No. 241208/2419361
Fax: 0821-2419363/2419301

e-mail : registrar@uni-mysore.ac.in
www.uni-mysore.ac.in

UNIVERSITY OF MYSORE

Estd. 1916

VishwavidyanilayaKaryasoudha
Crawford Hall, Mysuru- 570 005.

No: AC10/759/2019-20 **Dated: 06.07.2019.**

NOTIFICATION

Sub: Revision of B.Sc (Hons) in Agri Science & Horticulture Technology from the academic year 2019-20 -Reg.

Ref: 1.Decision of the Faculty of Science and Technology Meeting held on 01.04.2019.
2. Decision of the Academic Council meeting held on 07.06.2019.

*****

The Board of Studies in **Sampoorna International Institute of Agri. Science and Horticultural Technology** which met on **04.01.2019** has resolved and recommended to revise the Syllabus of **B.Sc (Hon's) in Agri./ B.Sc (Hon's) in Horticulture** from the academic year 2019-20.

The Faculty of Science & Technology and the Academic Council at their Meetings held on 01.04.2019 and 07.06.2019 respectively have also approved the above proposals.

The Syllabus may be downloaded from the University Website i.e., www.uni-mysore.ac.in .

DRAFT APPROVED BY THE REGISTRAR.

Sd/-
DEPUTY REGISTRAR (ACADEMIC),
UNIVERSITY OF MYSORE,
MYSORE.

To:

1. Registrar (Evaluation), University of Mysore, Mysuru.
2. The Dean, Faculty of Science Department of Studies in Zoology, Manasagangotri, Mysuru.
3. The Director, Sampoorna International Institute of Agri Sciences & Horticultural Technology, No.271/2, K.B.Doddi Grama Madapura Doddi, Nidagatta Post, Nidagatta Gram Panchyath, Athkur Hobli, Moddur(Tq) Mandya (Dist).
4. The Director, PMEB, Pareeksha Bhavan, University of Mysore, Mysuru.
5. The Director, College Development Council, MoulyaBhavan, Manasagangotri, Mysuru.
6. The Deputy Registrar/ Assistant Registrar/ Superintendent, AB and EB, University of Mysore, Mysuru.
7. The PA to Vice-Chancellor/ Registrar/ Registrar (Evaluation), University of Mysore, Mysuru.
8. Office Copy.

SP(S-3.1)/Approved.

No. 2419677/2419361
Fax: 0821-2419363/2419301

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UNIVERSITY OF MYSORE

Estd. 1916

VishwavidyanilayaKaryasoudha
Crawford Hall, Mysuru- 570 005

No: AC10/759/2019-20 **Dated: 05.07.2019.**

NOTIFICATION

Sub: Change of Nomenclature of B.Sc.(Honors) in Agricultural Science and Technology/Horticultural Sciences and Technology to B.Sc.(Hon's) in Agriculture/B.Sc (Hon's) in Horticulture under specialized/specified program - Reg.

Ref: 1. Decision of the BOS Dated 04.01.2019.
2. Decision of the Faculty Dated 01.04.2019.
3. Decision of the Academic Council Dated 07.06.2019.

*****

The Board of Studies in Sampoorna International Institute of Agri. Science and Horticultural Technology which met on 04.01.2019 has discussed and recommended to changes in the existing nomenclature from **"B.Sc.(Honors) in Agricultural Science and Technology/Horticultural Sciences and Technology to B.Sc.(Hon's) in Agriculture/B.Sc (Hon's) in Horticulture"** on par with ICAR recommendation from the academic year 2019-20.

The Faculty of Science & Technology and the Academic Council at their meetings held on 01.04.2019 and 07.06.2019 respectively have also approved the above proposal is notified.

DRAFT APPROVED BY THE REGISTRAR.

Sd/-
DEPUTY REGISTRAR (ACADEMIC),
UNIVERSITY OF MYSORE,
MYSORE.

To:

1. **Registrar (Evaluation), University of Mysore, Mysuru.**
2. **The Dean, Faculty of Science Department of Studies in Zoology, Manasagangotri, Mysuru.**
3. **Sampoorna International Institute of Agri Sciences & Horticultural Technology, No.271/2, K.B.Doddi Grama Madapura Doddi, Nidagatta Post, Nidagatta Gram Panchyath, Athkur Hobli, Moddur(Tq) Mandya (Dist).**
4. **The Director, PMEB, Pareeksha Bhavan, University of Mysore, Mysuru.**
5. **The Director, College Development Council, MoulyaBhavan, Manasagangotri, Mysuru.**
6. **The Deputy Registrar/ Assistant Registrar/ Superintendent, AB and EB, University of Mysore, Mysuru.**
7. **The PA to Vice-Chancellor/ Registrar/ Registrar (Evaluation), University of Mysore, Mysuru.**
8. **Office Copy.**

UNIVERSITY OF MYSORE

REGULATION FOR

SPECIALIZED PROGRAMME

IN

B.Sc. (Hon's) in Agricultural Sciences /

B.Sc. (Hon's) in Horticultural Sciences

Offered at

SAMPOORNA INTERNATIONAL INSTITUTE OF AGRI. SCIENCE AND HORTICULTURAL TECHNOLOGY

Venue:- 271/2, K.B. Doddi, Gram Madapuri Doddi, Nidagatta Post, Nidagatta Gram Panchayath, Athkur Hobli, Maddur (tq), Mandya(Dist.)

2019-20

UNIVERSITY OF MYSORE

REGULATION FOR

SPECIALIZED PROGRAMME

IN

Bachelor Degree in Agriculture Science & Horticulture Technology

Offered at

SAMPOORNA INTERNATIONAL INSTITUTE OF AGRI. SCIENCE AND HORTICULTURAL TECHNOLOGY

Venue :- 271/2, K.B. Doddi, Gram Madapuri Doddi, Nidagatta Post, Nidagatta Gram Panchayath, Athkur Hobli, Maddur (tq), Mandya(Dist.)

2019-20

UNIVERSITY OF MYSORE

REGULATION FOR

SPECIALIZED PROGRAMME

IN

B.Sc. (Hon's) in Agricultural Sciences / B.Sc. (Hon's) in Horticultural Sciences

Prof. Shobha Jagnath **Chairperson**	Shobhajagnath
Dr. G K Vasantha Kumar **Member**	
Dr. Seetha Ram. S **Member**	
Mr. Chidvilas K.A.K **Member**	Chidvilas
Mrs. Ananya **Member**	Ananya
Dr. Sampoorna Naidu B **Special Invitee**	
The Dean **Member**	

Offered at

SAMPOORNA INTERNATIONAL INSTITUTE OF AGRI. SCIENCE AND HORTICULTURAL TECHNOLOGY

Venue:- 271/2, K.B. Doddi, Gram Madapuri Doddi, Nidagatta Post, Nidagatta Gram Panchayath, Athkur Hobli, Maddur (tq), Mandya(Dist.)

2019-20

INDEX

ANNEXURE – I

Regulations and Curriculum

UNIVERSITY OF MYSORE

CBCS and CAGP Regulations for B.Sc.Honors – 2019

1. Title – Commencement

These Regulations shall be called the University of Mysore regulations for Choice Based Credit System (CBCS) and Continuous Assessment Grading Pattern (CAGP) for B.Sc.Honors under the regulation of Specialized Programs of University of Mysore. These Regulations shall come into force from the academic year 2019-2020.

2. Specialized Programs

a) B.Sc. Honors of four years — 8 Semesters majoring in Agricultural Science& Technology/Horticultural Science&Technology with a provision to choose Specialization stream either inAgricultural Science& Technology/Horticultural Science&Technology from 3rdsemester onwards. However, once the specialized stream is chosen, a candidate should continue with the same Specialization.

b) A candidate gets awarded with B.Sc. Honors degree if he/she earns 180 credits in 8 semesters and he/she can exercise an option to exit with B.Sc. degree by earning 140 credits as stipulated for the first six semesters of the B.Sc.Honors programs.

3. Definition

Course: Every course offered will have two components associated with the teaching-learning process of the course, namely:

(i) Lecture – L (ii) Practical /Practice– P, whereL stands for Lecture session.P stands for Practice session and it consists of Hands on experience / Laboratory Experiments / Field Studies / Case studies / Intensive practice exercises /Seminars/Discussions that equip students to acquire the much required skill component.

In terms of credits, every one-hour session per week of L amounts to 1 credit per semester and a minimum of two hours' session of P amounts to 1 credit per semester, over a period of one semester of 18 weeks for teaching-learning process. The total duration of a semester is 20 weeks inclusive of semester-end examination.

A course shall have either one or both the components. That means a course may have only L component, or only P component or combination of both.

The total credit earned by a student at the end of the semester upon successfully completing the course is L + P. The credit pattern of the course is indicated asL+P.

If a course is of 1/2/3/4/5credits, then the different credit distribution patterns in L+P format could be

0+1	0+2	0+3	0+4	0+5
1+0	2+0	1+1	1+2	2+1

The concerned BOS will choose the convenient credit pattern for every course based on the requirement.

Different courses of study are labeled and defined in the scheme of instruction for specialized B.Sc. Honors programs.

4. Eligibility for admission

A Candidate who is qualified as follows is eligible for admission

4.1 A candidate who has successfully completed +2 or equivalent with PCB / CBZ combination

4.2 A candidate who has completed Diploma in Agriculture / Horticulture or equivalent of at least 2 years' duration after 10thyear of schooling.

4.3 A candidate who has successfully completed +2 or equivalent with PCM combination is also eligible provided such a candidate completes the prescribed remedial courses in Biology during the 1st year of B.Sc. Honors program. The successful completion of remedial courses is mandatory and unless a candidatecompletes this mandatory requirement, he/she cannot enter 3rdsemester.

4.4 A candidate who has completed a Diploma in Technical/Engineering/Pathological/Clinical/Paramedical courses of a minimum of 2 years' durationsubjected to 10 years of schooling are also eligible provided such a candidate completes the prescribed remedial courses in Biology during the 1styear of B.Sc. program. The successful completion of remedial courses is mandatory and unless a candidatecompletes this mandatory requirement, he/she cannot enter into3rd

semester.

4.5 Candidates who have successfully completed 1st year and 2nd year of B.Sc. Agricultural Science/Horticulture Science from UGC recognized Universities (within Karnataka) are eligible for admission to 2nd year and 3rd year of the course respectively subject to the approval from the University.

4.6 Candidates who have successfully completed 1st year and 2nd year of B.Sc. Agricultural Science/Horticultural Science from UGC recognized Universities (outside Karnataka) are eligible for admission to 2nd year and 3rd year of the course respectively subject to the approval by the equivalence committee and authorities of University of Mysore.

The intake shall be as approved by the university from time to time.

5. Scheme of Instruction

5.1 A B.Sc. Honorsdegree program is of 8 semesters – 4 years' duration of 180 credits. A candidate can avail a maximum of 16 semesters – 8 years as per double duration norm, in one stretch to complete B.Sc. Honors degree, including blank semesters, if any. Whenever a candidate opts for blank semesters, he/she has to study the prevailing courses offered by the department when he/she resumes his/her studies.

A candidate can exercise an option to exit with B.Sc. degree by completing 140 credits as stipulated in the corresponding first six semesters of B.Sc. Honors. A candidate can avail in one stretch at most 12 semesters to exit with a B.Sc. degree subject to conditions as mentioned above.

5.2 A candidate has to earn 180 credits for successful completion of B.Sc.Honors degree with the distribution of credits for different courses over different semesters as given in Table 1 for B.Sc.Honors(Agri.) and in Table 2 for B.Sc.Honors (Horti.). Semesters 1st, 2nd and 3rd are common to both agricultural science and Horticultural Science, interested candidates can choose either Table- 1 for B.Sc.Honors in Agriculture science & Technology or Table-2 for B.Sc.Honors in Horticulture science & Technology.

