8	II	AG20508	Problematic Soils & their Management (Core 36)	1	3	40	60	100	1	
9	II	AG20509	Renewable Energy & Green Technology. (Core-37)	1	3	40	60	100	1	
10	II	AG20510 A	Weed Science.& their Management (DSE-2)	2	3	40	60	100	2	
		AG22510 B	Soil, water, Plant and Seed Testing (DSE-2)							
PRACTICALS										
11	II	AG20511	Rainfed Agriculture.& Watershed Management (Core-29)	2	3	40	60	100	1	
12	II	AG20512	Crop Improvement –I Kharif crops (Core-30)	2	3	40	60	100	1	
13	II	AG20513	Entrepreneurship .Devpt. & Business. Communication. (Core-31)	2	3	40	60	100	1	
14	II	AG20514	Diseases of Field crops , Horticultural crops & their Management. (Core-32)	2	3	40	60	100	1	
15	II	AG20515	Principles ofIPDM (Core-33)	2	3	40	60	100	1	
16	II	AG20516	Prod. Tech. Of Fruits & Plantation. Crops (Core-34)	2	3	40	60	100	1	
17	II	AG20517	Pests of Crops, stored grains & Their Management (Core-35)	2	3	40	60	100	1	
18	II	AG20518	Problematic Soils & their Management (Core 36)	2	3	40	60	100	1	
19	II	AG20519	Renewable Energy & Green Technology. (Core-37)	2	3	40	60	100	1	
20	II	AG20520 A	Weed Science.& their Management (DSE-2)	2	3	40	60	100	1	
		AG22520 B	Soil, Water, Plant and Seed Testing (DSE-2)							
Total				**34**		560	840	1400	**24**	

RAINFED AGRICULTURE AND WATERSHED MANAGEMENT

Credits: 1 **Semester: V**
Subject Code: AG20501 **No. of Lecture hours: 15**

Objective: To impart knowledge on Rainfed Agriculture
Outcome: Students will be able to acquaint with different aspects of Rainfed agriculture and water shed management
Course outcomes:

- Describe watershed concepts and classify drought
- Explains problems of crop production in drylands
- Explain fertilizer use in dry land agriculture and contingent crop planning
- Explain water harvesting techniques and watershed management
- Classify alternate land use systems

UNIT – I **3 Hrs**

- Rainfed Agriculture: Introduction, types, history of rainfed agriculture 1
- History of watershed concept in India – guidelines for Integrated watershed management programme, Problems and prospects of rainfed agriculture in India 1
- Drought: types, classification, effect of water deficit on physio-morphological characteristics of the plants 1

UNIT – II **3 Hrs**

- Mechanism of crop adaptation under moisture deficit condition 1
- Problems of crop production in drylands - Climatic parameters- Rainfall- Variability- Temperature and other parameters 1
- Problems of crop production in dry lands- Soil characteristics and their problems, cultivation practices, weed infestation, lack of suitable varieties, socio-economic constraints 1

UNIT - III **3 Hrs**

- Fertilizer use in dry lands, fertilizer use efficiency in dryland agriculture 1
- Management of crops and cropping systems in rainfed areas 1
- Contingent crop planning for aberrant weather conditions 1

UNIT - IV **3 Hrs**

- Efficient utilization of water through soil and crop management practices 1
- Water harvesting, importance and its techniques 1
- Concept and objectives of water shed management 1

UNIT – V **3 Hrs**

- Principles of water shed management 1
- Components of watershed management- soil and water conservation, water harvesting, crop management and alternate uses stems 1
- Alternate land use systems- different types of ALUS based on land capability classification 1

SUGGESTED READINGS:

- Amon, 1972, Crop Production in dry Regions – (Vol.I.) Leonard Hill., Pub., Co.,London.
- Dhruva Narayana, V.V. Shastri, G.S. and Patnail, V.V, 1990. Watershed management inIndia. ICAR, NewDelhi.
- Gupta U.S. 1975. Physiological Aspects of Dryland Farming – Oxford & IBH Publishers, Co., Ltd., NewDelhi
- ICAR, 1970. A New Technology for Dryland Farming. NewDelhi.

CROP IMPROVEMENT – I (*Kharif crops*)

Credits : 2 **Semester: V**
Subject code : AG20502 **No. of Lecture hours: 30**

Objective: To impart knowledge on origin, distribution and breeding objectives of various crops

Outcome: Students will be able to understand the concepts of breeding objectives for various stresses and hybrid seed production in different crops.

Course outcomes:

- Understand the objectives of breeding in different crops
- Explain various approaches of hybrid seed production technology of different crops
- Identify origin and progenitors of different crops
- Apply breeding methods for introgression of biotic stress
- Apply breeding methods for introgression of abiotic stress

UNIT –I **6 Hrs**

- Introduction-definition, aim, objectives and scope of crop improvement-breeding strategies and concepts of breeding self-pollinated, cross pollinated and vegetatively propagated crops **2**
- Centers of origin-Law of homologous series-Types of centers of diversity-gene sanctuaries-genetic erosion-reasons of genetic erosion-extinction-introgression-gene banks –types and distribution of crop species **2**
- Centers of origin, distribution of species, wild relatives in different cereals- Rice, Maize **2**

UNIT –II **6 Hrs**

- Centers of origin, distribution of species, wild relatives in different millets- Sorghum, Bajra, Ragi **3**
- Centers of origin, distribution of species, wild relatives in different pulses-Redgram, urd bean, mung bean and soybean **3**

UNIT –III **6 Hrs**

- Centers of origin, distribution of species, wild relatives in different oil seeds-Ground nut, sesame and castor **2**
- Centers of origin, distribution of species, wild relatives in different Fodder crops – Napier and Para grass **2**
- Centers of origin, distribution of species, wild relatives in different oil seeds-Fibre/cash crops-Cotton and Tobacco **2**

UNIT –IV **6 Hrs**

- Centers of origin, distribution of species, wild relatives in different vegetable crops –Tomato, Brinjal, Chilli, Bhendi 1
- Centers of origin, distribution of species, wild relatives in different horticultural crops- Mango, Banana, Guava, Papaya. **1**
- Study of qualitative and quantitative characters **1**
- Important concepts of breeding self-pollinated, cross pollinated and propagated crops. **1**

- Breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, stability, adaptability, abiotic and biotic stress tolerance and quality (physical, chemical and nutritional **2**

UNIT –V **6 Hrs**

- Seed production technology in self-pollinated, cross pollinated and vegetatively propagated crops **2**
- Hybrid Seed production technology in maize, Rice, Sorghum, Bajra andRedgram **2**
- Ideotype concept and climate resilient crop varieties for future-Breeding for drought, salinity, water logging, high temperature and low temperature tolerant varieties in different crops**2**

References

- Allard, R.W. 1960. *Principles of Plant Breeding*. John Wiley and Sons, NewYork.
- Phundan Singh, 2006. *Essentials of Plant Breeding* . Kalyani Publishers, NewDelhi.
- Poehlman, J.M. and Borthakur, D. 1995. *Breeding Asian Field Crops*. Oxford and IB H Publishing Co., New Delhi.
- Sharma, J.R. 1994.*Principles and Practice of Plant Breeding*. Tata McGraw Hill, Publishing Company Ltd., New Delhi.
- Singh, B.D. 2006. *Plant Breeding: Principles and Methods*. Kalyani Publishers, NewDelhi

ENTREPRENEURSHIP DEVELOPMENT & BUSINESS COMMUNICATION

Credits: 1 **Semester: V**
Subject Code: AG20503 **No. of lecture hours: 15**

Objective: To improve the knowledge level of the students on entrepreneurship Development and business communication skills.

Outcome: Students will be able to get knowledge on entrepreneurship development and business communication skills.

Course outcomes:

- Describe the concepts of entrepreneur, entrepreneurship, agricultural entrepreneurship, characteristics of entrepreneur, achievement motivation & entrepreneurship, business management skills.
- Gain knowledge and skills in project formulation, project report preparation and evaluation of projects.
- Explain Entrepreneurship Development programmes, Government policies, schemes and incentives for promotion of entrepreneurship, supply chain management and total quality management
- Develop business communication skills- reading, writing, listening and presentation skills.

UNIT-I **3 Hrs**

- Entrepreneur, entrepreneurship, Agri-entrepreneurship: Concept, need, & scope and opportunities of Rural and Agri Enterprises 1
- Entrepreneurial Characteristics 1
- Impact of economic reforms on agribusiness & Agri enterprise and overview of Agri Business in the country 1

UNIT-II **3 Hrs**

- Entrepreneurship Development Programmes (EDPs): Objectives, phases, government policies, programmes and schemes 1
- Process of EDP: Various stages 1
- Developing organizational skills: Controlling, Supervision, Monitoring and Evaluation 1

UNIT-III **3 Hrs**

- Achievement Motivation and Problem solving skills 1
- Managing an enterprise, SWOT Analysis and Time management 1
- Business written communication skills and Negotiation skills 1

UNIT-IV **3 Hrs**

- Managerial skills for Entrepreneurship Development: Planning, Budgeting, Coordination and Decision making 1
- Financing an Enterprise and Venture Capital 1
- Institutional support to entrepreneurs and Business Leadership Skills – communication, direction and motivation skills 1

UNIT-V **3 Hrs**

- Project – Meaning, importance, project formulation, project report components And preparation 1
- Supply Chain Management – Meaning, definition, process, advantages & disadvantages 1
- Total quality management: Meaning, definition, process and Advantages 1

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S. No.	Author's Name	Publishing Year	Book Name
1.	Anil Kumar S, Poornima S C, Mini K Abraham and Jayashree K	2003	Entrepreneurship development, *New Age international Publishers, New Delhi-110002*
2	Dipak De , Basavaprabhu Jirli	2008	Dynamics of entrepreneurship development in Agriculture-Basics to advances, Ganga Kaveri Publishing house, Varanasi.
2	Gupta C. B.	2001	Management Theory & Practice, *Sultan Chand &Sons.*
3	Indu Grover	2008	Handbook on Empowerment & Entrepreneurship, *Agrotech Public Academy*
	Jasmir Singh Saini	1996	Entrepreneurship Development Programmes and Practices, Deep Publications, New Delhi.
4	Khanka S. S.	1999	Entrepreneurial Development, *S. Chand & Co.*
5	Mary Coulter		Entrepreneurship in Action 2nd edition, Prentice Hall of India, New Delhi
6	Mohanty S K	2009	Fundamentals of Entrepreneurship, Prentice Hall of India, New Delhi
7	Singh D.	1995	Effective Managerial Leadership, *Deep & Deep Publ.*
8.	Vasanta Desai	2000	Dynamics of entrepreneurial development & Management
9	Vasanta Desai	1997	Small Scale Industries & Entrepreneurship, *Himalaya Publ. House.*
10.	EEI, ANGRAU, R'nagar, Hyderabad	2004	Reading Material of Personality development Training programme

DISEASES OF FIELD CROPS, HORTICULTURAL CROPS-I AND THEIR MANAGEMENT

Credits: 2 **Semester: V**
Subject code:AG20504 **No of lecture hours: 30**

Objective: To impart knowledge on the diseases of field crops and their management

Outcome: Students will be able to gain knowledge on various diseases of field crops and their management

Course outcomes:

- Identify different diseases ofcereal crops and gain knowledge about their management
- Identify different diseases of sugarcane, Cotton, Tobacco, Castor, Groundnut and gain knowledge about their management
- Identify different diseases of oil seeds and gain knowledge about their management
- Identify different diseases pulse crops and gain knowledge about their management
- Identify different diseases of fruit crops and gain knowledge about their management

UNIT-1

Economic importance, symptoms, cause, etiology, disease cycle and management of the following crops **6 Hrs**

- Rice: Blast, brown spot, bacterial blight, sheath blight, Stem rot, Sheath rot, False smut, Khaira & tungro 2
- Maize: Stalk rot, Downy mildew,Leafblight 1
- Sorghum: smut, grain mold and anthracnose, Rust, Downymildew,Striga 1
- Bajra :Downy mildew and ergot, Blast; Finger millet: Blast and leaf spot(*Helminthosporium*& *Cercospora)* 1
- Wheat:rusts,loosesmut,karnalbunt,powderymildew,alternaria blight and earcockle 1

UNIT-II **6 Hrs**

- Sugarcane: red rot, smut, wilt, grassy shoot, ratoon stunting and Pokkah Boeng, Ring spot1
- Cotton: anthracnose, vascular wilt (*Fusarium & Verticillium*), and black arm, leaf spots – *Alternaria, Cercospora,Greymildew* 2
- Tobacco: black shank, black root rot and mosaic, Frog eyeleafspot; 1
- Castor: Phytophthora blight, Wilt,Greymould 1
- Groundnut: Early and late leaf spots, Wilt, Stem rot, rust, Kalahasthi malady, Bud and stem necrosis 1

UNIT-III **6 Hrs**

- Soybean: *Rhizoctonia* blight, bacterial spot, seed and seedling rot, mosaic and rust 2

- Sesamum : Phyllody, Powdery mildew, *Alternaria* leaf spot 1
- Sunflower: *Sclerotinia* stem rot and Alternaria blight,downy mildew; 1
- Safflower: *Alternaria* leaf spot,wilt 1
- Mustard: *Alternaria* blight, white rust, downy mildew and *Sclerotinia* stem rot 1

UNIT-IV **6 Hrs**

- Pigeon pea: Phytophthora blight, wilt and sterility mosaic 2
- Black & green gram: *Cercospora* leaf spot and anthracnose 1
- Black & green gram: Web blight and yellow mosaic, *Corynespora* leafspot 1
- Gram: wilt, grey mould and *Ascochyta* blight, *Macrophomina* stem and root rot 1
- Lentil: rust and wilt; Pea: downy mildew, powdery mildew and rust 1

UNIT-V **6 Hrs**

- Mango: Anthracnose, Malformation, Bacterial blight, Powdery mildew, Sooty mold, Red rust, Loranthus 1
- Citrus :Canker, Gummosis, Tristeza, Greening , Dry Root Rot, Felt, Scab, Twig blight1
- Guava: Wiltand Anthracnose 1
- Banana: Panama wilt, Bacterial wilt, Sigatoka, Bunchy top, Erwinia rhizome rot, Banana mosaic, Banana bractmosaic,Anthracnose 2
- Papaya : Foot rot, Leaf curl, mosaic, Powdery mildew,Anthracnose 1

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1. Cook, A.A. 1981. Diseases of Tropical and Subtropical Field, Fibre and Oilplam. Mac Millan Publishing Co., NewYork.
2. Rangaswamy, G. and Mahadevan, K. 2001. Diseases of Crop Plants in India. Prentice Hall of India Pvt. Ltd., New Delhi. Singh, R.S.2005.
3. Plant Diseases. Oxford & IBH Publishing Co. Pvt. Ltd., NewDelhi
4. Pathak V N 1980. Diseases of fruit crops. Oxford and IBH Publ Co. New Delhi. 2. Sohi H S 1992.DiseasesofornamentalplantsinIndia.ICAR,NewDelhi.3.SinghRS1994.Diseasesof vegetable crops.Oxford and IBH Publ Co. New Delhi.

- Upadhyaya K.P. and Kusum Dwivedi. 1996. **A Text Book of Plant Nematology**. Meerut: Aman PublishingHouse.
- Vasantharaj David, B. 2003. **Elements of Economic Entomology**. Coimbatore: Popular Book Depot.
- Vasantharaj David, B and Aanathakrishnan, T.N. 2006. **General and Applied Entomology**. New Delhi: Tata McGraw-Hill PublishingHouse.