TABLE 1: B.Sc. HONORS IN AGRICULTURE SCIENCE & TECHNOLOGY

I semester curriculum

Semester	Sl. No	Course Title	Course Code	L+P	Contact hrs.	Credit
I	1	Fundamentals of Agronomy	AGR. 111	2+1	4	3
	2	Plant Biochemistry	BCM.111	1+1	3	2
	3	Fundamentals of Microbiology	AMB. 111	1+1	3	2
	4	Introduction to Forestry	FES. 111	1+1	3	2
	5	Rural sociology, Education psychology & constitution of India	AEX. 111	0+2	4	2
	6	Computer scienceand Agri -Informatics	CSC. 111	1+1	3	2
	7	Comprehension and communicative skills in English	ENG. 111	1+1	3	2
	8	Introductory Soil and Water Conservation Engineering	AEG.111	1+1	3	2
	9	Principles of Food Science and nutrition	FSN. 111	2+0	2	2
	10	Physical Education, and yoga practices	PED. 111	0+1	Non-Credit (NC)	Non-Credit (NC)
	11	Kannada-I	KAN. 111/ KAN. 112	0+1	Non-Credit (NC)	Non-Credit (NC)
TOTAL				**10+11**	**28+4**	**19 + 2**

II semester curriculum

Semester	Sl. No	Course Title	Course Code	L+P	Contact hrs.	Credit
II	1	Farm Machinery And power	AEG. 211	1+1	3	2
	2	Water management	AGR.121	1+1	3	2
	3	Fundamentals of Entomology	AET. 121	2+1	4	3
	4	Fundamentals of plant pathology	PAT. 211	2+1	4	3
	5	Soil & Applied Microbiology	AMB. 221	1+1	3	2
	6	Fundamentals of Cytogenetics	GPB. 121	1+1	3	2
	7	Fundamentals of Horticulture and Fruit crops production	HRT. 121	1+1	3	2
	8	Fundamentals of soil science	SAC. 121	2+1	4	3
	9	Fundamentals of Plant Biotechnology	PBT.121	2+1	4	3
	10	Fundamentals of Agricultural Extension education and Rural Development	AEX. 121	1+1	3	2
	11	Physical Education, and yoga practices	PED. 111*	0+1	Non-Credit (NC)	Non-Credit (NC)
	12	Kannada-II	KAN. 121/ KAN. 122	0+1	Non-Credit (NC)	Non-Credit (NC)
TOTAL				**14+11**	**34 + 4**	**24+1**

*continuation of 1st semester

III semestercurriculum

Semester	Sl. No	Course Title	Course Code	L+P	Contact hrs.	Credit
III	1	Fundamentals of Agricultural Economics	AEC.111	2+0	2	2
	2	Production technology of vegetable crops	HRT. 211	1+1	3	2
	3	Insect Ecology, Principles of Pest management and natural enemies	AET. 211	2 + 1	4	3
	4	Environmental studies and Disaster Management	FES. 221	2+0	2	2
	5	Soil Chemistry	SAC. 211	1+1	3	2
	6	Fundamentals of Crop physiology	CPH. 211	2+1	4	3
	7	Introduction to Apiculture	API. 311	1+1	3	2
	8	Fundamentals of Genetics	GPB. 211	1+1	3	2
	9	Renewable energy and green technology	AEG.221	1+1	3	2
	10	Introductory Agro meteorology & Climate Change	AGR.122	1+1	3	2
	11	Communication and diffusion of agricultural innovations	AEX. 211	1+1	3	2
	12	National Service Scheme	NSS. 111	0+1	Non-Credit (NC)	Non-Credit (NC)
TOTAL				**15+10**	**33 + 2**	**24 + 1**

IV semester curriculum

Semester	Sl. No	Course Title	Course Code	L+P	Contact hrs.	Credit
IV	1	Agricultural finance and co-operation	AEC. 121	1+1	3	2
	2	Insect pests of field crop and stored grains and their management	AET.311	1+1	3	2
	3	Crop Breeding	GPB.311	1+1	3	2
	4	Principles of plant disease management	PAT.221	1+1	3	2
	5	Crop production technology-I	AGR.211	2+1	4	3
	6	Live stock, poultry, fish production and management	ASC.311	2+1	4	3
	7	Principles and practices of seed production	SST.311	1+1	3	2
	8	Particle crop production-I (Rain fed crops)	AGR.311	0+1	2	1
	9	Fundamentals of Plant Breeding	GPB.221	2+1	4	3
	10	Production Technology of Flower Crops and Landscaping	HRT.221	1+1	3	2
	11	Applied Plant Physiology and Crop Modeling	CPH. 221	1+1	3	2
	12	National Service Scheme	NSS. 111*	0+1	Non-Credit (NC)	Non-Credit (NC)
TOTAL				**13+11**	**35+2**	**24**

*continuation of 3rd semester

V semester curriculum

Semester	Sl. No	Course Title	Course Code	L+P	Contact hrs.	Credit
V	1	Agricultural statistics	AST.221	2+1	4	3
	2	Farm Management, production and resource Economics	AEC.321	1+1	3	2
	3	Insect pests of horticultural crops and their management	AET.221	1+1	3	2
	4	Crop production technology-II	AGR.221	1+1	3	2
	5	Production technology of plantation crops, spice, medicinal and Aromatic plants.	HRT.311	1+1	3	2
	6	Diseases of field crops and their management.	PAT.311	2+1	4	3
	7	Nanotechnology in Agriculture	CPH. 222	0+1	2	1
	8	Particle crop production-II (Irrigated).	AGR.212	0+1	2	1
	9	Post Harvest Seed Technology and Quality Assurance	SST.321	1+1	3	2
	10	Manures, Fertilizers and soil fertility management	SAC. 321	2+1	4	3
	11	Rain fed Agriculture and water shed management	AGR.322	1+1	3	2
TOTAL				**12+11**	**34**	**23**

VI semester curriculum

Semester	Sl. No	Course Title	Course Code	L+P	Contact hrs.	Credit
VI	1	Agricultural Marketing, Trade and prices	AEC. 311	2+1	4	3
	2	Protected Cultivation and secondary agriculture	AEG.321	1+1	3	2
	3	Farming system, organic farming and precision agriculture	AGR.321	2+1	4	3
	4	Experimental Techniques in Agricultural Research	AGR.312	0+1	2	1
	5	Introduction to Sericulture	SER.321	1+1	3	2
	6	Post- harvest Management and value addition of Fruits and vegetables	HRT. 321	1+1	3	2
	7	Problematic soils and theirManagement, Geoinformatics	SAC 311	1+1	3	2
	8	Entrepreneurship Development and Business Communication	AEX. 321	1+1	3	2
	9	Food processing, food safety standard and value Addition	FSN. 321	1+1	3	2
	10	Diseases of Horticulture crops and their Management	PAT. 321	1+1	3	2
	11	Intellectual Property Rights	GPB. 321	1+0	1	1
TOTAL				**12+10**	**32**	**22**

VII semester curriculum

Semester	Sl. No	Course Title	Course Code	L+P	Contact hrs.	Credit.
VII	1.	Rural Agricultural Work Experience	RAWE 402	0+20	20	20
TOTAL				0+20	40	20

VIII semester curriculum

Semester	Sl. No	Course Title	Course Code	L+P	Contact hrs.	Credit
VIII	1.	Experiential Learning/Hands on Training/Skill Development	EL/HoT	0+20	20	20
TOTAL				0+20	40	20

TOTAL CREDITS: -

Semester	Credits
I	23
II	24
III	24
IV	24
V	23
VI	22
VII	20
VIII	20
TOTAL	**180**

Remedial Courses 2(1+1) / (2+0)
Educational Tour 0+1

Grand Total 183

TABLE 2: B.Sc. HONORS IN HORTICULTURAL SCIENCE &TECHNOLOGY

I semester curriculum

Semester	Sl. No	Course Title	Course Code	L+P	Contact hrs.	Credit
I	1	Fundamentals of Agronomy	AGR. 111	2+1	4	3
	2	Plant Biochemistry	BCM.111	1+1	3	2
	3	Fundamentals of Microbiology	AMB. 111	1+1	3	2
	4	Introduction to Forestry	FES. 111	1+1	3	2
	5	Rural sociology, Education psychology & constitution of India	AEX. 111	0+2	4	2
	6	Computer scienceand Agri -Informatics	CSC. 111	1+1	3	2
	7	Comprehension and communicative skills in English	ENG. 111	1+1	3	2
	8	Introductory Soil and Water Conservation Engineering	AEG.111	1+1	3	2
	9	Principles of Food Science and nutrition	FSN. 111	2+0	2	2
	10	Physical Education, and yoga practices	PED. 111	0+1	Non-Credit (NC)	Non-Credit (NC)
	11	Kannada-I	KAN. 111/ KAN. 112	0+1	Non-Credit (NC)	Non-Credit (NC)
TOTAL				**10+11**	**28 + 4**	**19 + 2**

II semester curriculum

Semester	Sl. No	Course Title	Course Code	L+P	Contact hrs.	Credit
II	1	Farm Machinery And power	AEG. 211	1+1	3	2
	2	Water management	AGR.121	1+1	3	2
	3	Fundamentals of Entomology	AET. 121	2+1	4	3
	4	Fundamentals of plant pathology	PAT. 211	2+1	4	3
	5	Soil & Applied Microbiology	AMB. 221	1+1	3	2
	6	Fundamentals of Cytogenetics	GPB. 121	1+1	3	2
	7	Fundamentals of Horticulture and Fruit crops production	HRT. 121	1+1	3	2
	8	Fundamentals of soil science	SAC. 121	2+1	4	3
	9	Fundamentals of Plant Biotechnology	PBT.121	2+1	4	3
	10	Fundamentals of Agricultural Extension education and Rural Development	AEX. 121	1+1	3	2
	11	Physical Education, and yoga practices	PED. 111*	0+1	Non-Credit (NC)	Non-Credit (NC)
	12	Kannada-II	KAN. 121/ KAN. 122	0+1	Non-Credit (NC)	Non-Credit (NC)
TOTAL				**14+11**	**34 + 4**	**24+1**

III semester curriculum

Semester	Sl. No	Course Title	Course Code	L+P	Contact hrs.	Credit
III	1	Fundamentals of Agricultural Economics	AEC.111	2+0	2	2
	2	Production technology of vegetable crops	HRT. 211	1+1	3	2
	3	Insect Ecology, Principles of Pest management and natural enemies	AET. 211	2 + 1	4	3
	4	Environmental studies and Disaster Management	FES. 221	2+0	2	2
	5	Soil Chemistry	SAC. 211	1+1	3	2
	6	Fundamentals of Crop physiology	CPH. 211	2+1	4	3
	7	Introduction to Apiculture	API. 311	1+1	3	2
	8	Fundamentals of Genetics	GPB. 211	1+1	3	2
	9	Renewable energy and green technology	AEG.221	1+1	3	2
	10	Introductory Agro meteorology & Climate Change	AGR.122	1+1	3	2
	11	Communication and diffusion of agricultural innovations	AEX. 211	1+1	3	2
	12	National Service Scheme	NSS. 111	0+1	Non-Credit (NC)	Non-Credit (NC)
TOTAL				**15+10**	**33 + 2**	**24 + 1**

IV semester curriculum

Semester	Sl. No	Course Title	Course Code	L+P	Contact hrs.	Credit
IV	1	Ornamental Horticulture	FLA.102	1+1	3	2
	2	Plantation crops	PMA.102	2+1	4	3
	3	Principles of Pest Management and Productive Insects	ENT 201	2+1	4	3
	4	Plant Propagation and Nursery Management	FSC 102	1+1	3	2
	5	Diseases of Fruit, Plantation, Medicinal and Aromatic Crops	PAT 201	2+1	4	3
	6	Commercial Floriculture	FLA 201	1+1	3	2
	7	Tropical and Sub tropical Fruits	FSC 201	2+1	4	3
	8	Temperate Fruit Crops	FSC 202	2+0	2	2
	9	Animal Science	ANS 202	1+1	3	2
	10	Elementary Statistics	STS 101	1+1	3	2
TOTAL				**15+9**	**33**	**24**