PRINCIPLES OF INTEGRATED PEST & DISEASE MANAGEMENT

Credits: 1 **Semester: V**
Subject Code: AG20505 **No of lecture hours:15**

Objective: To impart knowledge on basic concepts of pest management practices.

Outcome: Students will gain knowledge on integrated management practices of pests.

COURE OUTCOME

- Explain introduction strategies and concepts of IPM with examples
- Explain host plant resistance and different cultural and mechanical control of IPM
- Explain other tools and limitations of IPM
- Explain different control methods of Integrated disease management
- Explain different methods of disease forecasting and implementation of different IDM modules

UNIT-I **3 Hrs**

- IPM – Introduction history- importance-collapse of control systems, patterns of crop protection, environmental contamination and evolution. Concepts and principles of IPM and different categories of pests based on occurrence **1**
- Host plant resistance- horizontal and vertical resistance and types. Mechanisms of genetic resistance- Non-preference (Antixenosis), Antibiosis and tolerance. Tools of IPM – Cultural control- Normal cultural practices to control the pests and agronomic practices against the pests with examples **1**
- Mechanical control-Different mechanical methods of pest control with examples. Physical control against pests with examples. Legal control- importance of quarantine-examples of exotic pests. **1**

UNITII **3 Hrs**

- Biological control - types of biological control – introduction, augmentation and conservation– parasite–parasitoid-parasitism. Grouping of parasitoids based on nature of host, stage of host, site of parasitisation, duration of attack, degree of parasitisation and food habits –Kinds of parasitism–qualities/attributesofaneffectiveparasitoidtobesuccessfulone.Biologicalcontrol - Predators – predatism – qualities of insect predator – differences between predator and parasitoid **1**

Microbial control- Bacteria, virus, fungi, nematodes and protozoa-important species of microorganisms against major pests in IPM. Entomo pathogenic nematodes- important species- mode of infectivity- advantages and disadvantages of biological control. **2**

UNIT-III **3 Hrs**

- Limitations of IPM- political, social and legal implications of IPM and Case studies of IPM for important crops **1**
- IDM: Introduction, importance, difference between control and management concepts, principles of IDM. Economic importance of diseases **1**
- Methods of detection and diagnosis of diseases and Assessment of disease severity and Calculation of disease incidence level

UNIT-IV **3 Hrs**

- Methods of control: Cultural methods (rouging, eradication of alternate and collateral host, crop rotation, manure and fertilizer management, mixed cropping, sanitation, summer ploughing, soil amendments, time of sowing, seed rate and plant density, irrigation and drainage) **1**

- Methods of control: Physical (Solarization and hot water treatment), legislative (Seed treatment, inspection and certification, plant quarantine– plant quarantine and inspection, quarantine rules and regulations)Biologicalcontrol(mechanisms–competition,antibiosis,hyperparasitismandInduced Systemic Resistance (ISR), fungal and bacterial biocontrol agents– Plant Growth Promoting Rhizobacteria (PGPR)against phytopathogens) **1**
- Methodsofcontrol:Chemicalcontrol–fungicides,antibiotics,methodsandtimeofapplicationsand Host plant resistance (Importance and advantage of resistant varieties, selection, hybridization and mutation, sources of resistance- meaning of vertical, horizontal, monogenic, oligogenic and polygenic resistance),Biotechnology

UNITV **3 Hrs**

- Survey, surveillance and forecasting of diseases, Pestrisk analysis **1**
- IDM strategies for plant parasitic nematodes **1**
- Implementation and impact of IDM module for disease.Case histories of important IDM programmes **1**

REFERENCES:

- Vasanthrai David, B. 2003. Elements of Economic Entomology. Popular Book Depot, Coimbatore.
- NairKK,AnanthaKrishnanTNandBVDavid1976.Generalandappliedentomology,Tata Mc Graw Hill publishing co. Ltd, NewDelhi
- Yazdani, S.S and Agarwal, M.L.1979. Elements of Insect Ecology. Narosa Publishing House, NewDelhi.

PRODUCTION TECHNOLOGY OF FRUITS AND PLANTATION CROPS

Credits : 1 **Semester: V**
Course Code: AG20506 **No. of lecture hours: 15**

Objective: To impart knowledge on production technology of fruit crops and plantation crops.

Outcome: Students will be able to gain knowledge on the scientific reason for different cultivation practices of fruits and plantation crops with location specific recommendation.

COURSE OUTCOMES:

- Plan for laying out of orchard
- Identify problems in raising of Mango, Banana, Sapota crops
- Demonstrate the methods of planting and regulating flowering and fruiting in citrus, Guava, Papaya and pineapple, to select suitable training and pruning methods for Grape, Pomegranate andBer.
- Demonstrate Production and processing of plantation crops.

UNIT-I **3 Hrs**

M**ango** – origin – importance – climate – soils – varieties – propagation – land preparation – planting –HDP - spacing – irrigation – manuring – inter cultivation and intercropping – training and pruning – flowering – pollination – fruit set – cropping – harvesting – maturity indices – yield – physiological disorders black tip or mango necrosis, mango malformation, spongy tissue and fruit drop – causes and remedies – alternate or biennial bearing and irregular bearing. 1

Banana – origin – importance – climate – soils – varieties – propagation – propagating material – suckers (water and sword suckers) and rhizomes– planting – land preparation – system of planting – spacing – application of manures – season of planting – inter cultivation – de suckering – trashing – mattocking – wrapping of bunches – removal of male bud – removal of floral remnants – propping – earthing-up – weeding – harvesting – maturity indices– yield 1

Citrus – origin – importance – different citrus species – climate – soils – varieties – propagation–land preparation – method of planting – spacing - irrigation – manuring – pruning and training – inter cultivation – intercropping – flowering – bahar treatment – cropping – fruit drop – causes and control – harvesting – maturity indices – yield. 1

UNIT-II **3 Hrs**

Grape – origin – importance – climate – soils – varieties – propagation – different methods of propagation – different rootstocks used – planting – land preparation – system of planting – spacing – application of manures – season of planting – training – different methods of training – head, arbour, kniffin, and telephone trellis system – advantages and disadvantages of each system. Pruning – irrigation–manuring–intercultivation–fruitthinning–useofgrowthregulatorsinincreasingfruitset, berry size, cluster size and maturity harvesting – maturity indices – yield. 1

Guava – origin – importance – climate – soils – varieties –Propagation – different methods of propagation – commercial method of propagation – planting – land preparation – system of planting – spacing – application of manures – season of planting – flowering – seasons of flowering – crop regulation – irrigation – manuring – training – pruning for encouraging new shoots and for sanitation – pollarding, bending inter cultivation and intercropping – harvesting – maturity indices– yield. **1**

Papaya-origin–importance–climate–soils–varieties–sexexpression–climate–soils–propagation – raising of seedlings – planting – land preparation – system of planting – spacing – digging of pits – filling of pits – season of planting – irrigation – manuring – inter cultivation and intercropping – flowering and fruiting – harvesting – maturity indices – yield – papain – uses and its extraction

Pomegranate–origin–importance–climate–soils–varieties–propagation–methodsofpropagation – commercial method of propagation – planting – land preparation – system of planting – spacing– application of manures – season of planting – irrigation – manuring – cropping – harvesting – maturity indices – yield –physiological disorder – fruit cracking and its control. **1**

UNIT-III **3 Hrs**

Apple , Pear and peach -origin – importance –climate – soils – varieties – propagation – methods of propagation root stocks –planting – land preparation – system of planting – spacing – application of manures – training and pruning – irrigation – inter cultivation and intercropping – harvesting – maturity indices –yield. **1**

Custard Apple– origin – importance – different species of annonaceous fruits – climate – soils – varieties – propagation –raising of seedlings – land preparation – system of planting – spacing – application of manures – training and pruning – irrigation – inter cultivation and intercropping – flowering – factors affecting fruit set – fruiting – harvesting – maturity indices – yield. **1**

Ber&Phalsa–origin–importance–climate–soils–varieties–propagation–methodofpropagation – raising of seedlings and rootstocks used – planting – land preparation – system of planting – spacing —application of manures–training–method of training–pruning for sanitation and bearing–time of pruning–irrigation–intercultivation and inter cropping–flowering and fruiting–harvesting–maturity indices – yield; **1**

UNIT-IV **3 Hrs**

Pineapple &**Litchi** – origin – importance – climate – soils – varieties – propagation – propagation material – commercial method of propagation – planting – land preparation – systems of planting – spacing – application of manures – season of planting – irrigation – inter cultivation – induction of flowering – harvesting – maturity indices–yield **1**

Litchi -. origin – importance – climate – soils – varieties – propagation – methods of propagation – commercial method of propagation – planting – land preparation – systems of planting – spacing – application of manures – season of planting – training and pruning system of training adopted , irrigation – inter cultivation –intercropping – harvesting – maturity indices–yield **1**

Sapota & jack fruit – origin – importance – climate – soils – varieties – propagation – different rootstocks used– planting -land preparation – system of planting – spacing – season of planting – irrigation – manuring – inter cultivation and intercropping – flowering and cropping – harvesting – maturity indices– yield. **1**

Coconut – botanical name – family – origin – economic part – importance – botany – varieties – tall, dwarfandhybrids–climate–soil–planting–manuring–irrigation–intercultivation–harvestingand yield **1**

UNIT-V **3 Hrs**

Arecanut – Botanical name –family –origin - economic part –importance –botany –varieties –climate –soil - preparation of land – planting – irrigation – manuring – inter cultivation – intercropping – harvesting – yield–processing. **1**

Cashew nut – Botanical name –family –origin - economic part –importance –botany –varieties –climate –soil-preparationofland–planting–irrigation–manuring–intercultivation–intercropping–training and pruning – cropping – harvesting – yield– processing. **1**

Oil palm& Cocoa– botanical name – family – origin – economic part – importance – botany – varieties – climate – soil – propagation and planting – irrigation – inter cultivation – harvesting – yield
– processing. **Cacao** – botanical name – family – origin – importance – botany – varieties – forastero, criollo and other types – climate – soil – propagation – preparation of land – planting – irrigation – weeding – mulching – pruning – intercropping – cover cropping – manuring – harvesting – yield – processing **1**

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- Ranjit Singh. 1969. **Fruits**. National Book Trust of India, NewDelhi
- Shanmugavelu, K.G. **Production Technology of fruits**. Oxford and IBH, NewDelhi
- Hays, W.B. 1953. **Fruit Growing in India**. Kitabistan-Allahabad
- Bose, T.K.N. and Mitra, S.K. 1990. **Fruits- Tropical and SubTropical**
- Shanmugavelu, K. and Madhavarao, V.N. 1977. **Spices and Plantation Crops**. Popular Book depot,Madras.
- Thampan, P.K. 1980. **Coconut**. Oxford and IBM Publishing Co. NewDelhi.
- Kumar, N., Abdul Khader, J.B.M, Ranga Swami, P. and Irulappan, I. 1991. **Spices, Plantation Crops. Medicinal and Aromatic plants**. Oxford and IBH Co., New Delhi andKolkata.

PESTS OF CROPS, STORED GRAINS AND THEIR MANAGEMENT

Credits : 2 **Semester: V**
Subject code : AG20507 **No. of lecture hours:30**

Objective: Economic importance and popular classification, distribution, biology, nature and systems of damage and control measures of insect pests listed under I to IV units.

Outcome: Students will be able to gain knowledge on the host range of different insect pests, nature and symptoms of different pests, life cycle of major insect pests of different crops and their management.

COURSE OUTCOMES

- Explain identification marks, nature of damage, damaging symptoms and control measures of pests of cereal crops
- Explain identification marks, nature of damage, damaging symptoms and control measures of pests of oilseed and fiber crops
- Explain identification marks, nature of damage, damaging symptoms and control measures of pests of fruit crops
- Explain identification marks, nature of damage, damaging symptoms and control measures of pests of vegetable crops
- Explain identification marks, nature of damage, damaging symptoms and control measures of pests of flower crops and store grain pests

UNIT-I **6 Hrs.**

Introduction to economic entomology and economic classification of insects **1**

Pests of cereal crops

Paddy : Paddy stem borer, Gall midge, Hispa, Green leaf, Hoppers, leaf roller and Gundhi bug, panicle mite, IPM practices of rice. 2
Sorghum and other millets: Shoot fly, stem borer, midge and ear head bug, ragi cut worm, ragi pink borer, whea tghujia weevil 1
Maize : Stem borer and Cob worm 1
Sugarcane : Early shoot borer, Topshoot borer, Internodal borer, scales, mealy bug, termites, leaf hoppers,wooly aphid. 1

UNIT-II **6 Hrs.**

Cotton : Boll worms, Thrips & White fly, Jassids, Aphids, Thrips, Mites, whiteflies, red cotton bug, leaf roller, dusky cotton bug, IPM In cotton. **2**
Groundnut : Leaf Miner, Root grubs, Thrips, Jassids, Aphids, *Spodoptera*, *Helicoverpa*, Hairy caterpillars. **1**
Sesamum : Pod borer, Vectors of phyllody 1
Safflower :Aphids & caterpillar.Mustardsawfly,pestsofsunflower:HelicoverpaandSpodoptera **1**
Castor : Semilooper, shoot & capsule borer, jassids and *Spodoptera*
Pulses : Gram pod borer, pod fly, plume moth and Blue butterfly, Aphids, Spotted pod Borer **1**

UNIT-III **6 Hrs.**

Coconut : Black headed caterpillar, Rhinoceros beetle and Red palm weevil. 2

Mango : Hoppers, Nut weevil & stem borer, leaf webber, fruitfly 2
Citrus : Citrus butterfly, leaf miner, fruit sucking moths, Anar butterfly **1**
Guava : Fruit fly, apple wooly aphid, codling moth **1**

UNIT-IV **6 Hrs.**

Grape : Fleabeetle, mealybug,stemgirdler&thrips.PestsofBer&custardapple,Banana. Rhizome weevil, sapota leaf webber, cashew stem borer **2**
Chilli : Thrips, mites & fruit borer, moringa hairy caterpillar, potato tuber moth, sweet potato weevil 1
Tomato : Fruit borer Tobacco: Aphids & Tobacco caterpillar, leaf miner, bhendi fruit borer and onionthrips 1
Brinjal : Shoot & Fruit Borer,Epilachna beetle 1
Cabbage : Diamond back moth, Borer, Webber, cucurbit fruit fly, Turmeric and gingerpests 1

UNIT-V **6 Hrs.**

Coffee : Borers, scales and tea mosquito bug 2
Rose : Thrips, scales, chaffer beetles. Jasmine budworm and chrysanthemum aphid. Stored grain pests and their management 2
Locusts – phases, breeding places, migration, damage & control. 2

Note: 1. Detailed Biology will be dealt for major pests only. Mentioning of minor pests.

SUGGESTED READING

- Atwal, A.S. 1976. **Agricultural Pests of India and South East Asia**. Ludhiana: Kalyani Publishers.
- Butani, D.K. and Jotwani, M.G. 1984. **Insects in Vegetables**. New Delhi: Periodical Export BookAgency.
- Butani, D. K. 1984. **Insects and Fruits**. New Delhi: Periodical Export BookAgency.
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- Khare, S.P. 1993. **Stored Grain Pests and Their Management**. Ludhiana: KalyaniPublishers.
- Nair, M.R.G.K. 1986. **Insects and Mites of crops in India**. New Delhi.ICAR.
- Ramakrishna Ayyar, T.V. 1963. **Handbook of Economic Entomology for SouthIndia**.
- Madras: GovernmentPress.
- Upadhyaya K.P. and Kusum Dwivedi. 1996. **A Text Book of Plant Nematology**. Meerut: Aman PublishingHouse.
- Vasantharaj David, B. 2003. **Elements of Economic Entomology**. Coimbatore: Popular Book Depot.
- Vasantharaj David, B and Aanathakrishnan, T.N. 2006. **General and Applied Entomology**. New Delhi: Tata McGraw-Hill PublishingHouse.

PROBLEMATIC SOILS AND THEIR MANAGEMENT

Credits :1 **Semester :V**
Subject code : AG20508 **No. of Lecture hours:15**

Objective: To impart knowledge on problem soils and quality of irrigation water and their management techniques.

Outcome: The students will be able to understand the concepts of formation of problem soils and quality of irrigation water and remedies to overcome those problems.

Course outcomes:

- To understand the formation of problematic soils
- To understand the quality of irrigation water
- To formulate various management methods to reclaim problem soils
- To evaluate quality of irrigation water and management methods
- Application of technology to evaluate problem soils

UNIT –I **3Hrs**

Soil quality-soil health – definition – criteria for judging health and quality. Problem soils-categorizationandclassificationbasedontypesofproblems-distributionofdifferentproblemsoilsand waste lands in India and Telangana **1**

Salt affected soils – types – saline, alkali and saline alkali soils – properties and diagnostic criteria – history and nomenclature. Origin of saline soils – effect of soil salinity on soil conditions and plant growth – relative crop tolerance to soil salinity **1**

Reclamation of saline soils – leaching- leaching requirement – Mechanical and agronomic practices – crops suitable **1**

UNIT –II **3Hrs**

Alkali soils – origin – effect on soil conditions and plant growth – relative crop tolerance to sodicity. Reclamation of alkali soils – different practices – amendments- gypsum requirement – crops suitable 1

Saline alkali soils – characterization – effect on soil conditions and plant growth – reclamation and management **1**

Acid soils – characteristics – origin and causes of soil acidity – effect on plant growth – reclamation of acid soils – benefits of liming – harmful effects of over liming **1**

UNIT –III **3Hrs**

Acid sulphate soils – characterization, effect on soil conditions and plant growth – Reclamation **1**
Physical problems in soils and management- crusting and compaction, hard pans – light soils – soil erosion –eroded soils **1**
Physical problems - soil and management – shallow soils – ill drained and flooded soils

1

UNIT –IV **3Hrs**

Biological degradation/ problems in soils –polluted soils **1**

Irrigation water – criteria for judging quality – salinity of irrigation water – use of saline water for irrigation **1**

Irrigation water – sodium content of irrigation water – effect on soil – use of high sodium water for irrigation **1**

UNIT –V **3Hrs**

Irrigation water – specific ion effect toxicity in irrigation water – their contents and effect on soil and plant growth **1**

Land suitability classification and land capability classification – bioremediation – use of multipurpose trees – problem soils in different agro ecosystems **1**

Remote sensing and GIS – role in detection and management of problems soils **1**

SUGGESTED READINGS:

- Soil Science – An Introduction 2015 Indian Society of Soil Science, IARI, NewDelhi
- Saline and alkaline soils of India R.P. Agarwal, J.S.P. Yadav and R.N. Gupta 1968 IARI, New Delhi
- Saline and Alkaline soils Richard, L.A. 1997 USDA, Oxfords & IBMpublishers
- Nature , properties and management of saline and alkali soils G.L. Maliwal and L.L.Sumani 2014 Agrotech PublishingAcademy
- Soil Testing Manual Dhyan Singh, Chonkar, P.K and Pandey, R.N. 2010 IARI, NewDelhi
- Reclamation of Alkali soils in India K.K. Mehta. Oxford and IBHPublishing
- Acid soils management M.A. Mohsin, A.K. Sarkar and B.S. Mathal. KalyaniPublishers
- Methods of Analysis of Soils, Plant, water, and Fertilizers. Tandon, H.L.S. 1993 FDCO. Greater Kaliash, NewDelhi.

RENEWABLE ENERGY AND GREEN TECHNOLOGY

Credits : 1 **Semester: V**
Subject code: AG20509 **No. of lecture hours: 15**

Objective: To impart knowledge on renewable energy sources

Outcome: The students will able to gain knowledge on biogas plants, gasifiers, solar water and air heaters, solar cookers, solar dyers, wind mills and biodiesel and ethanol production.

Course outcome:

- Introduction to energy sources
- Explain different types of biogas plants, gasifiers, solar water and air heaters, solar cookers and solar dryers.
- Explain different parts and types of windmill.
- Explain bio-diesel and ethanol production.

UNIT-I **3 Hrs**

Introduction to different renewable energy sources - classification, advantages and disadvantages.1
Biomass - importance of biomass, classification of energy production, Principle of combustion, pyrolysis and gasification. **2**

UNIT-II **3 Hrs**

Biogas - principle of biogas production, advantages, disadvantages and it sutilization. **1**
Biomass plants – classification, types and constructional details of bio gas plants. **1**
Gasifier - types of gasifiers, producer gas and its utilization. **1**

UNIT-III **3 Hrs**

Briquette - types of briquetting machine and uses of briquettes. **1**
Mode of heat transfer – conduction, convection and radiation. **1**
Solar collectors- flat plate collectors and focusing type collectors. **1**

UNIT-IV **3 Hrs**

Solar energy applications – working principle of solar water heater, solar air heater, solar dryers, solar distillation, solar pond and solar cooker. **2**
Solar photovoltaic system – solar lantern, streetlights, fencing and pumping system

UNIT-V **3 Hrs**

Wind energy – wind mills, parts of wind mill, types, terms used and their applications **1**

Bio-fuels – bio-diesel production (transesterification process), utilization of biodiesel in IC engines, ethanol production from agricultural waste and uses 2

REFERENCES

- Non-Conventional Energy Sources - Rai G. D., 1984. Khanna Publishers, NewDelhi.
- Renewable Energy Sources and Conversion Technology - Bansal N. K., 1990. Tata McGraw Hill publications CO. Ltd., NewDelhi.
- Solar Energy Utilization - Rai G. D., 1984. Khanna Publishers, NewDelhi.
- Solar Energy - Sukatme S. P., 1985. Tata McGraw Hill publications CO. Ltd., NewDelhi.
- Production of biodiesel from Jatropha Carcus oil by using pilot biodiesel plant - Ramesh D, Samapathrajan A and Venkatachalam P., 2009. TNAUCoimbatore.
- BiotechnologyandotherAlternateTechnology-ChakravarthiA,1989.OxfordIBHpublications CO. Ltd., NewDelhi.

WEED SCIENCE AND THEIR MANAGEMENT

Credits :2 **Semester: V**
Subject Code: AG20510A **No. of lecture hours: 30Hrs**

Objective: To impart knowledge on various aspects of weeds and different methods of weed management for sustainable and higher crop production and also to develop reasonably good technical expertise and competence on weed management

Outcome: Students will be able to acquaint themselves with weed biology, ecology and weed management.

UNIT-I **6 Hrs**

- **Introduction**: Definition of weed, harmful and beneficial effects of weeds. 1
- Classification of weeds based on taxonomy (morphology), life cycle, habitat, origin, soil pH with suitable examples 1
- Propagation of weeds sexual-asexual-vegetative reproduction 1
- Disseminationofweedsseedandfruitsdispersalagents-windandwater-animal-man-manures-farm implements and silage-dispersal of vegetative propagules 1
- Weed biology-characteristic features of weeds 1
- Weed ecology-definitions –persistence of weeds-climatic, edaphic and biotic factors 1

UNIT-II **6 Hrs**

- Crop weed competition-principles-factors-critical period of crop of crop-weed competition in some important crops
- Allelopathy and its application for weed management 1
- Methods of weed management-preventive weed control measures 1
- Physical/mechanical, cultural weed management practices 1
- Chemical and biological methods of weed control-bio herbicide and their Application in agriculture 1
- Integrated weed management-concept and components 1

UNIT-III **6 Hrs**

- Herbicides: definition, advantages, disadvantages & limitations of herbicides usage in India1
- Herbicide classification-based on chemical nature-time and method of application and selectivity-spectrum
- Translocation-residual nature-soil sterilants and fumigants 1
- Types of formulations of herbicide-Soluble concentrate (SC), Soluble, liquid (SL), Soluble, powder (SP), Wettable powder (WP), Suspension/flowable concentrates, Water Dispersal granules (WDG), Emulsifiable concentrate (EC),Micro-emulsifiable concentrate 1
- Nomenclature of herbicides-commonly available herbicides in India 1
- Adjuvants-definition, their use in herbicide application 1

UNIT-IV **6 Hrs**

- Mode of action of herbicides, important bio-chemical modes of action of herbicides interfering with photosynthetic reactions, respiration, enzymatic inhibition etc.

- Selectivity of herbicides – fundamental principles of selectivity. Differential rate of absorption of herbicides –differences in morphology and growth habits of plants-rate of translocation of herbicides. 1
- Selectivity of herbicides-differential rate of of deactivation of herbicides-reverse metabolism-conjugation-protoplasm resistance to the specific herbicide 1
- Herbicidal resistance and management-Definition-types of resistance-Development of herbicide resistance in weeds and their management 1
- Herbicide rotation, mixtures and relevance in agriculture 1
- Compatibility of herbicides with agro-chemicals and their application 1
- Herbicide residue management-persistence and residue of herbicides-management of herbicide residue in soil-cultural and mechanical-enhancing biodegradation-deactivation of herbicides

UNIT-V **6 Hrs**

- New developments in herbicides-micro herbicides and nano herbicides 1
- weed management in cereals and millets
- weed management in pulses and oil seeds, sugarcane and cotton 1
- Weed management in orchards, vegetables and non-cropped areas 1
- Shift of weed flora in crops and cropping systems 1
- Aquatic weeds and their management 1
- Problematic weeds and management 1

SUGGESTED READING

- Crafts,AS.andRobbins,WW.1973.**WeedControl**.NewDelhi:TataMcGraw-HillPublishing Co. Ltd.
- Gupta, OP. 1984. **Scientific Weed Management**. New Delhi: Today and Tomorrow Printers andPublishers.
- Gupta, OP. 2004. **Modern Weed Management**. Jodhpur: Agro Bios(India).
- Rao, VS. 2000. **Principles of Weed Science**. New Delhi: Oxford & IBH PublishingCo.,
- Subramanian, S., Ali Mohammed, A. and KumarJaya, R. 1991. Ludhiana**: All About Weed Control**. KalyaniPublishers.
- Tadulingam, C. and Venkatnarayana, D. 1955. **A Handbook of Some South Indian Weeds**. Madras: GovernmentPress.
- Thakur, C. 1977. **Weed Science**. New Delhi: Metropolitan Book Co. Pvt.Ltd.

SOIL, WATER, PLANT AND SEED TESTING

Credits: 2+1 **Semester: V**
Course code: AG22510B **No. of lectures:30**

Objective: To impart knowledge on soil, plant, water and seed testing methods
Outcome: Students will be able to gain knowledge on the scientific methods of determining qualitative and quantitative parameters of soil, plant, water and seeds and their importance in agriculture

COURSE OUTCOMES:

- Analyses chemical properties of soil and their importance on Plant growth
- Analyses physical properties of soil and their importance on Plant growth
- Interprets analytical data of various chemical and physical properties of soils
- Demonstrates DRIS methods and its importance
- Explains significance of seed and its characters on crop productivity

UNIT – I

pH definition, principle - pH scale – soil pH, its importance in crop nutrition 1
Rating chart - working problems on pH and H^+ and OH^- ion concentrations, measurements of pH in soils and irrigation water 1
EC, definition, Principles of wheatstone bridge – effect of EC on seed germination, water and nutrient uptake, measurement of EC of soils and irrigation waters 2
Working principle of spectrophotometer – calorimetry, beer lambart law 1
Working principles of flame photometer – Emission spectrometry – Absorption spectroscopy merits and demerits, precautions. 1

UNIT – II

Soil analysis – objectives – sampling of soil, procedure and precautions – advantages and limitations 1
Soil texture, definition, determination – importance of soil texture on plant growth 1
Soil structure, definition, determination - importance of soil structure on plant growth 1
Bulk density and porosity - definition, determination and importance on plant growth 1
Soil air, importance, composition, characterization of soil aeration – ODR 1
Soil temperature, importance, measurement - diurnal variations of soil temperature at different soil depths 1

UNIT – III

Interpretation of analytical data viz., pH, EC, Organic carbon – N, P, K, S and micronutrients – nutrient index and their relative optimum values 2
Interpretation of analytical data viz., Soil texture, structure, aeration, soil temperature and their relative optimum values 1
Plant analysis – sampling stages and plant part to be sampled in various agriculture and horticultural crops 1
Analysis of nutrients – quantitative rating of plant analysis data and interpretation of results – critical nutrient concentration – critical nutrient ranges 2

UNIT – IV

DRIS, nutrient ratios, DRIS chart – benefits and limitations 2
Water analysis – quality criteria – classification and suitability of irrigation water – water quality index. 2

Use of soil testing kit for major and micro-nutrient analysis 2

UNIT – V

Floral biology - anthesis – pollination – fertilization , seed formation – filling – physiological maturity and harvest maturity of field crops 2 Physiological – biochemical – metabolic processes during seed development and transformation – seed morphological features 1

Seed structures – composition and functional components of seed- seed viability and seedling vigour and storage 1

Seed quality and its significance on crop productivity – germination – physical purity – genetic purity – Seed health and moisture content assessment and and prescribed standards 2

SUGGESTED READINGS:

- Soil Science – An Introduction 2015 Indian Society of Soil Science, IARI, New Delhi
- Saline and alkaline soils of India R.P. Agarwal, J.S.P. Yadav and R.N. Gupta 1968 IARI, New Delhi
- Saline and Alkaline soils Richard, L.A. 1997 USDA, Oxfords & IBM publishers
- Nature , properties and management of saline and alkali soils G.L. Maliwal and L.L. Sumani 2014 Agrotech Publishing Academy
- Thomson, J.R. 1979. **An introduction to Seed Technology**. London: Leonard Hill.
- Agrawal, P.K. and Dadlani. 1986. **Techniques in Seed Science and Technology**.New Delhi: South Asian Publishers.

RAINFED AGRICULTURE AND WATERSHED MANAGEMENT PRACTICALS

Credits: 1 **Semester: V**
Subject code: AG20511 **No. of Lecture hours:30**

Objective: To gain knowledge on rainfall pattern and soil & moisture conservation measures

Outcome: Students will be able to analyze rainfall pattern and learn various soil and moisture conservation measures for better crop production

Practical

1. Studies on climate classification,

2. Studies on rainfall pattern in rainfed areas of the country

3. Pattern of onset and withdrawal of monsoons.

4. Studies on cropping pattern of different rainfed areas in the country

5. Demarcation of rainfed area on map of India.

6. Interpretation of meteorological data

7. Scheduling of supplemental irrigation on the basis of evapo-transpiration demand of crops.

8-9. Critical analysis of rainfall and possible drought period in the country

10. Effective rainfall and its calculation.

11. Studies on cultural practices for mitigating moisture stress.

12. Characterization and delineation of model watershed.

13. Field demonstration on soil & moisture conservation measures.

14. Field demonstration on construction of water harvesting structures.

15. Visit to rainfed research station/watershed**.**

CROP IMPROVEMENT – I (*Kharifcrops*)

PRACTICALS

Credits :1 **Semester: V**
Subject code: AG20512 **No. of practical hours:30**

Objective: To impart knowledge on origin, distribution and breeding objectives of various crops

Outcome: Students will be able to understand the concepts of breeding objectives for various stresses and hybrid seed production in different crops.