V semester curriculum

Semester	Sl. No	Course Title	Course Code	L+P	Contact hrs.	Credit
V	1	Temperate Vegetables and Tuber Crops	VSC 201	2+1	4	3
	2	Growth and Development of Horticulture Crops	CPH 102	1+1	3	2
	3	Medicinal Crops.	PMA 202	1+1	3	2
	4	Principles of Seed Production in Horticulture Crops	SST 202	1+1	3	2
	5	Breeding of Fruit Crops	FSC 302	1+1	3	2
	6	Breeding and Seed Production of Vegetable Crops	VSC 301	2+1	4	3
	7	Protected Cultivation of Flower Crops	FLA 301	1+1	3	2
	8	Post-Harvest Management of Horticultural Produce	PHT 301	2+1	4	3
	9	Pests Of Vegetables Ornamental And Spice Crops	ENT.301	1+1	3	2
	10	Agripreneurship Development & Communication Skills	AEX.303	1+0	1	1
TOTAL				**13+9**	**31**	**22**

VI semester curriculum

Semester	Sl. No	Course Title	Course Code	L+P	Contact hrs.	Credit
VI	1	Spices and Condiments	PMA 201	1+1	3	2
	2	Aromatic Crops	PMA 301	1+1	3	2
	3	Organic Farming	AGR.302	1+1	3	2
	4	Pests of fruit plantation medicinal and aromatic crops	ENT.302	2+1	4	3
	5	Landscape Architecture	FLA 202	1+1	3	2
	6	Diseases Of Vegetables, Ornamental And Spice Crops	PAT.301	2+1	4	3
	7	Processing Of Horticulture Produce	PHT 302	2+1	4	3
	8	Horti- Business Management	AEC 202	2+0	2	2
	9	Breeding and seed production of flower crops	FLA 302	1+1	3	2
	10	Soil Fertility And Nutrient Management	SAC 302	1+1	3	2
TOTAL				**14+9**	**32**	**23**

VII semester curriculum

Semester	Sl. No	Course Title	Course Code	L+P	Contact hrs.	Credit
VII	1.	Rural Horticultural Work Experience	RHWE 402	0+20	20	20
TOTAL				0+20	40	20

VIII semester curriculum

Semester	Sl. No	Course Title	Course Code	L+P	Contact hrs.	Credit
VIII	1.	Experiential Learning/Hands on Training/Skill Developtment	EL/HoT	0+20	20	20
TOTAL				0+20	40	20

TOTAL CREDITS: -

Semester	Credits
I	23
II	24
III	24
IV	24
V	22
VI	23
VII	20
VIII	20
TOTAL	**180**

Remedial Courses 2(1+1) / (2+0)
Educational Tour 0+1

Grand Total 183

5.3 Normally, A candidate shall enroll for a minimum of 20 credits and a maximum of 28 credits per semester; Including dropped courses of previous semester, if any. However, a candidate may not successfully earn a maximum of 28 credits per semester.

5.4 Only such candidates who register for a minimum of 16 credits per semester and complete successfully 180 credits in 8 successive semesters shall be considered for declaration of ranks, medals and are eligible to apply for student fellowship, scholarship, free ships and hostel facilities.

5.5 A candidate admitted to B.Sc. Honors program can exercise an option to exit with B.Sc. degree after earning 140 credits successfully as stipulated over the first six semesters.

6. Continuous Assessment Earning of Credits and Award of Grades

The evaluation of the candidate shall be based on continuous assessment. The structure for evaluation is as follows:

6.1 Assessment and evaluation processes happen in a continuous mode. However, for reporting purposes, a semester is divided into 3 discrete components identified as C1, C2, and C3.

6.2 The performance of a candidate in a course will be assessed for a maximum of 100 marks as explained below.

6.2.1 The first component (C1), of assessment is for 25 marks. This will be based on test, assignmentand seminar. During the first half of the semester, the first 50% of the syllabus (unit 1 and 2) will be completed. This shall be consolidated during the 9th week of the semester. Beyond 9th week, making changes in C1 is not permitted.

The finer split-up for the award of 25 marks in C1 is as follows:

Assignment/brief presentation/seminars…….8 marks for unit 1

Assignment/brief presentation/seminars…….8 marks for unit 2

A review test ……..9 marks for unit 1 and 2

6.2.2 The second component (C2), of assessment is for 25 marks.

This will be based on test, assignment, and seminar. The continuous assessment and scores of second half of the semester will be consolidated during the 18th week of the semester. During the second half of the semester the remaining units (unit 3 and 4) of the syllabus will be completed.

The finer split-up for the award of 25 marks in C2 is as follows:

Assignment/brief presentation/seminars…….8 marks for unit 3

Assignment/brief presentation/seminars…….8 marks for unit 4

A review test …… 9 marks for unit 3 and 4

6.2.2.1 The outline for continuous assessment activities for Component-I (C1) and Component-II (C2) will be proposed by the teacher(s)concerned before the commencement of the semester and will be discussed and decided in the respective Departmental Council. The students should be informed about the modalities well in advance. The evaluated courses/assignments during component I (C1) and component II (C2) of assessment are immediately returned to the candidates after obtaining acknowledgement in the register maintained by the concerned teacher for this purpose.

6.2.3 During the 19th-20th week of the semester, a semester-end examination of 2 hours duration shall be conducted for each course.This forms the third/final component of assessment (C3) and the maximum marks for the final component will be 50.

Setting question papers and evaluation of answer scripts.

I. Question papers (for C3) in three sets shall be set by the internal examiner for a course. Whenever there are no sufficient internal-examiners, the chairman of BoE shall get the question papers set by external examiners.

II. The Board of Examiners shall scrutinize and approve the question papers and scheme of valuation.

III. (i) There shall be single valuation for all theory papers by internal examiners.

(ii) The examination for Practical work/ Field work/Project work/Internship will-be conducted jointly by internal and external examiners. However, the BoE on its discretion can also permit two internal examiners.

IV. Challenge valuation

A student who desires to apply for challenge valuation shall obtain a photo copy of the answer script by paying the prescribed fee within 10 days after the announcement of the results. He / She can challenge the grade awarded to him/her by surrendering the grade card and by submitting an application along with the prescribed fee to the Registrar (Evaluation) within 15 days after the announcement of the results. This challenge valuation is only for C3 component.

The answer scripts for which challenge valuation is sought for shall be sent to another examiner. The higher of two marks from first valuation and challenge value shall be the final.

In case of a course with only practical component a practical examination will be conducted with both internal and external examiners. A candidate will be assessed on the basis of a) knowledge of relevant processes b) Skills and operations involved c)Results / products including calculation and reporting. If external examiner does not turn up, then both the examiners will be internal examiners. The duration for semester-end practical examination shall be decided by the departmental council.

6.2.4 If X is the marks scored by the candidate out of 50 in C3 in theory examination, if Y is the marks scored by the candidate out of 50 in C3 in Practical examination, and then the final marks M in C3 is decided as per the following table:

L+P distribution	**Final mark M in C3**
L+P	$\frac{(L*X)+(P*Y)}{L+P}$
L+(P=0)	X
(L=0)+P	Y

6.2.5 The details of continuous assessment are summarized in the following Table:

Component	Syllabus in a course	Weightage	Period of Continuous assessment
C1	First 50% (first 2 units of total 4 units)	25%	First half of the semester to be consolidated by 9th week
C2	Remaining 50% (remaining units of the course)	25%	Second half of the semesterto be consolidated by 18th week
C3	Semester-end examination (all units of the course)	50%	To be completed during 18th-20th week

Final grades to be announced latest by 24th week

6.2.6 A candidate's performance from all 3 components will be in terms of scores, andthe sum of all three scores will be for a maximum of 100 marks (25 + 25 + 50).

6.2.7 Finally, awarding the grades should be completed latest by 24th week of the semester.

6.3 Evaluationof Project/Thesis/Dissertation/Internship

Right from the initial stage of defining the problem, the candidate has to submit the progress reports periodically and also present his/her progress in the form of seminars in addition to the regular discussion with the guide. Components of evaluation are as follows:

Component – I(C1): Periodic Progress and Progress Reports (25%) Component – II(C2): Results of Work and Draft Report (25%) Component– III(C3): Final Viva-voce and evaluation (50%). The report evaluation is for 30% and the Viva-voce examination is for 20%

6.4 In case a candidate secures less than 30% in C1and C2 put together in a course, the candidate is said to have DROPPED that course, and such a candidate is not allowed to appear for C3 in that course.

In case a candidate's class attendance in a course is less than 80% or as stipulated by the University, the candidate is said to have DROPPED that course, and such a candidate is not allowed to appear for C3 in that course.

6.5 In case a candidate secures more than 30% in C1+C2 but less than 30% in C3, such a candidate may opt to DROP that course or may opt to appear for C3 examination during the subsequent examinations. In case he/she opts to appear for just C3 examination, then the marks scored in C1+C2 shall get continued. Repeat C3 examinations will be conducted in every semester.

6.6 A candidate has to re-register for the DROPPED course when the course is offered again by the department. A candidate who is said to have DROPPED project or internship work has to re-register for the same subsequently within the stipulated period. The details of any DROPPED course will not appear in the grade card.

6.7 The tentative / provisional grade card will be issued by the Registrar (Evaluation) at the end of every semester indicating the courses completed successfully. This statement will not contain the list of DROPPED courses.

6.8 Upon successful completion of B.Sc.Honors Degree, a final grade card consisting of grades of all courses successfully completed by the candidate will be issued by the Registrar (Evaluation).

6.9The grade and the grade point earned by the candidate in the subject will be as given below

Marks (P)	Grade (G)	Grade Point (GP=V x G)
30-39	4	V*4
40-49	5	V*5
50-59	6	V*6
60-64	6.5	V*6.5
65-69	7	V*7
70-74	7.5	V*7.5
75-79	8	V*8
80-84	8.5	V*8.5
85-59	9	V*9
90-94	9.5	V*9.5
95-100	10	V*10

Here, P is the percentage of marks (P=[(C1+C2) +M] secured by a candidate in a course which is rounded to nearest integer. V is the credit value of course. G is the grade and GP is the grade point.

6.10A candidate can DROP any course within in ten days from the date of notification of final results. Whenever a candidate drops a course, he/she has to register for the DROPPED course as stated in 6.6.

6.11 Overall cumulative grade point average (CGPA) of a candidate after successful completion of the required number of credits (180 for B.SC Honors and 140 for B.SC) is given by CGPA =ΣGP / Total number of credits completed.

7. Classification of results

The final grade point (FGP) to be awarded to the student is based on CGPA secured by the candidate and is given as follows.

CGPA	Numerical Index	FGP Qualitative Index
4<=CGPA<5	5	PASS CLASS
5<=CGPA<6	6	SECOND CLASS
6<=CGPA<7	7	FIRST CLASS
7<=CGPA<8	8	
8<=CGPA<9	9	DISTINCTION
9<=CGPA<10	10	
Overall percentage = 10*CGPA		

8. Provision for appeal

If a candidate is not satisfied with the evaluation of C1 and C2 components, he/she can approach the grievance cell with the written submission together with all facts, the assignments, and test papers etc., which were evaluated. He/she can do so before the commencement of semester-end examination. The grievance cell is empowered to revise the marks if the case is genuine and is also empowered to levy penalty as prescribed by the university on the candidate if his/her submission is found to be baseless and unduly motivated. This cell may recommend taking disciplinary/corrective action on an evaluator if he/she is found guilty. The decision taken by the grievance cell is final.

For every program there will be one grievance cell. The composition of the grievance cell is as follows.

1. The Registrar (Evaluation) ex-officio Chairman / Convener
2. One senior faculty member (other than those concerned with the evaluation of the course concerned) drawn from the department/discipline and/or from the sister departments/sister disciplines.
3. One senior faculty member/subject expert drawn from outside the University department.

COURSE CONTENTS

TABLE -1

Sl.No	COURSE CODE	COURSE TITLE	CONTACT HRS.	CREDIT
I. BASIC SCIENCES AND HUMANITIES				
1	BCM. 111	Plant Biochemistry	1+1	1+1
2	CSC. 111	Computer Science and Agri-informatics	1+1	1+1
3	ENG. 111	Comprehension and communication Skills in English	1+1	1+1
4	AST. 221	Agricultural Statistics	2+1	2+1
5	PED. 111*	Physical Education and Yoga Practices	0+1	0+1
6	NSS. 111*	National Service Scheme	0+1	0+1
7	KAN. 111/ KAN. 112*	Kannada-I	0+1	0+1
8	KAN. 121/ KAN. 122*	Kannada-II	0+1	0+1
			TOTAL	**5+4=9**

*non gradial courses

Note: 1. PED 111 (0+1) spread over for one year

2. NSS 111 (0+1) spread over for two year

SL.NO	COURSE CODE	COURSE TITLE	CONTACT HRS.	CREDIT
II. AGRICULTURAL AND ALLIED SUBJECTS AGRONOMY				
1	AGR. 111	Fundamentals of Agronomy	2+1	2+1
2	AGR. 121	Water Management	1+1	1+1
3	AGR. 122	Introductory Agro meteorology & Climate Change	1+1	1+1
4	AGR. 211	Crop Production Technology-I	2+1	2+1
5	AGR. 212	Practical Crop Production-II (Irrigated)	0+1	0+1
6	AGR. 221	Crop Production Technology-II	1+1	1+1
7	AGR. 311	Practical Crop Production-I (Rainfed)	0+1	0+1
8	AGR.312	Experimental Techniques in Agricultural Research	0+1	0+1
9	AGR. 321	Farming Systems, Organic Farming and Precision Agriculture	2+1	2+1
10	AGR. 322	Rainfed Agriculture and Watershed Management	1+1	1+1
			TOTAL	**10+10=20**

SL.NO	COURSE CODE	COURSE TITLE	CONTACT HRS.	CREDIT
AGRICULTURAL ECONOMICS				
1	AEC. 111	Fundamentals of Agricultural Economics	2+0	2+0
2	AEC.121	Agricultural Finance & Co-operation	1+1	1+1
3	AEC. 311	Agricultural Marketing, Trade and Prices	2+1	2+1
4	AEC. 321	Farm Management, Production and Resource Economics	1+1	1+1
			TOTAL	**6+3=9**

SL.NO	COURSE CODE	COURSE TITLE	CONTACT HRS.	CREDIT
AGRICULTURAL ENGINEERING				
1	AEG. 111	Introductory Soil and Water Conservation Engineering	1+1	1+1
2	AEG. 211	Farm Machinery and Power	1+1	1+1
3	AEG. 221	Renewable Energy and Green Technology	1+1	1+1
4	AEG. 321	Protected Cultivation and Secondary Agriculture	1+1	1+1
			TOTAL	**4+4=8**

SL.NO	COURSE CODE	COURSE TITLE	CONTACT HRS.	CREDIT
AGRICULTURAL ENTOMOLOGY				
1	AET. 121	Fundamentals of Entomology	2+1	2+1
2	AET. 211	Insect Ecology, Principles of Pest management and natural enemies	2+1	2+1
3	AET. 221	Insect pests of Horticultural crops and their management	1+1	1+1
4	AET. 311	Insect pests of field crops and stored grains & their management	1+1	1+1
			TOTAL	**6+4=10**

SL.NO	COURSE CODE	COURSE TITLE	CONTACT HRS.	CREDIT
AGRICULTURAL EXTENSION				
1	AEX. 111	Rural Sociology, Education Psychology & Constitution of India	0+2	0+2
2	AEX. 121	Fundamentals of Agricultural Extension education and Rural Development	1+1	1+1
3	AEX. 211	Communication and Diffusion of agricultural Innovations	1+1	1+1
4	AEX. 321	Entrepreneurship Development and Business Communication	1+1	1+1
			TOTAL	**3+5=8**

SL.NO	COURSE CODE	COURSE TITLE	CONTACT HRS.	CREDIT
AGRICULTURAL MICROBIOLOGY				
1	AMB. 111	Fundamentals of Microbiology	1+1	1+1
2	AMB. 221	Soil and Applied Microbiology	1+1	1+1
TOTAL				**2+2=4**

SL.NO	COURSE CODE	COURSE TITLE	CONTACT HRS.	CREDIT
ANIMAL SCIENCE				
1	ASC.311	Livestock, poultry and fish Production Management	2+1	2+1
			TOTAL	**2+1=3**

SL.NO	COURSE CODE	COURSE TITLE	CONTACT HRS.	CREDIT
APICULTURE				
1	API. 311	Introduction to Apiculture	1+1	1+1
			TOTAL	**1+1=2**

SL.NO	COURSE CODE	COURSE TITLE	CONTACT HRS.	CREDIT
CROP PHYSIOLOGY				
1	CPH. 211	Fundamentals of Crop Physiology	2+1	2+1
2	CPH. 221	Applied Plant Physiology and Crop Modeling	1+1	1+1
3	CPH. 222	Nanotechnology in Agriculture	0+1	0+1
			TOTAL	**3+3=6**

SL.NO	COURSE CODE	COURSE TITLE	CONTACT HRS.	CREDIT
FOOD SCIENCE AND NUTRITION				
1	FSN. 111	Principles of Foods Science & Nutrition	2+0	2+0
2	FSN. 321	Food Processing, Food Safety Standards and Value Addition	1+1	1+1
			TOTAL	3+1=4

SL.NO	COURSE CODE	COURSE TITLE	CONTACT HRS.	CREDIT
FORESTRY AND ENVIRONMENTAL SCIENCE				
1	FES. 111	Introduction to Forestry	1+1	1+1
2	FES. 221	Environmental Studies and Disaster Management	2+0	2+0
			TOTAL	3+1=4

SL.NO	COURSE CODE	COURSE TITLE	CONTACT HRS.	CREDIT
GENETICS AND PLANT BREEDING				
1	GPB. 121	Fundamentals of Cytogenetics	1+1	1+1
2	GPB. 211	Fundamentals of Genetics	1+1	1+1
3	GPB. 221	Fundamentals of Plant Breeding	2+1	2+1
4	GPB. 311	Crop Breeding	1+1	1+1
5	GPB. 321	Intellectual Property Rights	1+0	1+0
			TOTAL	**6+4=10**

SL.NO	COURSE CODE	COURSE TITLE	CONTACT HRS.	CREDIT
HORTICULTURE				
1	HRT. 121	Fundamentals of Horticulture and Fruit Crops Production	1+1	1+1
2	HRT. 211	Production Technology of Vegetable Crops	1+1	1+1
3	HRT. 221	Production Technology of Flower Crops and Landscaping	1+1	1+1
4	HRT. 311	Production Technology of Plantation Crops, Spices, Medicinal and Aromatic Plants	1+1	1+1
5	HRT. 321	Post Harvest Management and Value Addition of Fruits and Vegetables	1+1	1+1
			TOTAL	**5+5=10**

SL.NO	COURSE CODE	COURSE TITLE	CONTACT HRS.	CREDIT
PLANT BIOTECHNOLOGY				
1	PBT. 121	Fundamentals of Plant Biotechnology	2+1	2+1
			TOTAL	**2+1=3**

SL.NO	COURSE CODE	COURSE TITLE	CONTACT HRS.	CREDIT
PLANT PATHOLOGY				
1	PAT. 211	Fundamentals of Plant Pathology	2+1	2+1
2	PAT. 221	Principles of Plant Disease Management	1+1	1+1
3	PAT. 311	Diseases of Field Crops and their Management	2+1	2+1
4	PAT. 321	Diseases of Horticultural Crops and their Management	1+1	1+1
			TOTAL	**6+4=10**

SL.NO	COURSE CODE	COURSE TITLE	CONTACT HRS.	CREDIT
SEED SCIENCE & TECHNOLOGY				
1	SST. 311	Principles and Practices of Seed Production	1+1	1+1
2	SST. 321	Post Harvest Seed Technology and Quality Assurance	1+1	1+1
			TOTAL	2+2=4

SL.NO	COURSE CODE	COURSE TITLE	CONTACT HRS.	CREDIT
SERICULTURE				
1	SER. 321	Introduction to Sericulture	1+1	1+1
			TOTAL	**1+1=2**

SL.No.	COURSE CODE	COURSE TITLE	CONTACT HRS.	CREDIT
SOIL SCIENCE & AGRICULTURAL CHEMISTRY				
1	SAC. 121	Fundamentals of Soil Science	2+1	2+1
2	SAC. 211	Soil Chemistry	1+1	1+1
3	SAC. 311	Problematic Soils and their Management, Geoinformatics	1+1	1+1
4	SAC. 321	Manures, Fertilizers and Soil Fertility Management	2+1	2+1
			TOTAL	**6+4=10**

ABSTRACT	
Basic science and humanities	5+4
Agricultural and allied subjects	71+56
Student "READY" programme • RAWE- Rural Agricultural work Experience • EL/HoT- Experiential learning/ Hands on Training	 0+20 0+20
Non graded courses • Physical Education • NSS • Kannada • Educational Tour • Remedial Courses	 0+1 0+1 0+2 0+1 2(1+1)/(2+0)
Grand total	(9+127+20+20+7*)=183

***Non graded courses**

BASIC SCIENCES AND HUMANITIES

BCM. 111 Plant Biochemistry

(1+1)

Unit-I: Introduction and importance, Plant cell- Structure and organellar functions. Biomolecules–Structure, properties and reactions: amino acids, peptides and proteins, lipids, carbohydrates, nucleotides and nucleic acids.

Unit-II: Enzymes- Factors affecting the activities, classifications, immobilization and other industrial applications.

Unit-III: Metabolism – Basic concepts. glycolysis, citric acid cycle, pentose phosphate pathway, n-oxidation of fatty acids, electron transport and oxidative phosphorylation.

Unit-IV: General reactions of amino acids degradation. Metabolic regulation. Secondary metabolites - terpenoids, alkaloids, phenolics.

LIST OF EXPERIMENTS/ PRACTICES

- Protein denaturation- heat, pH, precipitation of proteins with heavy metals
- Estimation of crude protein
- Estimation of protein by Lowry method
- Enzymes assays
- Extraction of nucleic acids
- Extraction of oil from oil seeds
- Estimation of crude fat
- Estimation of iodine number and saponification value of an oil
- Quantitative and qualitative determination of sugars
- Paper chromatography for the separation of sugars
- Determination of phenols, chlorophyll and ascorbic acid.

CSC. 111 Computer Science and Agri-informatics

(1+1)

Unit-I: Introduction to Computers, organization and architecture of Computers, Memory Concepts, Units of Memory, Operating System, definition and UNIX, WINDOWS.

Unit-II: Basic Computer networks, Internet and World Wide Web (WWW), Editing and Formatting a document, Database, concepts and types, creating database. Introduction to Computer C-Programming language, concepts and standard input/output operations. Introduction to ICT and uses in agriculture. Introduction to Computer-controlled devices (automated systems) for Agri-input management, Smartphone apps in Agriculture

Unit-III: Introduction to Bioinformatics and Omics database NCBI, searching and accessing genome sequences and protein sequences. Introduction to Bioinformatics and Omics database NCBI, searching and accessing genome sequences and protein sequences.