PRACTICAL

1. Floral biology-Types of inflorescence, flower structure of monocots and dicots, floral formula and diagram.
2. Emasculation and hybridization techniques in Rice and Maize
3. Emasculation and hybridization techniques in Jowar, Bajra, and Ragi
4. Emasculation and hybridization techniques in Redgram, blackgram, Greengram and Cowpea
5. Emasculation and hybridization techniques in Groundnut, Soybean and sesame
6. Emasculation and hybridization techniques in Castor, Cotton ,Tobacco
7. Maintenance breeding of different kharif crops Rice, Maize, Jowar, Redgram, Groundnut
8. Maintenance breeding of different kharif crops Castor, Cotton,Tobacco
9. Handling of germplasm and segregating generations by different methods-Pedigree, Bulk and SSD methods
10. Study of field techniques for varietal seed production and hybrid seed production in rice and maize.
11. Study of field techniques for varietal seed production and hybrid seed production in sorghum and redgram
12. Study of field techniques for varietal seed production and hybrid seed production in castor and cotton
13. Estimation of heterosis, inbreeding depression and heritability
14. Layout of field experiments
15. Study of quality characters, donor parents for different traits in different kharif crops and Visit to seed production plots- ACRIP plots for different kharif crops

ENTREPRENEURSHIP DEVELOPMENT & BUSSINESS COMMUNICATION

PRACTICALS

Credits:1 **Semester:V**

Subject Code:AG20513 **No. of lecture hours:30**

Objective: To impart firsthand information various entrepreneurial activities and business negotiation.

Outcome: Students will be able to study successful enterprises, develop project proposals and prepare project reports.

Practical Topics

1. Simulation exercise on assessing entrepreneurial traits
2. Practical exercise on problem solving skills
3. Practical exercise on managerial skills
4. Achievement motivation and goal setting
5. Identification and selection of business ideas
6. Practical exercise on decision-making
7. Planning , Preparation of business plan and proposal writing
8. Monitoring and supervision of entrepreneurialactivities
9. Presentation of business proposal
10. Practical exercises on time Management /time Audit
11. SWOT analysis of selected enterprise
12. Leadership Skills: organization skills
13. Visit to entrepreneurship Development Institute
14. Business Communication and Negotiation
15. Field Visit to Successful Enterprise - Study of Characteristics of Successful Entrepreneurs-Case Study

DISEASES OF FIELD CROPS, HORTICULTURE CROPS-I & THEIR MANAGEMENT

PRACTICALS

Credits :1 **Semester:V**

Subject code:AG20514 **No of Practical hours:30**

Objective: To diagnose the plant disease based on symptomatology and to understand the etiology and host-parasite relationship.

Outcome: Students will be able to gain knowledge on various diseases of field crops and their management

1. Study of symptoms, cause, etiology, host-parasitic relationship and specific control measures of diseases of rice
2. Study of symptoms, cause, etiology, host-parasitic relationship and specific control measures of diseases of sorghum
3. Study of symptoms, cause, etiology, host-parasitic relationship and specific control measures of diseases of pearl millet and wheat
4. Study of symptoms, cause, etiology, host-parasitic relationship and specific control measures of diseases of finger millet and maize
5. 5.Study of symptoms, cause, etiology, host-parasitic relationship and specific control measures of diseases of sugarcane
6. Study of symptoms, cause, etiology, host-parasitic relationship and specific control measures of diseases of tobacco
7. Study of symptoms, cause, etiology, host-parasitic relationship and specific control measures of diseases of groundnut
8. Study of symptoms, cause, etiology, host-parasitic relationship and specific control measures of diseases of safflower and sunflower
9. Study of symptoms, cause, etiology, host-parasitic relationship and specific control measures of diseases of castor and sesamum
10. Study of symptoms, cause, etiology, host-parasitic relationship and specific control measures of diseases of mustard
11. Studyofsymptoms,cause,etiology,host-parasiticrelationshipandspecificcontrolmeasuresof diseases of cotton
12. Study of symptoms, cause, etiology, host-parasitic relationship and specific control measures of diseases of red gram, green gram and black gram
13. Study of symptoms, cause, etiology, host-parasitic relationship and specific control measures of diseases of Bengal gram, Pea, Lentil and soybean
14. Diseases of Mango, citrus , Apple, Grape
15. Field visits at appropriate time during the semester

Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory. Field visit for the diagnosis of field problems .Collection and preservation of plant diseased specimens for herbarium.

Note: Students should submit 50 pressed and well-mounted specimens

PRINCIPLES OF INTEGRATED PEST & DISEASE MANAGEMENT PRACTICALS

Credits : 1 **Semester: V**
Subject code : AG20515 **No. of lecture hours: 30**

Objectives:

- To gain practical knowledge of insect population distribution
- To attain knowledge on factors influencing insect population
- To know the calculations on concentrations of different insecticides
- To gain knowledge on different insecticide formulations

ENTOMOLOGY

1. Methods of diagnosis and detection of various insect pests
2. Sampling techniques for estimation of insect population and damage
3. Pest surveillance through light traps, pheromone traps and forecasting of pest incidence.
4. Calculation of doses/concentrations of different insecticidal formulations.
5. Acquaintance of insecticide formulations
6. Mass multiplication techniques of important parasitoids.
7. Mass multiplication techniques of important predators.
8. Mass multiplication techniques of important microbial pathogens.
9. Insecticide classification, safety measures of insecticide application and specific antidotes.
10. Methods of diagnosis and detection of plant diseases

PATHOLOGY

11. Methods of plant disease measurement-phytopathometry, monitoring, assessment of disease severity and calculation of incidence levels
12. Forecasting of plant diseases
13. Isolation and Identification of biocontrol agents. Mass multiplication of *Trichoderma, Pseudomonas*
14. Study of fungicides and their formulations.
15. Methods of application and Safety issues in Fungicide uses. Calculation of fungicide sprays concentrations.

Laboratory manuals

- Dhaliwal GS and Ramesh Arora 2001. Integrated pest management. Concepts and approaches, Kalyani PublishersLudhiana
- Gautam, R.D 2008 Biological Pest Suppression. Westville publishing House NewDelhi.
- Yazdani, S.S and Agarwal,M.L.1979. Elements of Insect Ecology. Nervosa Publishing House, NewDelhi.

PRODUCTION TECHNOLOGY OF FRUITS AND PLANTATION CROPS

PRACTICALS

Credits :1 **Semester: V**
Course Code: AG20516 **No. of lecture hours:30**

Objective: To impart knowledge on production technology of fruit crops and plantation crops.

Outcome: Students will be able to gain knowledge on the scientific reason for different cultivation practices of fruits and plantation crops with location specific recommendation.

1. Identification and description of fruits
2. Identification and description of Plantation crops
3. Identification and description of varieties of Mango, Guava,
4. Identification and description of varieties of Guava andPapaya,
5. Identification and description of varieties of Sapota, Banana and Citrus and Pomegranate
6. Identification and description of varieties of Coconut , Areca nut andCashewnut
7. Propagation methods of fruit crops
8. Propagation methods of Plantation crops.
9. Seed propagation –scarification and stratification of seed
10. Physiological disorders of fruit crops
11. Identification and description of varieties of Grape,
12. Preparation of plant bio regulators and their use
13. 14, 15 Visit to orchards/ fruit Research stations/ Commercial plantations.

PESTS OF CROPS, STORED GRAINS AND THEIR MANAGEMENT

PRACTICALS

Credits :1 **Semester: V**

Subject code : AG20517 **No. of practical hours:30**

Objective: To know the nature and symptoms of damage of pests in different crops.

Outcome: Students will be able to identify insect and non - insect pest and diagnose the different insect pests based on symptoms of damage.

1. Typical symptoms of damage by various phytophagous insects
2. Identification of major insect pests of cereals & millets and their damage symptoms
3. Identification of insect pests of sugarcane & pulses and their damage symptoms
4. Identification of insect pests of cotton & other fibre crops and their damage symptoms
5. Identification of insect pests of oil seed crops and their damage symptoms
6. Identification of insect pests of vegetables and their damage symptoms
7. Identification of insect pests of mango, cashew & banana and their damage symptoms
8. Identification of insect pests of citrus, sapota & ber and their damage symptoms
9. Identification of insect pests of grapevine, pomegranate & guava and their damage symptoms
10. Identification of insect pests of coconut, turmeric, betelvine,
11. Identification of insect pests of onion, ginger & tobacco and their damage symptoms
12. Identification of insect pests of flower & ornamental plants and their damage symptoms
13. Identification of insect pests of Stored grains & their products and their damage symptoms

14 & 15. Assessment of losses due to insects in storage. Fumigation of grainstore/godown.

PROBLEMATIC SOILS AND THEIR MANAGAMENT

PRACTICALS

Credits: 1 **Semester: V**
Subject code: AG20518 **No. of practical hours:30**

OBJECTIVE: To impart knowledge on different soil sampling methods for identifying problematic soils

OUTCOME: Students will be able to analyze chemical properties of problematic soils and irrigation water and can able to interpret the favorable conditions for crop growth

1. Collection of water sample for analysis for assessing the quality of irrigation water
2. Determination of pH and Electrical Conductivity of irrigation water sample
3. Determination of carbonates and bicarbonates in irrigation water sample
4. Determination of chlorides in irrigation water sample
5. Determination of calcium and magnesium in irrigation water sample
6. Determination of sodium content in irrigation water sample
7. Determination of boron content in irrigation water sample
8. Determination of pH and electrical conductivity of soil
9. Determination of cation exchange capacity in soil
10. Determination of exchangeable Na in alkali soils
11. Determination of lime requirement of acid soils
12. Determination of gypsum requirement of alkali soils
13. Determination of bulk density at different depths insoil
14. Determination of soil strength
15. Assessment of irrigation water quality and management required

RENEWABLE ENERGY AND GREEN TECHNOLOGY

Credits :1 **Semester:V**
Subject code: AG20519 **No. of lecture hours:30**

Objective: To impart knowledge on sources of renewable energy.

Outcome: The students will able to gain knowledge on different types of biogas plants, gasifiers, briquetting, solar still, solar water heaters, solar cookers, solar dyers, wind mills and biodiesel production.

PRACTICALS

1. Constructional details of KVIC and Janata type biogas plants.
2. Constructional details of Dheen Bandu type biogas plants.
3. Constructional details of different types of gasifiers.
4. Study the performance of gasifiers.
5. Study the briquettes preparation from biomass.
6. Study the efficiency of solar cooker.
7. Study the performance of a solar still.
8. Study the performance of a solar dryers.
9. Study the working of solar photovoltaic pumping system.
10. Study the performance evaluation of domestic solar water heater.
11. Study the performance evaluation of solar lantern.
12. Study the performance evaluation of solar streetlight.
13. Study the performance of different types of windmills.
14. Field visit to biogas plants and windmills.
15. Study the processing of bio diesel production from Jatropha.

WEED SCIENCE AND THEIR MANAGEMENT

PRACTICALS

Credits :1 **Semester:V**
Subject Code :AG20520A **No. of practical hours: 30**

Objective: To develop mastery of weed identification and get acquainted with different herbicides.

Outcome: Students will be able to develop mastery of weed identification and technical know-how on computation of herbicide doses.

1 Identification of weeds and study of losses due to weeds
2 Biology and survey of weeds in cropped area and other habitats
3 Techniques of weed preservation-Herbarium preparation
4 Determination of critical period of crop weed competition under field condition and study of crop associated weeds
5 Estimation of weed population dynamics and efficacy of herbicides(WCE and WI)
6 Study of biology of important problematic weeds
7 Study of biology of parasitic and aquatic weeds
8 Study of weed flora study in long term experiments
9 Studyofcommonlyavailableherbicidesinthemarket,theirnomenclatureandlabelinformation
10 Study of herbicide formulation and mixture of herbicides
11 Computation of herbicide doses and Herbicide residue analysis
12 Study of herbicides application equipment and calibration
13 Herbicide application methods and precautionary measures
14 Herbicidesphytotoxicityscoringunderfieldconditionsanditscompatibilitywithagrochemicals
15 Field study of weed control in cropped and cropped areas

SOIL, WATER, PLANT AND SEED TESTING
PRACTICALS

Credits :1 **Semester:V**
Subject Code :AG22520B **No. of practical hours: 30**

PRACTICAL

1. Collection and preparation of soil samples
2. Estimation of pH and EC in soil sample
3. Estimation of soil organic carbon (qualitative and quantitative)
4. Estimation of available nitrogen by Subbaih and Asija method
5. Estimation of available soil phosphorus by Olsens methods
6. Estimation of available soil potassium by flame photometer method
7. Estimation of nitrogen in plant sample
8. Estimation of phosphorus in plant sample
9. Estimation of potassium in plant sample
10. Estimation of pH and EC and chlorides in irrigation water
11. Study Floral biology of major field crops
12. Physical purity test – purification of seeds, inert matter, weed seeds, other crop seeds
13. Genetic purity and grow-out tests
14. Determination seed moisture content and seed health tests
15. Seed vigour and viability tests

YEAR-WISE AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS B.Sc.
(Hons.) AGRICULTURAL SCIENCE & RURAL DEVELOPMENT
SIXTH SEMESTER
ACADEMIC YEAR-2022-23 OF 2020-24 BATCH (CBCS)

Sl. No.	Part	Subject Code	Title of the Subject	Hours/ week	Duration of Exam (hrs.)	Marks			Credits
						Internal	External	Total	
1	II	AG20601	Farming Systems and Organic farmingFor Sustainable Agriculture (Core 38)	2	3	40	60	100	2
2	II	AG20602	Geo-informatics and Nano technologyFor Precision Farming (SEC -4)	1	3	40	60	100	1
3	II	AG20603	Management of Beneficial insects (Core 39)	1	3	40	60	100	1
4	II	AG18604	Protected Cultivation & Secondary Agriculture (Core - 40)	1	3	40	60	100	1
5	II	AG20605	Livestock, poultry and fisheries management (Core 41)	2	3	40	60	100	2
6	II	AG20606	Diseases of Horticulture crops - II & their Management. (Core-42)	2	3	40	60	100	2
7	II	AG20607	Post harvest Management & VA of Fruits and Vegetables. (SEC-6)	1	3	40	60	100	1
8	II	AG20608	Comm. skills and Personality. Development. (SEC-7)	1	3	40	60	100	1
9	II	AG19609 A	Agri chemicals (DSE-3)	2	3	40	60	100	2
		AG20609 B	Commercial Plant Breeding (DSE-3)						
PRACTICALS									
10	II	AG20610	Farming Systems and Organic farming For Sustainable Agriculture (Core 38)	2	3	40	60	100	1
11	II	AG20611	Geo-informatics and Nano technology For Precision Farming (SEC -4)	2	3	40	60	100	1
12	II	AG20612	Practical crop production -II (Rabi Crops) (SEC-5)	2	3	40	60	100	1
13	II	AG20613	Management of Beneficial insects (Core 39)	2	3	40	60	100	1
14	II	AG18614	Protected Cultivation & Secondary Agriculture (Core - 40)	2	3	40	60	100	1
15	II	AG20615	Livestock, poultry and fisheries management (Core 41)	2	3	40	60	100	1
16	II	AG20616	Diseases of Horticulture crops-II & their Management. (Core 42)	2	3	40	60	100	1
17	II	AG20617	Post harvest Management &VA of fruitsand vegetables . (SEC-6)	2	3	40	60	100	1
18	II	AG20618	Comm. skills and Personality. Development. (SEC-7)	2	3	40	60	100	1
19	II	AG19619 A	Agri chemicals (DSE-3)	2	3	40	60	100	1
		AG20619 B	Commercial Plant Breeding (DSE-3)						
Total				**33**		560	840	1400	**23**

FARMING SYSTEMS AND ORGANIC FARMING FOR SUSTAINABLE AGRICULTURE

Credit: 2 **Semester: VI**
Subject code: AG20601 **No. of Lecture hours: 30**

Objective: To impart knowledge on the fundamentals of farming systems and organic farming towards sustainable agriculture to improve the economic conditions of the farmer.