Unit-IV: Introduction to GIS and its applications in Agriculture. Introduction to MIS and Decision Support System and its applications in Agriculture.

LIST OF EXPERIMENTS/ PRACTICES

- Introduction of different operating systems such as DOS and WINDOWS. Creating Files & Folders
- Introduction of programming languages. Use of MS-WORD and MS Power-point for creating, editing and presenting a scientific Document
- MS- EXCEL - Creating a spreadsheet, use of statistical tools, writing expressions, creating graphs, analysis of scientific data.
- MS- ACCESS: Creating Database, preparing queries and reports, demonstration of Agri-information system.
- Demonstration of HTML page design of e- Agriculture.
- Omics database of NCBI searching and accessing genome sequences and protein sequences, alignment of two genome sequences and alignment of two protein sequences

ENG. 111 Comprehension and Communication Skills in English (1+1)

Unit-I: Reading Comprehension, Vocabulary- Antonym, Synonym, Homophones, Homonyms, often confused words. Exercises to help the students in the enrichment of vocabulary based on TOEFL and other competitive examinations.

Unit-II: Functional grammar: Articles, Prepositions, And Verb, Subject verb Agreement, Transformation, Synthesis, Direct and Indirect Narration.

Unit-III: Writing Skills: Paragraph writing, Précis writing, Report writing, Proposal

writing and Letter Writing.

Unit-IV: Interview Skills. Resume /CV Preparation and Job applications. Synopsis Writing.

LIST OF EXPERIMENTS/ PRACTICES

- Listening Comprehension: Listening to short talks, lectures, speeches (scientific, commercial and general in nature).
- Oral Communication: Phonetics, stress and intonation, Conversation practice.
- Presentation skills and Public speaking.
- Reading skills: Reading and comprehension of general and technical articles
- Precise writing, summarizing, abstracting, Group discussion.

AST. 221 Agricultural Statistics

(2+1)

Unit-I: Introduction to Statistics and its Applications in Agriculture, Classification & Frequency Distributions of data, Diagrammatic Representation of Data: Bar & Pie diagrams, Graphical Representations of Data: Histogram, Frequency Polygon, Frequency curve and Cumulative frequency curve (Ogives). Measures of Central Tendency: Concepts & Definition, Characteristics of ideal Average, Arithmetic Mean, Median, Mode, Quartiles, Deciles & Percentiles (both for Ungrouped and Grouped data), Geometric Mean and Harmonic Mean (Ungrouped data).Measures of Dispersion: Concepts & Definition, Types of Measures of Dispersion: Range, Quartile deviation, Absolute Mean Deviation from mean and median, Standard Deviation and Variance, and Co-efficient of dispersion (both for Ungrouped and Grouped data). Moments, Measures of Skew ness and Kurtosis (both for Ungrouped and Grouped data).Concept of Set Theory: , Permutation & Combinations. Theory: of Probability: Concept & Definition, Addition and Multiplication rules (without proof). Theoretical Probability distributions: Binomial, Poisson and Normal Distribution, their Properties & Applications.

Unit-II: Simple Correlation Analysis: Definition, Measures of Correlation: Scatter diagram, Karl Pearson product moment and Spearman's rank correlation coefficients and their properties. Simple Linear Regression Analysis: Definition, Fitting of simple

linear regression equations Y on X and X on Y, Properties of regression coefficient, interrelation between correlation and regression. Introduction to Sampling Theory: , Sampling versus Complete Enumeration, Methods of Sampling, Type of Sampling-Simple Random Sampling (with and without replacement), Use of Random Number Tables for selection of Simple Random Sample, Concept of Sampling distribution and standard error, concept of systematic stratified and cluster sampling along with their advantage & disadvantages.

Unit-III: Test of Significance: Introduction, Null & Alternative hypothesis, Types of Errors, Level of significance, degrees of freedom, Critical & Acceptance regions. Large sample tests: Z-Test for Means - One and Two sample Means for Known and Unknown population variance. Small sample test: Student t-test for Means - One and Two sample means, Paired t-test and F-test for two population variances. Chi-Square test: Test for Goodness of Fit, Test for independence of attributes for *rXc* contingency table, 2x2 contingency table with Yates correction, and test for single population variance.

Unit-IV: Introduction to Analysis of Variance and its Assumptions, Analysis of Variance for One & Two Way Classification. Concept of design of experiments: Basic Principle of Experimental Design: Randomization, Replication & Local control, Basic Designs: CRD, RCBD and LSD, their advantages and disadvantages.

LIST OF EXPERIMENTS/ PRACTICES

- Construction of Frequency Distribution tables. Diagrammatic presentation of data: Bar diagrams & pie diagrams
- Graphical Representation of Data: Histogram, Frequency polygon, Frequency curve and Cumulative frequency curve (Ogives).
- Computation of Measures of Central Tendency: Arithmetic Mean, Median, Mode, Quartiles, Deciles & Percentiles (both for Ungrouped and Grouped data), Geometric Mean and Harmonic Mean (Ungrouped data).
- Computation of Measures of Dispersion: Range, Quartile deviation, Absolute Mean Deviation, Standard Deviation and Variance and Co-efficient of dispersion (both for

Ungrouped and Grouped data).

- Computation of Moments, Measures of Skewness and Kurtosis (both for Ungrouped and Grouped data), Problems on permutation and combination.
- Problems on Simple Probability, Addition and Multiplication rules. Computation of probabilities using Binomial, Poisson and Normal Distributions
- Computation of Correlation Coefficient: Karl Pearson product moment and Spearman's rank correlation coefficients.
- Fitting of Simple linear Regression Equations Y on X, & X on Y.
- Use of Random Number Tables for selection of Simple Random Sample. Problems on Large sample tests: Z-Test for Means - One and Two sample means for known and unknown population variance.
- Problems on Chi-Square test: Test for Goodness of Fit, Test for independence of attributes for *rXc* contingency table, 2x2 contingency table with Yates correction and test for single population variance.
- Problems on Analysis of Variance for One & Two Way Classified data. Problems on CRD, RCBD and LSD.

PED. 111 Physical Education and Yoga Practices

(0+1)

PART I

Unit-I: Teaching of skills of Football – demonstration, practice of the skills, correction, involvement in game situation (For girls teaching of Badminton) Teaching of different skills of Football – demonstration, practice of the skills, correction, involvement in game situation (For girls teaching of Badminton)

Unit-II: Teaching of advance skills of Football – involvement of all the skills in game situation with teaching of rules of the game Teaching of skills of Basketball – demonstration

practice of the skills, correction of skills, involvement in game situation

UNIT III: Teaching of skills of Basketball – demonstration, practice of the skills, involvement in game situation Teaching of skills of Basketball – involvement of all the skills in game situation with teaching of rule of the game Teaching of skills of Kabaddi – demonstration, practice of the skills, correction of skills, involvement in game situation Teaching of skills of Kabaddi – demonstration, practice of the skills, correction of skills, involvement in game situationTeaching of advance skills of Kabaddi – involvement of all the skills in game situation with teaching of rule of the game

UNIT IV: Teaching of skills of Ball Badminton – demonstration, practice of the skills, correction of skills, involvement in game situation Teaching of skills of Ball Badminton – involvement of all the skills in game situation with teaching of rule of the game Teaching of some of Asanas – demonstration, practice, correction and practice Teaching of some more of Asanas – demonstration, practice, correction and practice Teaching of skills of Table Tennis – demonstration, practice of skills, correction and practice and involvement in game situation Teaching of skills of Table Tennis – demonstration, practice of skills, correction and practice and involvement in game situation

PART II

UNIT I: Teaching of skills of Hockey – demonstration practice of the skills and correction. Teaching of skills of Hockey – demonstration practice of the skills and correction. And involvement of skills in games situation Teaching of advance skills of Hockey – demonstration practice of the skills and correction. Involvement of all the skills in games situation with teaching of rules of the game teaching of skills of Kho-Kho – demonstration practice of the skills and correction. Teaching of skills of Kho-Kho – demonstration practice of the skills and correction. Involvement of the skills in games situation

UNIT II: Teaching of advance skills of Kho-Kho – demonstration practice of the skills and correction. Involvement of all the skills in games situation with teaching of rules of the game. Teaching of different track events – demonstration practice of the skills and correction. Teaching of different track events – demonstration practice of the skills and

correction with competition among them. Teaching of different field events – demonstration practice of the skills and correction.

UNIT III: Teaching of different field events – demonstration practice of the skills and correction. Teaching of different field events – demonstration practice of the skills and correction with competition among them. Teaching of different asanas – demonstration practice and correction. Teaching of different asanas – demonstration practice and correction.

UNIT IV: Teaching of different asanas – demonstration practice and orrection.Teaching of different asanas – demonstration practice and correction.Teaching of weight training – demonstration practice and correction.Teaching of circuit training-demonstration practice and correction.Teaching of calisthenics – demonstration practice and correction.

NSS. 111 National Service Scheme (0+1)

PART I

Unit I: Introduction and basic components of NSS:Orientation: history, objectives, principles, symbol, badge; regular programes under NSS, organizational structure of NSS, code of conduct for NSS volunteers, points to be considered by NSS volunteers awareness about health.NSS programmes and activities:Concept of regular activities, special camping, day camps, basis of adoption of village/slums, conducting survey, analysing guiding financial patterns of scheme, youth programme/ schemes of GOI, coordination with different agencies and maintenance of diary.

Unit II: Understanding youth: Definition, profile, profile, categories, issues and challenges of youth; and opportunities for youth who is agent of the social change. Community mobilization: Mapping of community stakeholders, designing the message as per problems and their culture; identifying methods of mobilization involving youth-

adult partnership.

Unit III: Social harmony and national integration: Indian history and culture, role of youth in nation building, conflict resolution and peace- building Volunteerism and shramdan:Indian tradition of volunteerism, its need, importance, motivation and constraints; shramdan as part of volunteerism

Unit IV: Citizenship, constitution, human rights, human values and ethics: Basic features of constitution of India, fundamental rights and duties, human rights, consumer awareness and rights and rights to information, human values and ethics. Family and society: Concept of family, community (PRIs and other community based organisations) and society

PART II

Unit I: Importance and role of youth leadership: Meaning, types and traits of leadership, qualities of good leaders; importance and roles of youth leadership Life competencies: Definition and importance of life competencies, problem-solving and decision-making, inter personal communication

Unit I: Youth development programmes: Development of youth programmes and policy at the national level, state level and voluntary sector; youth-focused and youth-led organstions

Unit II: Health, hygiene and sanitation: Definition needs and scope of health education; role of food, nutrition, safe drinking water, water born diseases and sanitation (Swachh Bharat Abhiyan) for health; national health programmes and reproductive health.Youth health, lifestyle,

Unit III: HIV AIDS and first aid: Healthy lifestyles, HIV AIDS, drugs and substance abuse, home nursing and first aid Youth

Unit IV: yoga: History, philosophy, concept, myths and misconceptions about yoga; yoga traditions and its impacts, yoga as a tool for healthy lifestyle, preventive and curative method.

PART III

Unit I: Vocational skill development: To enhance the employment potential and to set up small business enterprises skills of volunteers, a list of 12 to 15 vocational skills will be drawn up based on the local conditions and opportunities. Each volunteer will have the option to select two skill-areas out of this list

Unit II: Issues related environment: Environmental conservation, enrichment and sustainability, climatic change, natural resource management (rain water harvesting, energy conservation, forestation, waste land development and soil conservations) and waste management

Unit III: Disaster management: Introduction and classification of disaster, rehabilitation and management after disaster; role of NSS volunteers in disaster management. Entrepreneurship development: Definition, meaning and quality of entrepreneur; steps in opening of an enterprise and role of financial and support service institution.

Unit IV: Formulation of production oriented project: Planning, implementation, management and impact assessment of project Documentation and data reporting: Collection and analysis of data, documentation and dissemination of project reports

PART IV

Unit I: Youth and crime: Sociological and psychological factors influencing youth crime, cyber crime, pear mentoring in preventing crime and awareness for juvenile justice

Unit II: Civil/self defence: Civil defence services, aims and objectives of civil defence; needs and training of self defence

Unit III: Resource mobilization: Writing a project proposal of self fund units (SFUs) and its establishment

Unit IV: Additional life skills: Positive thinking, self-confidence and esteem, setting life goals and working to achieve them, management of stress including time management.

ಕನ್ನಡ ಪಠ್ಯಕ್ರಮ

ಕನ್ನಡ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ

KAN. 111 **0+1**

ಅ. ಕಾವ್ಯ–ಕಥೆ

ಜನಪದ ಗೀತೆಗಳು–ಜನಪದರು; ಶರಣರ ವಚನಗಳು–ಜೇಡರದಾಸಿಮಯ್ಯ, ಬಸವಣ್ಣ, ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ; ಹೊಸ ಬಾಳಿನ ಗೀತೆ– ಕುವೆಂಪು; ತಿಳಿದವರೇ ಹೇಳಿ–ವೈದೇಹಿ; ಜೀತ– ಡಾ॥ ಬೆಸಗರಹಳ್ಳಿ ರಾಮಣ್ಣ; ಒಂದು ಖಾಸಗಿ ಪತ್ರ–ಏನಯಾ ಒಕ್ಕುಂದ.

ಆ. ಕೃಷಿ ಬರಹ

ಆಧುನಿಕ ಪೂರ್ವ ಕನ್ನಡ ಕೃಷಿ ಸಾಹಿತ್ಯ ಪರಿಚಯ – ಡಾ॥ಜಿ.ವೀರಭದ್ರಗೌಡ, ಕನ್ನಡದಲ್ಲಿ ಕೃಷಿವಿಜ್ಞಾನ ಸಾಹಿತ್ಯದ ಉಗಮ ಮತ್ತು ವಿಕಾಸ–ಡಾ॥ ಜೆ. ಬಾಲಕೃಷ್ಣ, ಎಲ್ ಫಾರ್ ಲೈನ್ ಅಲ್ಲ: ಲಕ್ಷ್ಮಣಯ್ಯ – ಡಾ॥ ಟಿ.ಎಸ್.ಚನ್ನೇಶ್, ಅಹಾರವೆಂಬ ಆಯುಧ–ನಾಗೇಶ ಹೆಗಡೆ

ಇ. ಪ್ರಾಯೋಗಿಕ

ಅನುವಾದ, ಪಾರಿಭಾಷಿಕ ಪದರಚನೆಯ ವಿಧಾನಗಳು.

ಕನ್ನಡೇತರ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ/ **For Non Kannada Speaking Students**

KAN. 112 **0+1**

Development of listening and speaking skills with Kannada structure pattern - Introducing each other - Conversation between friends - Enquiring about family - Plan to go for a movie - Routine activities of a student - In a book shop - Introducing College/University - Conversation between a farmer and a Scientist - Data collection in a village – Conversation on going on a tour.

Development of writing and reading skills with Kannada structure pattern - Kannada Script practice and reading.

ಕನ್ನಡ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ

KAN. 121 **0+1**

ಅ. ಕಾವ್ಯ – ಕಥೆ– ಜನಪದ – ಸಂಸ್ಕೃತಿ ಮತ್ತು ಕನ್ನಡ ಪ್ರಜ್ಞೆ –ಸಂಕೀರ್ಣ

ಬೇವಿನಹಟ್ಟಿ ಕಾಳಮ್ಮನ ಸಾಲು– ಜನಪದ, ಗೋವಿನ ಹಾಡು– ಜನಪದ, ಕರ್ನಾಟಕ ಜಾನಪದ ಲೋಕದೃಷ್ಟಿ – ಪುರುಷೋತ್ತಮ ಬಿಳಿಮಲೆ, ಕೆರೆಗೆ ಹಾರ– ಜನಪದ, ನೀರೆಂಬ ಜೀವ ದ್ರವ – ಜೆ.ಬಾಲಕೃಷ್ಣ, ಸೂಫಿ ಕತೆಗಳು, ಕನ್ನಡದ ಶುದ್ಧತೆ – ಕೆ.ವಿ.ನಾರಾಯಣ, ವಚನಕಾರರು ಮತ್ತು ಭಾಷೆ, ಕದಂಬರ ಕನ್ನಡ ಲಿಪಿ – ಷ.ಶೆಟ್ಟರ್, ಅವನತಿ – ಪೂರ್ಣಚಂದ್ರ ತೇಜಸ್ವಿ, ಇಲ್ಲಿ ಯಾರೂ ಮುಖ್ಯರಲ್ಲ, ಯಾರೂ ಅಮುಖ್ಯರಲ್ಲ... – ಕೃಪಾಕರ ಸೇನಾನಿ, ಕೃಷಿ ಗಾದೆಗಳು – ಜನಪದ, ಕೃಷಿ ಗಾದೆಗಳ ಅವಲೋಕನ – ಜಿ. ವೀರಭದ್ರಗೌಡ.

ಆ. ಪ್ರಾಯೋಗಿಕ

ಕನ್ನಡದಲ್ಲಿ ಕೃಷಿ ಸಾಹಿತ್ಯ ಪ್ರಕಾರಗಳು ಮತ್ತು ಅವುಗಳ ರಚನಾ ಸ್ವರೂಪ; ವ್ಯವಹಾರ ಕನ್ನಡ–ಪತ್ರಲೇಖನ.

ಕನ್ನಡೇತರ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ/ **For Non Kannada Speaking Students**

KAN. 122 **0+1**

Development of listening and speaking skills with Kannada structure pattern - Conversation between a Doctor and a Patient; About Children's Education; Halebid-Belur; Discussing about Examination and Future Plan.

Development of writing and reading skills with Kannada structure pattern : Translation of simple sentences English into Kannada, Selected lesson for reading (Nada Geete, Kannada Habbagalu, Prekshaniya Sthalagalu, Kannada Kavi, Kannada Vignani).

AGRICULTURAL AND ALLIED SUBJECTS AGRONOMY

AGR. 111 Fundamentals of Agronomy

(2+1)

Unit-I: Agronomy and its scope, Agriculture as an art, science and business of crop production, Factors affecting crop production

Unit-II: History of agriculture development in India and Karnataka, Importance and scope of agriculture, classification of crops, Seeds and sowing, Soil and its components, properties, fertility and productivity and their management, Tillage and tilth, Crop density and geometry

Unit-III: Crop nutrition - manures and fertilizers, nutrient use efficiency, Growth and development of crops, ideotypes, Cropping systems and its principles, Crop adaptation and distribution, crop management technologies in problematic areas, Harvesting and threshing of crops.

Unit-IV: Weeds- importance, classification, crop weed competition, concepts of weed management-principles and methods, herbicides- classification, selectivity and resistance, allelopathy.

LIST OF EXPERIMENTS/ PRACTICES

- Identification of crops, seeds and fertilizers, Classification of field crops, tillage implements
- Study and practice of different methods of ploughing,
- Study of different methods of sowing, Study of seed drills, intercultural implements
- Study of fertilizers, manures and green manures
- Calculation of fertilizers and seed rates, Study on seed germination and plant population, Preparation of FYM and compost, Participation in ongoing field operations,
- Study of agro- climatic zones of Karnataka and India. Study and identification of dry land and waste land weeds.
- Study and identification of garden land, wet land and aquatic weeds. Calculation of herbicide doses and their spray.

AGR. 121 Water Management (1+1)

Unit-I: Definition of irrigation, water resources; soil water relations; Basic terms in water management and irrigation. Study of soil moisture constantans and hydrodynamic relation. Measurement of soil moisture-direct and indirect methods; Expression of soil moisture and their mutual relations, Plant water relationship –critical stages. Meaning and impact of water stress, water availability and its relationship with nutrient availability and losses

Unit-II: Water management of crops – its definition, meaning, measurement and relevance in crop production, concept of evapotranspiration and its management, factors affecting water management, study of water requirement of field and horticultural crops

Unit-III: Methods of irrigation – surface, subsurface, sprinkler and drip, constraints and advantages of different methods. Efficiency of irrigation and methods to measure them, Quantitative estimation of irrigation water – direct and indirect methods, Weeds-importance, classification, crop weed competition, concepts of weed management-principles and methods, herbicides- classification, selectivity and resistance, allelopathy.

Unit-IV: Expression of flowing water and mutual relations, Concept of water use efficiency and methods to improve water use efficiency, Assessment of irrigation requirement, Scheduling of irrigation – Approaches and methods, Suitability of water for irrigation, Concept of drainage and methods.

LIST OF EXPERIMENTS/ PRACTICES

- Soil moisture determination by direct and indirect methods, Study and installation of tensiometer and soil moisture gauges,
- Determination of maximum water holding capacity, field capacity, permanent wilting point and bulk density
- Determination of infiltration rate and capillarity in soil, Study of methods of flow measurement
- Determine the use of weirs, orifices, Parshall flume and water meters, Surface & sub-surface irrigation methods, Micro irrigation methods, Water requirement of different crops, On-farm irrigation structures, Drainage structures, Practice of numerical examples.

AGR. 122 Introductory Agro meteorology & Climate Change (1+1)

Unit-I: Meaning and scope of agricultural meteorology; Earth atmosphere- its composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze; Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, long wave and thermal radiation, net radiation, albedo.

Unit-II: Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature, Energy balance of earth; Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud; Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification.

Unit-III: Artificial rainmaking. Monsoon- mechanism and importance in Indian agriculture, Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold-wave. Agriculture and weather relations; Modifications of crop microclimate, climatic normal's for crop and live stock production.

Unit-IV: 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 and mitigation strategies.

LIST OF EXPERIMENTS/ PRACTICES

- Visit of Agro meteorological Observatory, site selection of observatory, exposure of instruments and weather data recording.
- Measurement of total, shortwave and long wave radiation, and its estimation using Planck's intensity law.
- Measurement of albedo and sunshine duration, computation of Radiation Intensity using BSS.
- Measurement of maximum and minimum air temperatures, its tabulation, trend and

variation analysis.

- Measurement of soil temperature and computation of soil heat flux. Determination of vapor pressure and relative humidity.
- Determination of dew point temperature.
- Measurement of atmospheric pressure and analysis of atmospheric conditions. Measurement of wind speed and wind direction, preparation of windrose.
- Measurement, tabulation and analysis of rain. Measurement of open pan evaporation and evapotranspiration.
- Computation of PET and AET.

AGR. 211 Crop Production Technology-I

(2+1)

Unit I: Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Kharifcrops.

Unit II: Cereals – rice, maize, wheat, sorghum, pearl millet and finger millet, Nutrimillets /small millets: kodo millet, foxtail maillet, Proso millet, little millet, baranyard millet

Unit III: Pulses- chickpea, peas,pigeonpea, mungbean, urdbean, cowpea, horsegramand lentil.

Unit IV: Forage crops: sorghum, cowpea, cluster bean,napier, berseem, lucerne and oat.

LIST OF EXPERIMENTS/ PRACTICES

- Study of area, production and productivity of cereals, pulses and forage crops in Karnataka, India and world
- Raising of important cereals, pulses and forage crops in the crop museum, Rice nursery preparation, transplanting of Rice, effect of seed size on germination and seedling vigour crops
- Effect of sowing depth on germination of crops
- Identification of weeds in crops, top dressing and foliar feeding of nutrients
- study of yield contributing characters and yield calculation of crops
- study of crop varieties and important agronomic experiments at experimental farm.