Outcome: Students will be able to gain comprehensive knowledge on the fundamental principles of farming systems and organic farming.

UNIT-I **6 Hrs**

- Farming system - introduction- scope, importance and concept-principles of farming system related te
- Types of farming systems-advantages and limitations-suitability-factors affecting the farming system.
- Farming systems-system approach- determinants of farming system-cropping systems-and related terminology.
- Allied enterprises-significance of integrating crop and livestock enterprises-components and maintenance- dairying and sheep and goat rearing-breeds-housing-feed and fodder requirements-biogas plant.
- Allied enterprises poultry farming-breeds housing-feed and fodder requirements-apiculture-species and management.
- Allied enterprises-sericulture-moriculture and silkworm rearing- agro-forestry systems suitable for dry land farming
- Tools for determining production and efficiencies in different farming and cropping systems.

UNIT-II **6 Hrs**

- Adverse effects of modern agriculture-sustainableagriculture-definition-concept-goals-elements.
- Problems related to soil water and environment-adaption and mitigation strategies-indicators of sustainability
- Conservation agriculture-concepts-need-management of natural resources-land water and vegetation
- Techniques for sustainability-Low External Input Agriculture (LEIA) and Low External Inputs for sustainable agriculture (LEISA) and HEIA (High External Input Agriculture).
- Integrated Farming system-Historical back ground, objectives characteristics and advantages.
- Site specific development of IFS models for different agro-climatic zones of India and Telangana

UNIT-III **6 Hrs**

- Resource use efficiency-optimization of resource use by different methods in IFS
- Resource cycling-flow of energy in different farming systems.
- Organic farming-definition –need-scope-principles-characteristics-relevance to modern agriculture
- Different eco-friendly farming systems-biological farming natural farming, regenerative agriculture – permaculture-biodynamic farming.
- Initiatives taken by state and central government, NGO’s and other organizations for promotion of organic

agriculture.

- Organic eco systems and their concepts-organic nutrient sources-organic manures and methods of composting.

UNIT-IV **6 Hrs**

- Green manures-bio-fertilizers-types, methods of application-benefits and limitations.
- Nutrient management in organic farming.
- Choice of crops and varieties in organic farming-crop rotations-multiple cropping-need and benefits.
- Fundamentals of insect pest, disease and weed management under organic mode of production-cultural biological and non-chemical pest and disease management.
- Botanicals –pyrethrum, neem seed kernel extract, neem seed powder, neem oil and neem formulations.

UNIT-V **6 Hrs**

- Marketing and export potential of organic products-opportunities and constraints.
- Operational structure of NPOP- other agencies for organic production.
- Inspection-certification- and accreditation procedures for organic products.
- Processing- labelling and economic considerations and viability.

SUGGESTED READING

1. Arun K. Sharma. 2006. **A Hand book of Organic Farming**. Jodhpur: Agrobios(India).
2. Dahama, A.K. 2007. **Organic Farming for Sustainable Agriculture**.Jodhpur: Agrobios(India).
3. Deb, D.L. 1994. **Natural Resources Management for Sustainable Agriculture and Environment**. New Delhi: Angkor publishersLtd.
4. Ruthenburg, H. 1971. **Farming Systems in Tropics**. London: ClarendonPress.
5. Saroja Raman. 2006. **Agricultural Sustainability – Principles, Processes & prospects**. New York: Food productspress.
6. Subramaniyan, S. 2004. **Globalization and Sustainable Agriculture**. Ludhiana: KalyaniPublishers.
7. Thampan, P.K. 1993. **Organics in Soil Health and Crop Production**. Cochin: Peekay Tree Crops DevelopmentFoundation.
8. Dushyent Gehlot.2005.Organic **farming-standards,accreditation,certificationand inspection**. Agrobios, India.357p
9. Reddy SR2017. **Farming system and sustainable agriculture** Kalyani publishers. (India) 10.Reddy SR2017. **Principles of organic farming** Kalyani publishers.(India).

GEO-INFORMATICS AND NANOTECHNOLOGY FOR PRECISION FARMING

Credits: 1 **Semester: VI**
Subject code: AG20602 **No. of Lecture hours: 15**

Objective: To impart knowledge on GIS, GPS, and Crop simulation models, Remote sensing in Precision Farming,

Outcome: The students will be able to gain knowledge on Tools, techniques, applications of Geo- informatics, nanotechnology and remote sensing

Course outcomes:

- Explains the concepts of geo-informatics in precision agriculture
- Illustrates GIS data modeling and graphic representation of spatial data
- Analyses Remote sensing and Global positioning system (GPS), concepts and application in Agriculture
- Distinguish Crop Simulation Models
- Classify nano- particles and their applications in agriculture

UNIT–I **3 Hrs**

- Precision Agriculture - Concepts and techniques - their issues and concerns for Indian Agriculture
- Geo-informatics – definition, concepts- Tools and techniques - Applications of Geoinformatics and its use in Precision Agriculture
- Crop discrimination and Yield monitoring – Spectral signatures, NDVI concept and Principles, yield monitors, GPS receiver

UNIT–II **3 Hrs**

- Soil mapping and fertilizer recommendation using geospatial technologies - Supervised and unsupervised mapping and classification
- Spatial data and their management in GIS–Stages of GIS data modeling-graphic representation of spatial data Vector& Raster
- GIS models and their comparison –database management systems-GIS data file management; database models and storage

UNIT–III **3 Hrs**

- Remote sensing concepts and application in Agriculture–Principles, Remote sensing process-electromagnetic spectrum-atmospheric interactions with electro magnetic radiation-remote sensing platforms and sensors-key elements of visual image interpretation - applications in agriculture.
- Image processing and interpretation – Characters of digital image, pre-processing, corrections, image registration, enhancement, filtering & transformations, Image classification
- Global positioning system (GPS), components and its functions – Maps, classification and scale of maps, spatial referencing system, linkage between RS, GPS and GIS

UNIT–IV **3 Hrs**

- Introduction to Crop Simulation Models – Concepts and principles- their use for optimization of Agricultural Inputs
- STCR approach for Precision Agriculture – Assessing, defining, monitoring and amending the variability in STCR approach
- Introduction and Historic developments and Fundamentals of Nano-science & Nanotechnology – Nano-scale materials – definition and properties

UNIT–V **3 Hrs**

- Natural nano-particles and their occurrence, manufacturing and characterization of nano-particles, Nano- pesticides, nano-fertilizers, nano-sensors – Types and strategies for synthesis of nano- materials
- Use of nano-technology in tillage, seed, water, fertilizer, plant protection for scaling up of farm productivity, Nano-Biosensors, Nanotechnology in precision farming
- Nanotech Delivery Systems for Pests (nano-pesticides), Nutrients (nano-fertilizers) and Plant Hormones – Biosafety of nanoscale material – Environmental regulation of nano-materials.

MANAGEMENT OF BENEFICIAL INSECTS

Credits: 1 **Semester: VI**

Subject code: AG20603 **No. of Lecture hours: 15**

Objective: To impart knowledge on rearing of Silk worms, Honey bees, Lac insects and their products.

Outcome: The students will be able to gain knowledge on rearing of silkworms, honeybees and lac insects and their products, identify different pests and diseases of host plants of silk worms and lac insects and their management and different enemies of silk worms, honey bees, lac insects and their management.

COURSE OUTCOMES

- Explain importance of sericulture, Moriculture and grainage technology
- Explain silkworm rearing types, rearing house, pests and disease management
- Explain post cocoon technology, types of reeling and importance of bee industry
- Explain honey bee rearing equipment, management and extraction of honey
- Explain Lac culture, and important predators, parasitoids and pollinators

UNIT-I **3 Hrs**

- Importance of sericulture – types of silk worms with their host plants, biology and lifecycle 1
- Moriculture–varieties of mulberry, initial establishment of mulberry and package of practices. Pest and diseases of mulberry and their management. 1
- Silkworm grain age technology – production of DFLs- hibernation and methods to overcome – Acid treatment. 1

UNIT-II **3 Hrs**

- Silkworm rearing – rearing house – equipment and appliances. 1
- Types of rearing – young age and late age – feeding, spacing, bed cleaning, hygiene and climatic factors, moulting. 1
- Silkworm enemies and diseases and their management. 1

UNIT-III **3 Hrs**

- Post cocoon technology – stifling, storing, cooking and processing of reeling. 1
- Types of reeling – country charka, cottage basin and filature. Uses of silk and byproducts. 1
- Bee keeping as rural industry -importance– species wild and domesticated, Life cycle of honey bee with cast distinction. 1

UNIT-IV **3 Hrs**

- Equipment of apiary – colony activities round the year. Establishment of a new colony – location, swarm prevention and management of apiary. 2
- Extraction of honey, its composition and uses. Enemies and diseases of honeybees 1

UNIT-V

3 Hrs

- Lac insects – biology and behavior of lac insect, host plants, extraction of lac and enemies of lac 1
- Predators and Parasitoids: Insect orders bearing predators and parasitoids used in insect control. 1
- Important species of pollinators, weed killers and scavengers and their importance in agriculture. 1

SUGGESTED READING

1. **Sericulture manuals** – FAO.
2. Ganga and Sulochana Shetty.**Introduction toSericulture.**
3. Narsimhanna and Ullal. **Hand book of practical Sericulture.** CSR &TI.
4. Vasanth Raj and David. **Elements of EconomicEntomology**.

PROTECTED CULTIVATION AND SECONDARY AGRICULTURE

Credits: 1 **Semester: VI**

Subject code: AG18604 **No. of lecture hours: 15**

Objective: To impart knowledge on protected cultivation.

Outcome: The students will able to gain knowledge on design criteria and materials for construction of greenhouse, environmental parameters to be controlled with-in greenhouse, irrigation system and fertigation management in green house. It also provides the knowledge on cultivation of important horticultural crops, medicinal and aromatic plants.

Course outcome:

- Introduction to greenhouse technology and study of different types of greenhouses.
- Explain design criteria and constructional details of greenhouse.
- Explain environmental parameters to be controlled with-in greenhouse.
- Explain the cultivation of important horticultural crops, medicinal and aromatic plants.
- Explain the attack of insect, pest and disease management factors in greenhouses.

UNIT I

Protected cultivation - importance and scope, status of protected cultivation in India and world, types of protected structure based on site and climate – glass house, poly house, rain shelters, poly tunnels, hotbeds and cold flames, shade nets. Introduction to greenhouses - history, definition, greenhouse effect, advantages of greenhouses.

UNIT II

Types of greenhouses - based on shape, utility, construction and covering/cladding material. Cladding material involved in greenhouse/poly house - glass, flexible plastic film, Polyethylene film, ethylene vinyl acetate, poly vinyl chloride, poly vinyl fluoride films, acrylic sheet, tefzel T^2 film, reinforced plastic, rigid plastic sheet and polycarbonate rigid panel. Greenhouse –locating a green house, green house orientation, layout of greenhouse, material requirement.

UNIT III

Environmental control - natural sunlight, supplemental lightning- incandescent lamps, fluorescent lamps, high intensity discharge lamps, temperature control, heat distribution, ventilation and cooling in green house- naturally ventilated, fan and pad cooling, forced air cooling etc. Relative humidity, carbon-dioxide level.

UNIT IV

Soil preparation and management – soil sterilization methods, soil and soilless media (cocopeat, vermicompost, perlite, vermiculite, charcoal, pumice, rockwool etc.), substrate management. Types pf benches and containers – benches - no bench, raised benches, ground benches, arrangement of benches – longitudinal, cross-benching, peninsula arrangement, movable benches, pyramid benches, containers - types of containers

UNIT V

Automation – types of green house control – step control, integrated control, feedback, proportional, integral, derivative, feed forward, energy balance, sensors (Temperature, light, CO_2, RH, irrigation etc.) Irrigation and fertigation management – irrigation – water application methods, hand watering and automatic watering systems, tube watering, capillary mat, overhead sprinklers, perimeter watering, drip system, misting. Fertigation – dry and liquid fertilizers, methods of application of liquid fertilizers, carbon-dioxide fertilization.

REFERNCES

1. The complete Book of Greenhouse Gardening-Cavendish M 1974. Marshal Cavendish Books, London.
2. Greenhouse Management for Flowers and plantProduction-Kennard S and Nelson B A 1977. International printers and publishers Inc., Illinois.
3. GreenHouseTechnology and Applications-Vilas M. Salone and Ajay K. Sharma, 2012.
4. Green House Technology and Management - K Radha Manohar and C Iagdinathane, 2013.

LIVESTOCK, POULTRY AND FISHERIES MANAGEMENT

Credits: 2 **Semester: VI**
Subject code: AG20605 **No. of lecture hours: 30**

Objective:

- To impart knowledge to the students on dairy farming, poultry, sheep and goat farming, prawn, swine and fish production.
- To understand the selection and breeding methods of livestock to gain good profits.
- To get knowledge on different livestock diseases and their control measures, sanitation, care, feed and good management practices.
- To get knowledge of feeding of least cost ration formulation with available local ingredients.

Outcome:

- Students will be able to gain knowledge on dairy farming, poultry, sheep and goat farming, prawn, swine and fish production.
- Knowledge on different types of breeds which are suitable to our local climate area. How to run profitable dairy, poultry, sheep, goat farming.
- Clear idea about economics of livestock production and management

UNIT-I	**6 Hrs**
• Role of livestock in Indian economy-Statistics, Livestock development programmes, Operation flood programme	1
• Different systems of livestock rearing – Extensive, Semi-intensive, Intensive and Mixed	1
• Classification of breeds of livestock and poultry with characteristics	3
• Transportation of livestock and poultry	1

UNIT-II	**6 Hrs**
• Reproductive systems of livestock and poultry-signs of estrous	1
Artificial Insemination and parturition	1
• Factors affecting onset of puberty, fertility and milk production in cattle	2
• Selection and breeding methods, Qualitative &Quantitative traits	2

UNIT-III	6 Hrs
• Digestive systems in ruminants, swine &poultry-feeding requirements	1
• Classification of feedstuffs for livestock & poultry, feed ingredients for balanced ration	1
• Anti-nutritional factors and feed additives in feeds	1
• Management practices for calves, pregnant animal &diseased animal.	2
• Management practices of sheep, goat and swine	1

UNIT-IV **6 Hrs**

- Housing systems/principles-space requirements-raring systems 1
- Poultry management-incubation, brooding, hatching, biosecurity measures.2
- Diseases of livestock & poultry, their control measures- vaccination and sanitation1
- Project report on economics of livestock. 1
- Brief note on rabbit, quail, emu &duck farming 1

UNIT-V **6 Hrs**

- Fishery resources in India-statistics 1
- Types of fishes and Prawns found in India 1
- Inland, Brackish and Sea Production of fishes and prawns 2
- Integrated raring of fish-Fish and Prawn Product Technology 1
- Production-breeds-inland &sea production 1

SUGGESTED READING

1. Banerjee G. C. 1982. **A Textbook of Animal Husbandry**. New Delhi: Oxford & IBH publishing co. Pvt.Ltd.
2. Sastry, M. R, Thomas C. K and Singh R.A. 1986. **Farm Animal Management and Poultry Production**. New Delhi: Vikas Publishing House PvtLtd.
3. Srinivasaiah, P.V. 1998. **Scientific Poultry Production**. Bangalore: IBHPrakasan.