- study of forage experiments, morphological description of crops, visit to research centres of related crops.Green leaf manuring
- use of bio-fertilizers in rice, Fertilizer management in cereals, pulses and forage crops, fertilizer management of paddy, preservation of fodder and silage making

AGR. 212 Practical Crop Production-II (IRRIGATED) (0+1)

LIST OF EXPERIMENTS/ PRACTICES

- Crop planning, raising field crops in an area of 5 guntas by each student
- Crop planning, raising field crops in an area of 5 guntas by each student.
- Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce.
- The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies.
- Preparation of balance sheet including cost of cultivation, net returns per student

AGR. 221 Crop Production Technology-II

(1+1)

Unit I: Origin, geographical distribution, economic importance

Unit II: soil and climatic requirements, varieties, cultural practices

Unit III: yield of oilseed crops- groundnut, sunflower, rapeseed and mustard, soybean, sesamum, niger, safflower, castor,linseed,

Unit IV: Commercial crops – sugarcane, cotton, jute, mesta.

LIST OF EXPERIMENTS/ PRACTICES

- Study of area, production and productivity of oilseeds and commercial crops in Karnataka, India and world
- Raising of important oilseed and commercial crops in the crop museum, Planting methods of sugarcane
- Study on methods of shelling and rhizobium and PSB seed treatment in groundnut, study

on nipping in castor and safflower

- Methods of testing the maturity of sugarcane and computation of commercial cane sugar
- Study of yield contributing characters of oilseed and commercial crops
- Study on quality parameters of cotton, study of bast fibre like mesta, jute and their retting, visit to research stations of related crops/sugar factory.

AGR. 311 Practical Crop Production-I (Rainfed) (0+1)

LIST OF EXPERIMENTS/ PRACTICES

- Crop planning, raising field crops in an area of 5 guntas by each student.
- Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce.
- The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. Preparation of balance sheet including cost of cultivation, net returns per student.

AGR. 312 Experimental Techniques in Agricultural Research (0+1)

LIST OF EXPERIMENTS/ PRACTICES

- Aims and objectives of field experiments, Essence, levels and methods of research,
- Identification and statement of problem, selection of treatments, selection of site, plot shape and size, Use of random sampling numbers in field experiments
- Layout of field experiments and conduct of field trials by individual student, Recording of observations from field experiments, Review collection and writing of reference cards
- Basic concepts and measurement of data, Analysis of variance and test of significance
- Experimental designs and basic principles of experimental design, Completely Randomized Design (CRD)

- Randomized Complete Block design (RCBD), Latin Square design (LSD), Factorial Concept, each student has to conduct a micro plot field experiment.
- Study of tabulation, analysis of experimental data and experimental results, Transformation of data and Preparation of research report & presentation of results

AGR. 321 Farming Systems, Organic Farming and Precision Agriculture

(2+1)

Unit I: Farming System-scope, importance and concept, Types and systems of farming system and factors affecting types of farming, Farming system components and their maintenance, Cropping system and pattern, multiple cropping system, Efficient cropping system and their evaluation, Allied enterprises and their importance, Tools for determining production and efficiencies in cropping and farming system; Sustainable agriculture-problems and its impact on agriculture, indicators of sustainability, adaptation and mitigation

Unit II: conservation agriculture strategies in agriculture, HEIA, LEIA and LEISA and its techniques for sustainability, Integrated farming system-historical background, objectives and characteristics, components of IFS and its advantages, Site specific development of IFS model for different agro-climatic zones, resource use efficiency and optimization techniques, Resource cycling and flow of energy in different farming system, farming system and environment, Organic farming, principles and its scope in India; Initiatives taken by Government (central/state).

Unit III: NGOs and other organizations for promotion of organic agriculture; Organic ecosystem and their concepts; Organic nutrient resources and its fortification; Restrictions to nutrient use in organic farming; Choice of crops and varieties in organic farming; Fundamentals of insect, pest, disease and weed management under organic mode of production; Operational structure of NPOP

Unit IV: Indian agriculture. Global Positioning System (GPS) Geographic Information System (GIS). Site Specific Nutrient Management (SSNM) for nutrient and irrigation management practices. Comparative yield, quality and farm profits under SSM practices v/s Variable Rate Technology (VRT) practices.

LIST OF EXPERIMENTS/ PRACTICES

- Visit of organic farms and outlets to study the various components and their utilization.
- Visit to IFS model in different agro-climatic zones of nearby states University/ institutes and farmers field to study the various components and their utilization
- Preparation of enrich compost, vermicompost, bio-fertilizers/bio-inoculants and their quality analysis; Indigenous technology knowledge (ITK) for nutrient, insect, pest disease and weed management; Cost of organic production system; Post harvest management; Quality aspect, grading, packaging and handling.

AGR. 322 Rainfed Agriculture and Watershed Management (1+1)

Unit I: Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India; Problems and prospects of rainfed agriculture in India .

Unit II: Soil and climatic conditions prevalent in rainfed areas; Soil and water conservation techniques, Drought: types, effect of water deficit on physio- morphological characteristics of the plants, Crop adaptation and mitigation to drought

Unit III: Water harvesting: importance, its techniques, Efficient utilization of water through soil and crop management practices

Unit IV: Management of crops in rainfed areas, Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management, factors affecting watershed management

LIST OF EXPERIMENTS/ PRACTICES

- Studies on climate classification, studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons.
- Studies on cropping pattern of different rainfed areas in the country and demarcation of rainfed area on map of India. irrigation on the basis of evapo-transpiration demand of crops.
- Critical analysis of rainfall and possible drought period in the country, effective rainfall

and its calculation.

- Studies on cultural practices for mitigating moisture stress. Characterization and delineation of model watershed.
- Field demonstration on soil & moisture conservation measures.
- Field demonstration on construction of water harvesting structures. Visit to rainfed research station/watershed.

AGRICULTURAL ECONOMICS

AEC. 111 Fundamentals of Agricultural economics

(2+0)

Unit-I: Economics: Meaning, scope and subject matter, definitions, activities, approaches to economic analysis; micro and macro economics, positive and normative analysis. Nature of economic Theory: ; rationality assumption, concept of equilibrium, economic laws as generalization of human behavior Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare. Agricultural economics: meaning, definition, characteristics of agriculture, importance and its role in economic development Technical change and types, Agricultural planning and development in the country.

Unit-II: Basic concepts: Land reforms: meaning of land tenure, land tenancy, land reform measures – abolition of intermediaries, tenancy reforms, fixation of ceiling on land holdings, consolidation of holdings, development of cooperative farming. Agricultural labour and farm mechanization.Demand: meaning, law of demand, demand schedule and demand curve, determinants, utility Theory: ; law of diminishing marginal utility, equi-marginal utility principle. Consumer's equilibrium and derivation of demand curve, elasticity of demand: concept and measurement of price elasticity, income elasticity and cross elasticity**.**

Unit-III: Supply: Stock v/s supply, law of supply, supply schedule, supply curve, determinants of supply, elasticity of supply. Production: process, creation of utility, factors of production, laws of returns and returns to scale. Market structure: meaning and types of market,basic features of perfectly competitive and imperfect markets.

Distribution Theory: meaning, factor market and pricing of factors of production. Concepts of rent, wage, interest and profit. National income: Meaning and importance, circular flow, concepts of national income accounting and approaches to measurement, difficulties in measurement.

Unit-IV: Population: Importance, Malthusian and Optimum population theories, natural and socio-economic determinants, current policies and programmes on population control. Money: Barter system of exchange and its problems, evolution, meaning and functions of money, classification of money, money supply, general price index, inflation and deflation. Banking: Role in modern economy, Agricultural and public finance: meaning, micro v/s macro finance, need for agricultural finance, public revenue and public expenditure. Tax: meaning, direct and indirect taxes, agricultural taxation, VAT. Economic systems: Concepts of economy and its functions, important features of capitalistic, socialistic and mixed economies, elements of economic planning, NITI Ayoga.

AEC. 121 Agricultural Finance & Co-operation (1+1)

Unit I: Agricultural Finance - meaning, scope and significance, credit needs and its role in Indian agriculture. Agricultural credit: meaning, definition, need, classification.

Unit II: Credit analysis: 3 R'S and 5 C'S of credits Loan repayment plans. Sources of agricultural finance: institutional and non-institutional sources, types of banks, functions of commercial and central bank, credit creation policy, social control and nationalization of commercial banks, micro financing including KCC and SHGs. Lead bank scheme, RRBs, Scale of finance and unit cost.

Unit III: Introduction to higher financing institutions – RBI, NABARD, ADB, IMF, World Bank, Insurance and Credit Guarantee Corporation of India. Cost of credit. Recent development in agricultural credit-Banking reforms and their implication on agricultural credit – Narasimham Committee and other reports. Preparation and analysis of financial statements – Balance Sheet and Income Statement. Basic guidelines for preparation of project reports Time value of money, capital budgeting techniques – PBP, ARR, NPV, BCR, IRR, Bank norms – SWOT analysis.

Unit IV: Agricultural Cooperation – Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significance of cooperatives in Indian agriculture. Agricultural Cooperation in India - credit, multi-purpose cooperatives, farmers' service cooperative societies, role of ICA, NCUI, NCDC.

LIST OF EXPERIMENTS/ PRACTICES

- Determination of most profitable level of capital use. Optimum allocation of scarcecapital among different enterprises.
- Exercise on Time value of money, capital budgeting techniques – PBP, ARR, NPV, BCR, IRR,Analysis of performance of cooperatives using secondarydata.
- Analysis of performance of commercial banks and RRB's using secondary data. Visit to cooperative banks, credit societies, commercial banks, NABARD, lead bank to acquire firsthand knowledge of their management, schemes and procedures.
- Estimation of credit requirement of farm business – Case studies. Preparation and analysis of balance sheet – case studies.
- Preparation and analysis of income statement – case studies. Appraisal of a loan proposal – case studies.
- Techno-economic parameters for preparation of projects. Preparation of bankable projects for various agricultural crops / products including their value added products.

AEC. 311 Agricultural Marketing, Trade and Prices (2+1)

Unit I: Agricultural Marketing: Concepts and definitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation, classification and characteristics of agricultural markets studying the problems of marketing-Functional, institutional, commodity and behavioral approaches, Market forces – Demand and Supply, Consumer surplus and producer surplus, nature and determinants of demand and supply of farm products

Unit II: producer's surplus – meaning and its types, marketable and marketed surplus, factors affecting marketable surplus of agri- commodities product life cycle (PLC) and

competitive strategies Meaning and stages in PLC; characteristics of PLC; strategies in different stages of PLC; pricing and promotion strategies: pricing considerations and approaches – cost based and competition based pricing; Price determination under different types of markets, market promotion – advertising, personal selling, sales promotion and publicity – their meaning and merits & demerits

Unit III: Marketing process and functions: Marketing process-concentration, dispersion and equalization; exchange functions – buying and selling; physical functions – storage, transport and processing; facilitating functions – packaging, branding, grading, quality control and labeling (AGMARK); Market functionaries and marketing channels: Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel; number of channel levels; marketing channels for different farm products; Integration, efficiency, costs and price spread: Meaning, definition and types of market integration; marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs; Role of Govt. in agricultural marketing and market regulation

Unit IV: Market research- information and intelligence, Public sector institutions- CWC, SWC, FCI, CACP & DMI – their objectives and functions; cooperative marketing in India, NAFED Risk in marketing: Types of risk in marketing; speculation & hedging; an overview of futures trading; Agricultural prices and policy: Meaning and functions of price; need for agricultural price policy; Administered Prices, CACP, MSP, MIS, Trade: Concept of International Trade and its need, theories of absolute and comparative advantage. Present status and prospects of international trade in agri- commodities; GATT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR. Quality control, HACCP, Eco-mark, Agri-export zones, Export- import bank of India.