DISEASES OF HORTICULTURE CROPS-II & THEIR MANAGEMENT

Credits :2 **Semester: VI**

Subject code: AG20606 **No of lecture hours: 30**

Objective: To impart knowledge on the diseases of field crops and their management

Outcome: Students will be able to gain knowledge on various diseases of field crops and their management

COURSE OUTCOMES

- Identify different diseases of Grapevine, Apple, Pomegranate, Crucifers, Cucurbits and gain knowledge about their management
- IdentifydifferentdiseasesofBrinjal,Chilli,Tomato,Bhendiandgainknowledgeabouttheirmanagement
- Identify different diseases of Onion, Potato, Bean, Turmeric, Ginger and gain knowledge about theirmanagement
- IdentifydifferentdiseasesofCoconut,Tea,Rose,Marigold and gain knowledge about their management
- IdentifydifferentdiseasesofJasmine,Crossandra,Betelvine,Mulberry and gain knowledge about their management

UNIT-1 6 Hrs

Economic importance, symptoms, cause, etiology, disease cycle and management of the following crops

- Grapevine: Downy mildew, Powdery mildew, Anthracnose, Alternaria Leaf spot, Rust 2
- Apple: Scab, Powdery mildew, Fire blight, Crown gall, Peach:leaf curl 1
- Pomegranate: Bacterial blight, Anthracnose, Strawberry: Leaf spot Ber: Powdery Mildew and Sootymold 1
- Crucifers: Alternaria leaf spot, Black rot, Club root, Downy mildew, Powdery mildew, White rust1
- Cucurbits: Downy mildew, Powdery mildew, Wilt, Cucumber mosaic virus, Cercospora leaf spot,Alternaria leaf spot,Fruit rot 1

UNIT-II 6 Hrs

- Brinjal: Phomopsis blight and fruit rot, Sclerotinia blight, Little leaf, Bacterialwilt 1
- Tomato: Damping off, Wilt, Early and late blight, Buck eye rot, Leaf curl, Mosaic, Septoria leaf spot, Tomato spotted wilt, Bacterial fruit canker, Root knot nematode, Stemphyliumleaf blight 2
- Chillies: Anthracnose and fruit rot, Wilt, Leaf curl, Damping off, Powdery mildew, Choanephora blight, Chilli virus complex, Bacterial leaf spot, Cercospora leaf spot, Alternarialeaf spot 2

- Bhendi: Yellow vein mosaic virus, Cercospora leaf Spot,Powdery mildew 1

UNIT-3 **6 Hrs**

- Onion and Garlic: Purple blotch, Stem phylium blight, Smudge, Smut 1
- Potato: Early and late blight, Black scurf, Leaf roll, Mosaic, Common scab, Brown rot, Wart, Potato spindle tuberviroid 2
- Beans: Anthracnose, Bacterial blight, Rust, Mosaic (Green mosaic And Yellow mosaic) 1
- Turmeric: Leaf spot, Leaf blotch, Rhizome rot, Ginger: Soft rot, Phyllosticta leafspot 2

UNIT-4 **6 Hrs**

- Coconut: Wilt, Bud rot, Ganoderma basal stem Rot, Stem Bleeding, Tatipaka disease, Grey blight, Oil palm: Bunch rot, spear rot 2
- Tea: Blister blight, Coffee: Rust, Colocasia: Phytophthora blight, Coriander: Stem gall 2
- Rose: Die back, Powdery mildew, Black leaf spot Marigold: Botrytis blight, Cercospora leaf spot 2

UNIT-5 **6 Hrs**

- Jasmine:Rust,Cercospora leafspot, Chrysanthemum: Septoriablotch, Stunt, Fusarium Wilt, Alternaria leaf spot 2
- Crossandra: Fusarium wilt, Cercospora leaf spot, Anthracnose Betelvine: Wilt, Anthracnose, Root rot, Leaf rot and foot rot
  2
- Mulberry: Powdery mildew, Cercospora leaf spot, Bacterial leaf spot,Mosaic 2

REFERENCES

Cook, A.A. 1981. Diseases of Tropical and Subtropical Field, Fibre and Oilplam. Mac Millan Publishing Co., New York.

Rangaswamy, G. and Mahadevan, K. 2001. Diseases of Crop Plants in India. Prentice Hall of India Pvt. Ltd., New Delhi. Singh, R.S. 2005.

Plant Diseases. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi

Pathak V N 1980. Diseases of fruit crops.Oxford and IBH Publ Co. New Delhi. 2. Sohi H S 1992. Diseases of ornamental plants in India. ICAR, New Delhi. 3. Singh R S 1994. Diseases of vegetable crops.Oxford and IBH Publ Co. New Delhi.

POST-HARVEST MANAGEMENT AND VALUE ADDITION OF FRUITS AND VEGETABLES

Credits : 1 **Semester: VI**
Subject code: AG20607 **No. of Lecture hours: 15**

Objective: To impart basic knowledge on Pre & post-harvest factors affecting the quality and post-harvest shelf life of fruits and vegetables

Outcome: The students will gain knowledge on different aspects of processing and preserving foods.

COURSE OUTCOMES:

- Define food processing and preservation, Classify foods for processing and preservation
- List out methods of food preservation
- Explain processing methods of cereals, millets and legumes
- Explain processing methods of fruits and vegetables and oilseeds
- Explain processing methods of spices and plantation crops

UNIT-I 3 Hrs

- Importance of post-harvest technology of horticulture crops – meaning and importance of post- harvest technology – causes of post-harvest losses. 1
- Pre-harvest factors affecting the quality and post-harvest shelf life of fruits and vegetables – environment factors (temperature, light, rain, wind and humidity) – mineral nutrients (Ca, Mg, Zn, B and Cu) growth regulators (auxins, gibberellins, cytokinins, ethylene and growth retardants)- rootstock, irrigation, pruning, thinning, girdling, varieties, pests and diseases, pesticides, maturity and mechanical injury. 1
- Ripening – definition – types of fruits based on ripening – changes occurring during ripening – maturation of seed/change in seed colour, water content, carbohydrates, organic acids, proteins, texture, taste, aroma, abscission, development of surface wax, respiration rate, chemical changes and enzymes – factors affecting ripening of fruits and vegetables – temperature CO_2 , O_2 radiation, air humidity, volatiles, growth regulators – chemicals used for hastening and delaying ripening of fruitsand vegetables. 1

UNIT–II **3 Hrs**

- Factors responsible for deterioration of harvested fruits and vegetables – respiration,transpiration, ethylene, mechanical damages, pestsand diseases. 1

- Harvesting and post harvesting of fruits and vegetables – methods of harvesting (hand and mechanical) – their advantages and disadvantages – curing – degreening – precooling –washing and drying – sorting and grading – disinfestations – post harvest treatmentsandwaxing. 1

- Methods of storage – low temperature storage (cellar refrigeration and freezing) – controlled atmospheric storage – hypobaric storage – irradiation and low-cost storage structure – zero energy cool chamber – storage in pits – storage in wind breaks –*in situ* – storage I cellars – clamp storage. 1

UNIT-III **3 Hrs**

- Packaging – definition – purpose of packaging – methods of packaging – packaging materials different materials for fresh fruits and vegetables – specific packaging for export of mango, banana, grapes, kinnow, sweet orange and mandarin; cushioning materials – introduction – purpose of using cushioning material – characteristics of cushioning materials various kinds of cushioning materials. 1

- Value addition concept - Importance and scope of preservation of fruits and vegetables in India - principles and methods of preservation – principles – methods – asepsis – preservation by high temperature, drying, filtration, chemicals, salt, sugar, oil, acid fermentation, carbonation, antibiotics and irradiation. 1

- Preservation by canning and bottling – selection of fruits and vegetables – sorting and grading – washing – peeling (hand peeling, mechanical peeling by heat, lye peeling and flame peeling)- cutting and blanching and their advantages and disadvantages – can filling – syruping or bringing glidding or clinching – exhausting – sealing – processing labeling, packing – storing – flowchart for canning and bottling – containers for canning and bottling – tin containers, glass containers, lacquers, acid resistant, Sulphur resistant,
- other containers, plywood container, string opening, composite containers and self- heatingcan. 1

UNIT-IV **3 Hrs**

- Spoilage of canned food – swell, hydrogen, springer, flipper, leakage, breather and bursting – discoloration of canned foods – metallic contamination – ferric tennate, iron sulphide and copper sulphide combined with hydrogen– biological causes – enzymes ad chemical reaction – Maillard reaction – spoilage due to physical and chemical changes – microbialspoilage. 1
- Drying and dehydration of fruits and vegetables – definition – factors affecting rate of drying – advantages of dehydration over sundrying and other methods principles of dryingand dehydration
- flow chart for drying / dehydration of fruits and vegetables – blanching – sulphuring and spoilage of dried product – freezing of fruits and vegetables – methods of freezing – sharp freezing, quick freezing, direct immersion, indirect immersion, air blast freezing,
  cryogenic freezing, dehydro freezing andfreezedrying. 1
- Intermediate moisture food, Jam Jelly and Marmalade –Conceptsstandards. 1

UNIT-V **3 Hrs**

- Intermediate moisture food preserve candy. 1
- Pickles – methods of pickling preservation with salt, vinegar, oil and spices – problems in pickle making – preserve – candy ad crystallized fruits and vegetables– glazed fruits and vegetables – chutneys and sauces / ketchups – flowchart for ketchup- flow chart
  for sauce. 1
- Fruit juices, squashes and cordial – preparation – selection of fruit, washing, extraction of juice, deaeration, straining, filtration and clarification and preservation – preservatives ad colours permitted and prohibited in India.

REFERENCES:-

S.No.	Book title & Author	Publisher
1.	Preservation of Fruits and Vegetables – Giridharilal, G.S., Siddappa and Tondon, G.L.2007.	ICAR, New Delhi
2.	Post harvest Biology and Handling- Hard, N.F, and Salunkhe, D.K. 1980	AVI Publishing Co., Westport
3.	Handling, Transportation and Storage of Fruits and vegetables (Vol.2) – Lloyd Ryoll, A.M.S. and Pentzer W.T.M.S.1982.	AVI Publishing Tables Co.Inc.,Connecticut.
4.	Post Harvest Physiology and Storage of Tropical and Subtropical Fruits – Mitra, S.K.2005.	CABI Publishers, Kolkatta.
5.	Hand Book of Fruit Science and Technology- Salunkhe,D.K. andKadam,S.S.1995	Marcel Dekker Incorporated, New York
6.	Fruit and Vegetable Preservation: Principles and Practices. - Srivastava, R.P. and SanjeevKumar.2002.	International Book Distribution Company, Lucknow.
7.	Packaging of Fruits and Vegetables in India – Venkatarathnam, L.1988.	Agri-Horticultural Society Hyderabad.

COMMUNICATION SKILLS AND PERSONALITY DEVELOPMENT

Credits: 1 **Semester: VI**

Subject Code: AG20608 **No. of lecture hours: 15**

Objective:

To improve the knowledge level of the students on various communication skills & personality development

Outcome: Students will be able to get knowledge on communication skills and personality development.

Course outcomes:

- Understand the meaning & Concepts of communication skills- hard and soft skills.
- Identify and understand various Non-verbal communication skills.
- Gain understanding on the skills of learning and presentation.
- Know the importance of Personality Development and identify the different personality traits.
- Understand the different dimensions of Personality Development like Attitude, Team work, management of Conflicts, stress & Time, etc.

Unit-I **3 Hrs**

- Communication: Meaning, Process and its forms 1
- Communication skills: Meaning and overview of hard &soft skills 1
- Verbal and non-verbal communication: Verbal – oral and written skills, Non-verbal communication skills: Concept, meaning, forms, functions and importance 1

Unit-II **3 Hrs**

- Listening skill: Meaning, concept, types of listening, barriers in listening & note taking 1
- Oral presentation skills: Impromptu presentation &extempore presentation 1
- Effective Public Speaking 1

Unit-III **3 Hrs**

- Group Discussion: Procedure, principles, purpose, advantages and disadvantages 1
- Small group discussion techniques 1
- Writing of technical articles, field diary, lab record, indexing, footnote and bibliographic procedures 1

Unit-IV **3 Hrs**

- Personality development: Meaning, definition and overview of personality Traits 1
- Questioningskills 1
- Attitude: Meaning, functions of attitude and developing positiveattitude 1

Unit-V **3 Hrs**

- Team building, time management and techniques of time management 1
- Conflict management: Meaning, concept, causes and managing of conflict 1
- Stress management: Meaning, definition and management of stress 1

REFERENCES

1. Communication Skills. Sanjay Kumar. 2011. Oxford Publication. ISBN9780198069324.
2. Extension Communication and Management- Ray G L 1991 NayaPrakasham,Kolkata.
3. Communication of Innovations- Rogers EM and Floyd F Shoemaker 1971 Free Press, a divisionof MacmillanPublishingCo
4. Education and communication for development Dahama O P and Bhatnagar O P 1980 Oxfordand IBH publishingCo.,Delhi
5. Communication Rayudu C S 1997 Himalaya publishinghouse,Hyderabad
6. Personality Development and Soft skills. Barun K. Mitra. 2011. Oxford Publication. ISBN130198066217.
7. Soft Skills for Professional Excellence – Personality Development – Vol I and II,CRTD Publications,Hyderabad.
8. A Youngsters' guide to personality development. S.P. Sharma 2013 V &SPublishersDelhi

AGRICHEMICALS

Credits : 2 **Semester: VI**

Subject code: AG19609A **No. of lecture hours: 30**

Objective: To impart knowledge to the students on different agricultural chemicals used in agriculture.

Outcome: Students will be able to gain knowledge on various insecticides, synthetic pyrethroides, organo chlorine insecticides, carbamates and fungicides used in agriculture and pesticide residues influence on soil, water, air, animals and human beings.

Course outcomes:

- Differentiate organic compounds and inorganic compounds
- Classify inorganic insecticides with examples
- Illustrate various organic, natural and synthetic insecticides
- Understands various organochlorine, carbamate and phosphorus compounds
- Analyzes various fungicides and pesticide residues influence on environment

UNIT-I 6 Hrs

- Introduction to agrochemicals – classification, type and role of agrochemicals inagriculture – Introduction to insecticides and classification of insecticides based onchemical nature with examples
- Botanical insecticides – examples, advantages – disadvantages.Neem – chemicals in neem and insecticidal action of neem
- Natural pyrethrum – sources, extraction, chemistry and insecticidal action
- Nicotine and Rotenone – sources, chemistry and mode of action
- Organochlorine insecticides – structure, properties and insecticidal activity of BHC, DDT, Endosulfan

UNIT- II **6 Hrs**

- Organophosphorus insecticides – mode of action – classification with structures ofacids and examples of their derivatives – structure-activity relationships of thiophosphoricacid derivative insecticides - structure and properties of DDVP,phosphamidon, chlorpyriphos, Malathion, phorate, profenofos, methyl parathion, acephate, monocrotophos
- Carbamate insecticides – chemistry – mode of action – structure and properties of Carbaryl, carbofuran
- Synthetic pyrethroids – examples, uses, advantages and disadvantages
- Neonicotinoids – chemistry and insecticidal action – properties and uses of neonicotinoid insecticides imidacloprid, acetamaprid.

Herbicides – classification with examples – selectivity of herbicides –- Mode of action of herbicides with examples

UNIT- III **6Hrs**

- Structure and properties of important herbicides – Atrazine, butachlor, 2, 4-D, glyphosate - Fate of herbicides
- Fungicides – classification with examples. Inorganic fungicides – characteristics, preparation, mode of action and use of sulphur fungicides
- Characteristics, preparation, mode of action and use of copper fungicides – Bordeaux mixture and copper oxy chloride
- Organic fungicides – Dithiocarbamates - mode of action – structure, preparation, properties and use of zineb, maneb, thiram and ziram
- Systemic fungicides – structure, characteristics and use of benomyl, carboxin, oxycarboxin, metalaxyl, carbendazim
- Insecticide Act and rules - Pesticides banned, withdrawn and restricted use

UNIT- IV **6 Hrs**

- Plant growth regulators – examples and uses - Biorationals, biopesticides, reduced risk insecticides - Bio-insect repellents - Animal origin insecticides
- Fertilizers – classification with examples – their importance in agriculture.
- Nitrogenous fertilizers – Haber-Bosch process – feed stocks for ammonia synthesis 21. Feed stocks and manufacturing process of ammonium sulphate, ammonium nitrate, calcium ammonium nitrate, ammonium chloride
- Feed stocks and manufacturing process of urea, slow release N-fertilizers
- Phosphatic fertilizers – Feed stocks and manufacturing process of SSP – Preparation of bone meal and basic slag

UNIT-V **6 Hrs**

- Potassic fertilizers – natural sources – manufacturing of potassium chloride, potassium sulphate
- Complex fertilizers – manufacturing of ammonium phosphates, nitrophosphates, potassium nitrate and NPK complexes
- Mixed fertilizers – sources and compatibility – preparation of major, secondary and micronutrient mixtures
- Fertilizer control order- fertilizer logistics - fertilizer subsidy - fertilizer marketing 28. Persistence of agrochemicals – fate and effect of their use on the environment, soil, human health and animal health
- Merits and demerits of use of chemicals in agriculture – management of agrochemicals for sustainable agriculture

SUGGESTED READING

1. Thomson, WT. 1980. **Agricultural Chemicals-Fungicides (Vol.5).** USA: Thomas publications.
2. Worthington, CA. 1985. **The Pesticide Manual British Crop Protection**. UK: A world Compendium Council.
3. Nene, YL. andThapliyal, PN. 1993. **Fungicides in plant disease control**. New Delhi: Oxford & IBH Pub. Co.
4. SreeRamulu, US. 1991. **Chemistry of insecticides and fungicides**. New Delhi: Oxford & IBH Pub. Co.
5. Rao, VS. 1992. **Principles of Weed Science**. New Delhi: Oxford & IBH Pub. Co.

COMMERCIAL PLANT BREEDING

Credits : 2 **Semesters: VI**
Subject code : AG 20609 B **No. of Lecture hours: 30**

Objective: To impart knowledge on hybrid seed production techniques and quality testing

Outcome: The students will be able to understand the concepts of hybrid seed production techniques of various crops

Course outcomes:

- Understand the types of reproduction andpollination
- Analyze the advances in hybrid seed production of cereals
- Analyze the advances in hybrid seed production of oilseeds and pulses Appraise the alternate methods of developing a line
- Understand the principles of seedquality

UNIT –I

Modes of plant reproduction and classification of crops based on pollination
Line development and maintenance breeding in self and cross pollinated crops (A/B/R and two line system) for development of hybrids and seed production.
Genetic purity test of commercial hybrids

UNIT –II **6hrs**

Advances in hybrid seed production of rice
Advances in hybrid seed production of maize
Advances in hybrid seed production of sorghum

UNIT –III **6hrs**

Advances in hybrid seed production of pearlmillet
Advances in hybrid seed production of castor, sunflower and Brassica Advances in hybrid seed production of cotton and pigeonpea

UNIT –IV **6hrs**

Quality seed production of vegetable crops under open and protected environment
Alternative strategies for the development of the line and cultivars: Haploid inducer and tissue culture techniques
Alternative strategies for the development of the line and cultivars: Biotechnological tools
IPR issues in commercial plant breeding

UNIT –V **6hrs**

DUS testing and registration of varieties under PPV & FR Act
Variety testing, release and notification systems in India

Principles and techniques of seed production, types of seeds, quality testing in self pollinated crops

Principles and techniques of seed production, types of seeds, quality testing in cross pollinated crops

Suggested readings:

Allard, R.W. 1960. *Principles of Plant Breeding*. John Wiley and Sons, New York.

Phundan Singh, 2006. *Essentials of Plant Breeding* . Kalyani Publishers, New

Delhi.

Poehlman, J.M. and Borthakur, D. 1995. *Breeding Asian Field Crops*. Oxford and IB H Publishing Co., New Delhi.

Sharma, J.R. 1994.*Principles and Practice of Plant Breeding*. Tata McGraw Hill, Publishing Company Ltd., NewDelhi.

Singh, B.D. 2006. *Plant Breeding: Principles and Methods*. Kalyani Publishers, New Delhi

FARMING SYSTEMS AND ORGANIC FARMING FOR SUSTAINABLE AGRICULTURE PRACTICALS

Credits : 1 **Semester: VI**
Subject code: AG20610 **No. of practical hours: 30**

Objective: To impart practical skills involved in vermi-composting, biofertilizers and other components of organic farming.
Outcome: Students will be able to implement the methods involved in vermi-composting, biofertilizers and other components of organic farming, farming systems and sustainable agricultural practices.

1. Components of organic ecosystem-soil water environment and biodiversity
2.Compost making-aerobic and anaerobic methods.
3. Preparation of enriched farmyard manure
4. Vermicompost and enriched Vermicompost methods from crop residues and organicwastes 5.Biofertilizers production techniques and its applicationmethods.
6. Methods of application of bio pesticides (Trichoderma, Bt, NPV).
7.Preparation of neem products and other botanicals for pest and disease control
8 Preparation of green pesticides (Panchagavya, Beejamrutham, Jeevamruthametc.,)
9 .Case studies of Indigenous Technical knowledge (ITK) for nutrient and weedmanagement.
10. Case studies of Indigenous Technical knowledge (ITK) for pest and disease.
11.Study of quality parameters of organic products.
12. Economic analysis of organic productionsystem.
13. Visit to IFS units of nearby state Agri. University/Institutes and farmersfield. 14.Visit to organic farms to study the various components and their utilization. 15.Grading, labeling and packaging of organic products.

GEO-INFORMATICS AND NANOTECHNOLOGY FOR PRECISION FARMING

PRACTICAL

Credits :1 **Semester: VI**
Subjectcode: AG20611 **No. of Lecture hours:30**

Objective: To impart knowledge on GIS, GPS, Crop simulation models, Remote sensing in Precision Farming,

Outcome: The students will be able to gain knowledge on Tools, techniques, applications of Geo-informatics, nanotechnology and remote sensing

Practicals

1. Introduction to GIS software
2. Spatial data creation and editing
3. Introduction to image processing software
4. Visual and digital interpretation of remote sensing images
5. Generation of spectral profiles of different objects
6. Supervised and unsupervised classification and acreage estimation
7. Multispectral remote sensing for soil mapping
8. Creation of thematic layers of soil fertility based on GIS
9. Creation of productivity and management zones based on GIS
10. Fertilizers recommendations based on VRT and STCR techniques
11. Crop stress (Abiotic/Biotic) monitoring using geospatial technology
12. Use of GPS for agricultural survey
13. Formulation and characterization of nano-particles
14. Different nano-particles and its application in agriculture
15. Smart nano-scale systems for targeted delivery of nutrients and pesticides

PRACTICAL CROP PRODUCTION-II (RABI CROPS)

Credits: 1 **Semester: VI**
Subject code: AG20612 **No. of practical hours: 30**

OBJECTIVE: To impart knowledge on layout of experimental plots, nursery raising and seed sowing, fertilizer application, weed control methods, water management, plant protection and harvesting of rabi crops

Outcomes: Students will able gain knowledge on crop production technology practices of field crops

PRACTICALS

1. Preparation of cropping plan/scheme in multiple cropping system.
2. Field preparation and layout of experiment plots.
3. Seed treatment, nursery raising and sowing of field crops.
4. Time and method of fertilizer application for Rabi crops.
5. Weed control methods in Rabi crops.
6. Water management for different Rabi crops.
7. Recording biometric observations in crops.
8. Plant protection measures in Rabi crops.
9. Yield attributes and estimation of yield in different crops.
10. Harvesting, recording of yield
11. Post-harvest operations in different field crops.
12. Visit to seed production farm.
13. Visit to Integrated Farming System unit.
14. Visit to farm mechanization unit.
15. Economic analysis and preparation of balance sheet.

MANAGEMENT OF BENEFICIAL INSECTS PRACTICALS

Credits : 1 **Semester: VI**
Subject code: AG20613 **No. of practical hours: 30 Hrs**

Objective: To impart knowledge on rearing of silkworms, honey bees, lac insects and their products.

Outcome: Students will be able to gain knowledge on rearing of silkworms, honey bees, lac insects, their concerned pests, diseases and their management.

1. Study of important species of honey bees and caste of honey bees.
2. Study of different types of beehives, beekeeping appliances & seasonal management of bees
3. Study of enemies & diseases of honeybees
4. Study of bee pasturage, foraging and communication in bees.
5. Study of mulberry varieties and preparation of planting material of mulberry.
6. & 7. Raising of mulberry nursery & planting of mulberry in main field
8. Study of methods of harvesting and preservation of leaves
9. Study of different species of mulberry & non-mulberry silk worms
10. Rearing equipment and appliances used in sericulture
11. Dissection of silkworm larvae for study of silk glands
12. Study of lac insect, types of lac and host plants
13. Collection & identification of important pollinators, weed killers and scavengers
14. Visit to silkworm rearing station and reeling unit
15. Visit to biocontrol laboratory

PROTECTED CULTIVATION AND SECONDARY AGRICULTURE

Credits: 1 **Semester: VI**

Subject code: AG18614 **No. of lecture hours: 30**

Objective: To impart knowledge on protected cultivation.

Outcome: The students will able to gain knowledge on different types of greenhouses based on shape, construction and cladding material. Calculation of ventilation and air exchange rates with-in greenhouse, study of irrigation system and fertigation management in green house.

PRACTICALS

1. Study of different types of greenhouses based on shape.
2. Study of different types of greenhouses based on construction.
3. Study of different types of greenhouses based on cladding material.
4. Study of materials for construction of Greenhouses.
5. Study of construction of pipe framed greenhouse.
6. Measurement of environmental parameters inside greenhouse.
7. Calculation of ventilation rates in active summer cooling system.
8. Calculation of rate of air exchange in active summer cooling system.
9. Field visit to green house
10. Raising of seedlings and saplings under protected conditions.
11. Use of portrays in quality planting material production.
12. Bed preparation and planting crop for production.
13. Intercultural operations.
14. Soil EC and pH measurement.
15. Regulation of irrigation.
16. Fertilizers through drip, fogging and misting.

LIVESTOCK, POULTRY AND FISHERIES MANAGEMENT

PRACTICALS

Credits : 1 **Semester: VI**

Subject Code: AG20615 **No. of practical hours: 30 Hrs**

Objective: To impart knowledge on identification marks of body parts of live-stock and different breeds both indigenous and exotic breeds of live-stock and suitability, selection of good quality breeds and different diseases of livestock and control.

Outcome: Students will be able to gain knowledge on different types of breeds and selection methods, combat diseases of live-stock and finally students will be able to run profitable dairy farm, sheep and goat farming with their knowledge.

Practicals

1 External body parts of cattle, buffalo, sheep, goat, swine, poultry and fishes 2-3 Study of livestock breeds
4-5 Handling and restraining methods of livestock
6-7 Identification methods of farm animals & poultry
8-9 Judging & Grading-Elimination and culling of livestock, poultry and fishes 10-11 Familiarization with routine farm operations and farm records
12 Feed analysis & ration formulation
13 Planning, layout and construction of livestock & poultry farm houses and fishponds
14 Clean milk production and different milking methods
15 Visit to Livestock units

DISEASES OF HORTICULTURE CROPS-II & THEIR MANAGEMENT PRACTICAL

Credits : 1 **Semester: VI**
Subjectcode: AG20616 **No of Practical hours: 30 Hrs**

Objective: To impart knowledge on the diseases of field crops and their management

Outcome: Students will be able to gain knowledge on various diseases of field crops and their management

1. Diseases of Ber,Guava
2. Diseases of Sapota,Papaya
3. Diseases of Banana and Pomegranate
4. Diseases of Strawberry and Chilli
5. Diseases of Brinjal and Bhendi
6. Diseases of Potato and Tomato
7. Field visit
8. Diseases of Crucifers of Cucurbits
9. Diseases of Betel vine, Onion and garlic
10. Diseases of Coconut, Oil Palm and Colocassia
11. Diseases of Tea, Coffee and Coriander
12. Diseases of Turmeric, Ginger, Mulberry and Beans
13. Diseases of Rose, Jasmine, Chrysanthemum and Crossandra
14. Field visit.

POST HARVEST MANAGEMENT AND VALUE ADDITION OF FRUITS AND VEGETABLES

Credits :1 **Semester: VI**
Subject code :AG20617 **No. of Lecture hours:30**

Objective: To impart knowledge of processing and preservation of various foods.
Outcome: Students will independently perform different processing and preservation techniques of foods.

PRACTICAL

1. Visit to Rythu bazaar for vegetable harvesting indices
2. Application of different types of packaging containers for shelf life extension
3. Effect of temperature on shelf life and quality of produce
4. Demonstration of chilling and freezing injury in fruits and vegetables
5. Extraction and preservation of pulp and juices
6. Preparation of Jam and jelly
7. RTS, Nectar and Squash
8. Preparation of osmotically dried products, fruit bar and candy
9. Preparation of tomato products
10. Quality evaluation of products – Physico chemical
11. Quality evaluation of products – sensory evaluation
12. Visit to processing unit or industry
13. Studies on physiological loss of weight
14. Analysis of TSS, Acidity in different fruits
15. Analysis of Ascorbic acid in different fruits

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COMMUNICATION SKILLS AND PERSONALITY DEVELOPMENT

PRACTICAL

Credits: 1 **Semester: VI**

SubjectCode:AG20618 **No. of lecture hours:30**

Objective: To inculcate effective communication skills, reading skills, comprehension skills and creative skills among students.

Outcome: Students will be able to get knowledge on communication skills and personality development.

1. Simulation exercise for non- verbal communication & students feedback
2. Listening & note taking & student feedback
3. Exercise on reading & comprehension & students feedback
4. Exercise on impromptu presentation & students feedback
5. Group discussion – Practical exercises
6. Group discussion – Practical exercises
7. Exercise on writing of technical articles& students feedback
8. Identification of personality types- role play & psychological tests & students feedback
9. Attitude-Role play- analysis of attitude & student feedback
10. Working in learners- management games
11. Simulation exercise on time management
12. Simulation exercise on conflict management
13. Interview Skills – Mock interviews
14. Interview Skills – Mock interviews
15. Simulation exercise on creativity

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AGRICHEMICALS

Credits : 1 **Semester: VI**
Subject code: AG19619 A **No. of practical hours: 30 Hrs**

Objective: To impart knowledge to the students on different agricultural chemicals used in agriculture.

Outcome: Students will be able to gain knowledge on various insecticides, synthetic pyrethroides, organo chlorine insecticides, carbamates and fungicides used in agriculture and pesticide residues influence on soil, water, air, animals and human beings.

PRACTICALS

1. Sampling of fertilizers and pesticides for analysis
2. Pesticide application technology – pesticide application appliances
3. Pesticide formulations - formulations of pesticides available in market
4. Quick tests for identification of fertilizers – identification of cations
5. Quick tests for identification of fertilizers – identification of anions
6. Estimation of nitrogen content of urea
7. Estimation of phosphorous content in SSP by colourimetry
8. Estimation of potassium content of potassic fertilizers using flame photometer
9. Determination of calcium content of fertilizers
10. Standardization of sodium thiosulphate by iodimetry
11. Determination of iodine content of test solution by iodometry
12. Determination of purity of copper oxy chloride
13. Determination of purity of sulphur fungicide
14. Determination of purity of malathion
15. Calculations of fertilizer application and preparation of fertilizer mixtures
16. Calculation of doses of pesticides to be used

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COMMERCIAL PLANT BREEDING

PRACTICALS

Credits : 1 **Semester: VI**
Subject code : AG20619 B **No. of practical hours:**

30 Objective: To impart knowledge on hybrid seed production techniques and quality testing

Outcome: The students will be able to understand the concepts of hybrid seed production techniques of various crops

PRACTICAL

1. Techniques of seed production in self and cross pollinated crops using A/B/R system
2. Techniques of seed production in self and cross pollinated crops using two line system
3. Learning techniques in hybrid seed production using male-sterility in field crops.
4. Tools and techniques for optimizing hybrid seed production
5. Concept of rouging in seed production plotss
6. Concept of line and its multiplication and purification in hybrid seed production
7. Role of pollinators in hybrid seed production
8. Hybrid seed production techniques in cereals
9. Hybrid seed production techniques in millets
10. Hybrid seed production techniques in oil seeds
11. Hybrid seed production techniques in pulses
12. Hybrid seed production techniques in fibre crop

YEAR-WISE AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS
B.Sc. (Hons.) AGRICULTURAL SCIENCE & RURAL DEVELOPMENT
SEVENTH SEMESTER
ACADEMIC YEAR-2022-23 OF 2019-23 BATCH (CBCS)

SECTION -A

Sl. No.	Part	Subject Code	Title of the Subject	Hours/ week	Duration of Exam (hrs.)	Marks			Credits
						Internal	External	Total	
1	II	AG18701	Rural Agricultural Work experience Program (SEC-5,6,7,8,& 9)	18	3	40	60	100	12
2	II	AG18702	Industry Internship (DSE-4)	12	3	40	60	100	8
				30		80	120	200	**20**

SECTION – B

Sl. No.	Part	Subject Code	Title of the Subject	Hours/ week	Duration of Exam (hrs.)	Marks			Credits
						Internal	External	Total	
1	II		Agricultural Experiential LearningProgramme (AELP)(DSE-5)	30	3	40	60	100	20
		AG 18803A	1. Mushroom cultivation Technology						
		AG 18803B	2. Raising of Commercial Nursery						
		AG 18803C	3. Vermi-Composting						
		AG 18803D	4. Organic Production Technology						
		AG 18803E	5. Food Processing						
				30		80	120	200	**20**

Self learning course : Agricultural Development Schemes In India

RURAL AGRICULTURAL WORK EXPERIENCE PROGRAMME
(80 Working Days)
SECTION-A

Credits: 6 **Semesters: VII**
Subject code : AG 18701

Objective:

- To provide the students with an opportunity to gain practical knowledge in Crop Production and Crop Protection.
- To familiarize the students with the socio-economic conditions of the farmer and institutions involved in rural development.
- To develop effective communication skills using extension training methods in the transfer of technology.

Outcome: Students will be able to get first-hand experience of various agricultural operations involved in Crop Production and Crop Protection and learn actual farming in order to develop proper perspective.

Course outcomes:

- Apply the knowledge of the various agricultural operations involved in Crop Production
- Apply the knowledge of Crop Protection techniques in the host farmers field
- Survey on socio economic status of farmers in the village
- Organize method demonstration and agricultural exhibition in the villages for benefit of farmers
- Prepare report in prescribed format in crop production, crop protection, Agrl. Economics, Ag. Extension and KVK activities

In this programme students are required to stay in villages attached to an Agricultural Research Station / Krishi Vigyana Kendra and interact with formers of the village by visiting them regularly. They are required to collect information in prescribed proforma and also perform extension activity in the village in small groups. A team of experienced specialists supervises and guides their activities during this programmes.
At the end of the programme each student is required to submit a report detailing the work done and knowledge gained with sound basic background this practical field experience equips the students with desired Professional Skill enabling them to serve the Farming Community in a better way.

ACTIVITIES :

Each student will take up an Agro-Economic Survey of the Village. The student will conduct a Farm Holding Survey.

The student shall maintain a Record of Daily Work Done. Bio-metrical observation shall be recorded.

Record of Land Protection Work undertaken.

Collect and Submit 15 Herbarium specimens each of insect damage and plant disease symptoms. Conduct Result Demonstration and Method Demonstrations.

Preparation of relevant charts for Farmer's Knowledge. Student shall arrange Farmer's Training Programme.

Students shall establish Information Corner in the Village. Celebrate Farmers' Day

The students shall involve themselves in Actual Day to Day Agricultural Operations along with their Host Farmers.

Participate in Village Service Activity.

INDUSTRY INTERNSHIP PROGRAMME
(50 Working Days)
SECTION-A

Credits : 3 **Semester: VII**
Subject code: AG 18702

Objective: To expose the students to an agri- related industry/ company so that they gain working knowledge which will enable them to easily get into jobs in agri- based industry

Outcome: Students will be able to learn techniques and skills to find suitable placements in agro based Industries/ Instuitions.

Course outcomes:

- Select the agro-industry based on the interest of the students
- Apply various techniques and skills in Agro-Industry
- Formulate research proposal
- Makeup of project report
- Defend the research project

The objective of this programme is to provide the students an opportunity to gain first hand knowledge of the industrial work to learn techniques and skills and to train them for assignments after completion of graduation. As part of this each student will be attached to an Industry or an Organization in the field of Agriculture, Animal Husbandry etc. At the end of the semester each student shall submit a report detailing the work done and the knowledge gained.

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AELP

(Agricultural Experiential Learning Programme)

SECTION-B

Credits: 20 **Semester: VII**

Subject code: AG 18703

Experiential learning

a) concept

The word ‘ experiential ‘ essentially means that learning and development are achieved through personally determined experience and involvement ,rather than on received teaching or training ,typically in group ,by observation ,study of theory or hypothesis ,bring in innovation or some other transfer of skills or knowledge .Experiential learning is a business curriculum –related endeavor which is interactive .

EL is for building (or reinforcing) skills in project development and execution , decision – making ,individual and team coordination ,uproots to problem solving , accounting, marketing and resolving conflicts , etc . The program has end to end approach. Carefully calibrated activities move participants to explore and discover their own potential. Both activities and facilitation play a critical role in enhancing team performance.

b) Objectives

EL provides the students an excellent opportunity to develop analytical and entrepreneur skills , and knowledge through meaningful hands on experience , confidence in their ability to design and execute project work.

The main objectives of EL are:

- To promote professional skills and knowledge through meaning full hands on experience.
- To build confidence and to work in project mode
- To acquire enterprise management capabilities

c) Duration

The experiential learning programme will be offered for 180 days (one semester) period in the final year .As the programme is enterprise oriented, students and faculty are expected to attend the activities of the enterprise even on institutional holidays with total commitment , and without any time limit or restriction of working hours for ELP. The Experiential Learning Programme shall be run for full year by making two groups and rotating activities of the final year in two groups. Each student shall register for two modules carrying 10 credits each.

d) Attendance

The minimum attendance required for this programme is 85%.The attendance of the student will be maintained at EL unit. The students will be eligible for the final evaluation of EL only when the attendance requirement is met with. Any student in the event of recording shortage of attendance has to re-register the EL when offered next by paying the assigned fee.

e) Students eligibility

To get the eligibility for registering the EL programme, the students should have completed all the courses successfully. The assignment /allotment of the EL programe shall be based on merit of the student at the end of 5th semester. A separate certificate should be issued to the students after successful completion of EL course. In this work experience, student will know exact problems of farming and suggest appropriate
technology and finally useful in enhancing productivity and profitability at farmers end.

Subject code: AG 18703A	**MUSHROOM PRODUCTION TECHNOLOGY**
Subject code: AG 18703B	**RAISING OF COMMERCIAL NURSERY**
Subject code: AG 18703C	**VERMI-COMPOSTING**
Subject code: AG 18703D	**ORGANIC PRODUCTION TECHNOLOGY**
Subject code: AG 18703E	**FOOD PROCESSING**

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FARMERS' WELFARE SCHEMES IN INDIA

Semester:VII
No. of lecture hours:15

Objective:
To provide awareness on various available schemes in India for farmers' welfare.

Outcome:
Students will be able to understand the importance of different schemes that are being provided by the Government of India for agricultural development in general and strengthening of farmers in particular.

Syllabus:

1. Doubling of Farmers' Income
2. Soil Health Card Scheme
3. Pradhan Mantri Fasal Bima Yojna/Restructured Weather Based Crop Insurance Scheme
4. Neem Coated Urea
5. National Agriculture Market (e-NAM)
6. Micro Irrigation Fund
7. District Agriculture Contingency Plan
8. Rainfed Area Development Programme
9. National Watershed Development Project for Rainfed Areas (NWDPRA)
10. National Mission for Sustainable Agriculture (NMSA)
11. Livestock Insurance Scheme
12. Gramin Bhandaran Yojna
13. Parampargat Krishi Vikas Yojna
14. Rastriya Krsihi Vikas Yojna
15. National Scheme on Welfare of Fishermen

References

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https://pib.gov.in/newsite/mberel.aspx?relid=96201
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YEAR-WISE AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS

B.Sc. (Hons.) AGRICULTURAL SCIENCE & RURAL DEVELOPMENT

EIGTH SEMESTER
ACADEMIC YEAR-2022-23 OF 2019-23 BATCH (CBCS)

SECTION-A

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		AG 18803C	3.Vermi-Composting						
		AG 18803D	4.Organic Production Technology						
		AG 18803E	5.Food Processing						
				30		80	120	200	**20**

SECTION -B

Sl. No.	Part	Subject Code	Title of the Subject	Hours/ week	Duration of Exam (hrs.)	Marks			Credits
						Internal	External	Total	
1	II	AG18801	Rural Agricultural Work experience Program (SEC-5,6,7,8,& 9)	18	3	40	60	100	12
2	II	AG18802	Industry Internship (DSE-2) /	12	3	40	60	100	8
				30		80	120	200	**20**

AGRICULTURAL EXPERIENTIAL LEARNING PROGRAMME
SECTION-A

Credits: 20 **Semester: VIII**
Subject code: AG 18803

Experiential learning

a) concept

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- To build confidence and to work in project mode
- To acquire enterprise management capabilities

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e) Students eligibility

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student at the end of 5th semester. A separate certificate should be issued to the students after successful completion of EL course. In this work experience, student will know exact problems of farming and suggest appropriate

technology and finally useful in enhancing productivity and profitability at farmers end.

Subject code: AG 18803A MUSHROOM PRODUCTION TECHNOLOGY

Subject code: AG 18803B RAISING OF COMMERCIAL NURSERY

Subject code: AG 18803C VERMI-COMPOSTING

Subject code: AG 18803D ORGANIC PRODUCTION TECHNOLOGY

Subject code: AG 18803E FOOD PROCESSING

RURAL AGRICULTURAL WORK EXPERIENCE PROGRAMME
(80 Working Days)
SECTION-B

Credits : 6 Semesters: VIII
Subject code : AG 18801

Objective:

- To provide the students with an opportunity to gain practical knowledge in Crop Production and Crop Protection.
- To familiarize the students with the socio-economic conditions of the farmer and institutions involved in rural development.
- To develop effective communication skills using extension training methods in the transfer of technology.

Outcome: Students will be able to get first-hand experience of various agricultural operations involved in Crop Production and Crop Protection and learn actual farming in order to develop proper perspective.

Course outcomes:

- Apply the knowledge of the various agricultural operations involved in Crop Production
- Apply the knowledge of Crop Protection techniques in the host farmers field
- Survey on socio economic status of farmers in the village
- Organize method demonstration and agricultural exhibition in the villages for benefit of farmers
- Prepare report in prescribed format in crop production, crop protection, Agrl. Economics, Ag. Extension and KVK activities

In this programme students are required to stay in villages attached to an Agricultural Research Station / Krishi Vigyana Kendra and interact with formers of the village by visiting them regularly. They are required to collect information in prescribed proforma and also perform extension activity in the village in small groups. A team of experienced specialists supervises and guides their activities during this programmes.

At the end of the programme each student is required to submit a report detailing the work done and knowledge gained with sound basic background this practical field experience equips the students with desired Professional Skill enabling them to serve the Farming Community in a better way.

ACTIVITIES :

Each student will take up an Agro-Economic Survey of the Village. The student will conduct a Farm Holding Survey.

The student shall maintain a Record of Daily Work Done. Bio-metrical observation shall be recorded.

Record of Land Protection Work undertaken.

Collect and Submit 15 Herbarium specimens each of insect damage and plant disease symptoms. Conduct Result Demonstration and Method Demonstrations.

Preparation of relevant charts for Farmer's Knowledge. Student shall arrange Farmer's Training Programme.

Students shall establish Information Corner in the Village. Celebrate Farmers' Day

The students shall involve themselves in Actual Day to Day Agricultural Operations along with their Host Farmers.

Participate in Village Service Activity.

INDUSTRY INTERNSHIP PROGRAMME
(50 Working Days)
SECTION-B

Credits : 3 **Semester: VIII**
Subject code: AG 18802

Objective: To expose the students to an agri- related industry/ company so that they gain working knowledge which will enable them to easily get into jobs in agri- based industry

Outcome: Students will be able to learn techniques and skills to find suitable placements in agro based Industries/ Instuitions.

Course outcomes:

- Select the agro-industry based on the interest of the students
- Apply various techniques and skills in Agro-Industry
- Formulate research proposal
- Makeup of project report
- Defend the research project

The objective of this programme is to provide the students an opportunity to gain first hand knowledge of the industrial work to learn techniques and skills and to train them for assignments after completion of graduation. As part of this each student will be attached to an Industry or an Organization in the field of Agriculture, Animal Husbandry etc. At the end of the semester each student shall submit a report detailing the work done and the knowledge gained.