LIST OF EXPERIMENTS/ PRACTICES

- Plotting and study of demand and supply curves and calculation of elasticities
- Study of relationship between market arrivals and prices of some selected commodities
- Computation of marketable and marketed surplus of important commodities

- Study of price behaviour over time for some selected commodities; Construction of index numbers; Visit to local markets to study various marketing functions performed by different agencies
- Identification of marketing channels for commodities, collection
- Analysis of data on marketing costs, margins and price spread and presentation of report in the class
- Visit to market institutions – NAFED, SWC, CWC, e-marketing, regulated market, cooperative marketing society, Export house, etc.
- To study their organization and functioning; Application of principles of comparative advantage of international trade.

AEC. 321 Farm Management, Production and Resource Economics (1+1)

Unit I: Meaning and concept of farm management, objectives and relationship with other sciences. Meaning and definition of farms, its types and characteristics, factor determining types and size of farms. Principles of farm management: Differences between farm management and production economics, concept of production function and its type - Linear, quadratic, Cobb Douglas models, meaning and interpretation. Uses of production function in decision- making

Unit II: Laws of returns: Law of variable proportions (factor- product),factor-factor and product-product relationships, law of equi- marginal returns, principle of opportunity cost, law of comparative advantage. Meaning and concept of cost, types of costs and their interrelationship, fixed costs, sunken costs, valuation and depreciation of farm assets, total and average cost curves in the short and long run and farm management cost concepts (CACP), Concept and estimation- gross farm income, net farm income, family labor income and farm business income. Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises. Discounted Cash Flow Measures and their role in financial strategic decisions etc.,

Unit III: Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain on farm, single entry and double entry book keeping,

farm inventory, balance sheet, profit and loss accounts. Meaning and importance of farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting, linear programming, appraisal of farm resources, selection of crops and livestock's enterprises. Concept of risk and uncertainty in farming, nature and sources of risks and its management strategies, Crop/livestock/ machinery insurance schemes – weather based crop insurance, features, determinants of compensation, PMFBY.

Unit IV: Concepts of resource economics, Significance of NRE in farming, differences between NRE and agricultural economics, unique properties of natural resources - land, surface water, groundwater, environment, biodiversity, ecosystem services: uniqueness, indispensability, irreversibility, invisibility, remoteness, intricacy, synergy, ambiguous property rights, externalities, market failure, free riding, property rights. Positive and negative externalities in agriculture, inefficiency and welfare loss, internalization of externalities, important issues in economics and management of common property resources of land, water, pasture, fishery and forest resources etc. evaluation, equipping farmer as decision maker – production.

LIST OF EXPERIMENTS/ PRACTICES

- Preparation of farm layout. Determination of cost of fencing of a farm. Computation of depreciation cost of farm assets.
- Illustration of loss minimization principle, Application of equi- marginal returns/opportunity cost principle in allocation of farm resources.
- Determination of most profitable level of inputs use in a farm production process.
- Determination of least cost combination of inputs. Selection of most profitable enterprise combination.
- Formulation of LP problems. Application of cost principles including CACP concepts in the estimation of cost of crop and livestock enterprises.
- Preparation of farm plan and budget, partial budgeting exercises, Exercise on book keeping in farm, Amortization
- Illustration of costing of groundwater irrigation. Visit to IFS farms, farm section office, cooperative farms, and other representative farms.

AGRICULTURAL ENGINEERING

AEG. 111 Introductory Soil and Water Conservation Engineering (1+1)

Unit-I: Introduction to Soil and Water Conservation causes of soil erosion. Definition and agents of soil erosion.

Unit-II: water erosion: Forms of water erosion. Gully classification and control measures. Soil loss estimation by universal Loss Soil Equation. Soil loss measurement techniques.

Unit-III: Principles of erosion control: Introduction to contouring, strip cropping. Contour bund. Graded bund and bench terracing. Grassed water ways and their design. Water harvesting and its techniques.

Unit-IV: Wind erosion: mechanics of wind erosion, types of soil movement. Principles of wind erosion control and its control measures.

LIST OF EXPERIMENTS/ PRACTICES

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

AEG. 211 Farm Machinery and Power (1+1)

Unit I: Status of Farm Power in India, Sources of Farm Power engines, working principles of I C engines, comparison of two stroke and four stroke cycle engines, Study of different components of I.C. engine, I.C. engine terminology and solved problems, Familiarization with different systems of I.C.

Unit II: engines: Air cleaning, cooling, lubrication, fuel supply and hydraulic control system of a tractor

Unit III: Familiarization with Power transmission system : clutch, gear box, differential and final drive of a tractor, Tractor types, Cost analysis of tractor. with Primary and Secondary Tillage implement, Implement for hill agriculture, implement for intercultural operations

Unit IV:, Familiarization with sowing and planting equipment, calibration of a seed drill and solved examples, Familiarization with Plant Protection equipment, Familiarization with harvesting and threshing equipment

LIST OF EXPERIMENTS/ PRACTICES

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

AEG. 221 Renewable Energy and Green Technology (1+1)

Unit I: Classification of energy sources, contribution of these of sources in agricultural sector

Unit II: Familiarization with biomass utilization for biofuel production and their application, Familiarization with types of biogas plants and gasifiers,

Unit III: Biogas, bioalcohol, biodiesel and bio oil production and their utilization as bioenergy resource, introduction of solar energy, collection and their application

Unit IV: Familiarization with solar energy gadgets: solar cooker, solar water heater, application of solar energy: solar drying, solar pond, solar distillation, solar photovoltaic system and their application, introduction of wind energy and their application.

LIST OF EXPERIMENTS/ PRACTICES

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

AEG. 321 Protected Cultivation and Secondary Agriculture (1+1)

Unit I: Green house technology: Introduction, Types of Green Houses; Plant response to Green house environment, Planning and design of greenhouses, Design criteria of green house for cooling and heating purposes. Green house equipments, materials of construction for traditional and low cost green houses.

Unit II: Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying. Cost estimation and economic analysis.

Unit III: Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT

equipment design and operation. Drying and dehydration; moisture measurement, EMC.

Unit IV: Drying Theory: , various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, recirculatory dryer and solar dryer). Material handling equipment; conveyer and elevators, their principle, working and selection.

LIST OF EXPERIMENTS/ PRACTICES

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

AGRICULTURAL ENTOMOLOGY

AET. 121 Fundamentals of Entomology

(2+1)

Unit I: History of Entomology in India. Position of the insect in Animal kingdom. Factors for insect's abundance. Major points related to dominance of Insecta in Animal kingdom. Classification of phylum Arthropoda upto classes. Relationship of class Insecta with other classes of Arthropoda.

Unit II: Morphology: Structure and functions of insect cuticle and molting. Body segmentation. Structure of Head, thorax and abdomen. General external structure and modifications of insect antennae, mouth parts, legs, Wing venation, modifications and

wing coupling apparatus. Structure of male and female genital organ. Metamorphosis and diapause in insects. Types of larvae and pupae. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretary (Endocrine) and reproductive system, in insects.

Unit III :Types of reproduction ininsects. Major sensory organs like simple and compound eyes, chemoreceptors. Systematics: Taxonomy –importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order. Classification of class Insecta upto Orders.

Unit IV: Basic groups of present day insects with special emphasis to orders and families of Agricultural importance like Orthoptera: Acrididae, Tettigonidae, Gryllidae, Gryllotalpidae; Dictyoptera: Mantidae, Blattidae; Odonata; Isoptera: Termitidae; Thysanoptera: Thripidae; Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae, Lygaeidae, Miridae, Reduviidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Aleyrodidae, Lophophidae, Aleurodidae, Pseudococcidae; Neuroptera: Chrysopidae; Hemirobidae; Lepidoptera: Pieridae, Papiloinidae, Noctuidae, Nymphalidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera: Tenthridinidae, Apidae. Trichogrammatidae, lchneumonidae, Braconidae, Chalcididae; Encyrtidae Bethylidae, Formicidae,Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae,Muscidae, Tephritidae, Tabanidae, Syrphidae.

LIST OF EXPERIMENTS/ PRACTICES

- Methods of collection and preservation of insects including immature stages.
- External features of Cockroach/Grasshopper/Blister beetle.
- study of close relatives of insects, phylum Arthropoda.
- Types of insect antennae, mouthparts and legs; Wing venation, types of wings and wing coupling apparatus.
- Types of insect larvae and pupae.
- Dissection of digestive system in insects (Grasshopper, Cockroach).
- Dissection of male and female reproductive systems in insects (Grasshopper,

Cockroach).

- Study of characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance.

AET. 211 Insect Ecology, Principles of Pest Management and Natural Enemies

(2+1)

Unit I: Insect Ecology: Introduction, Environment and its components. Effect of abiotic factors–temperature, moisture, humidity, rainfall, light, atmospheric pressure and air currents. Effect of biotic factors – food competition, natural and environmental resistance. Concepts of Balance of life in nature, biotic potential and environmental resistance and causes for outbreak of pests in agro- ecosystem.

Unit II: Categories of insect pests, IPM: Introduction, history, importance, concepts, principles and tools of IPM. Economic importance of insect pests and pest risk analysis. Methods of detection and diagnosis of insect pest. Calculation and dynamics of economic injury level and importance of Economic threshold level. Methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control. Ecological management of crop environment.

Unit III: Introduction to conventional pesticides for the insect pests management. Survey surveillance and forecasting of Insect pest. Development and validation of IPM module. Implementation and impact of IPM (IPM module for Insect pest . Safety issues in pesticide uses. Political, social and legal implication of IPM. Case histories of important IPM programmes.

Unit IV: Study of insecticides including mode of actions, formulations. Pest resurgence and insecticide resistance. Insect orders bearing predators and parasitoids used in pest control and their mass multiplication techniques. Important species of pollinator, weed killers and scavengers with their importance.

LIST OF EXPERIMENTS/ PRACTICES

- Methods of diagnosis and detection of various insect pests, Methods of insect pests measurement,
- Assessment of crop yield losses, calculations based on economics of IPM, Identification of biocontrol agents, different predators and natural enemies.
- Mass multiplication of NPV, coccinella, green lace wing and other important bioagents.
- Identification and nature of damage of important insect pests and their management.Insecticides formulations, plant protections equipments, Crop (agro-ecosystem) dynamics of a selected insect pest.
- Plan & assess preventive strategies (IPM module) and decision making. crop monitoring attacked by insect, pest and diseases, Awareness campaign at farmers' fields. Identification of major parasitoids and predators commonly being used in biological control.

AET. 221 Insect Pests of Horticultural Crops and their Management (1+1)

Unit I: General account on nature and types of damage by different arthropod pests.

Unit II: Scientific name, order, family, host range, distribution

Unit III: Biology and bionomics, nature of damage, and management of major pests and control practices for other important arthropod pests of various vegetable crops, fruit crops, plantation crops, ornamental crops, narcotics, flowers, spices and condiments. Pest of crops grown under protected cultivation.

Unit IV: Pests of tuber crops, important vectors of plant diseases of horticultural crops.

LIST OF EXPERIMENTS/ PRACTICES

- Identification of different types of damage. Identification and study of life cycle and seasonal history of various insect pests attacking crops and their produce: (a) Vegetable Crops; (b) Fruit Crops; (c) Plantation, gardens, Narcotics, spices & condiments.
- Identification of insect pests.Identification of pests of protected cultivation crops.

- Determination of fruit and spices moisture content. Methods of sampling for pest damage assessment.
- Visit to nearby Horticultural research stations.

AET. 311 Insect Pests of Field Crops & Stored Grains and their Management (1+1)

Unit I: General account on nature and type of damage by different arthropods pests. Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage, and management of major pests and scientific name, order, family, host range, distribution,

Unit II: Nature of damage and control practice other important arthropod pests of various field crops, Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain.

Unit II: Insect pests, mites, rodents, birds and microorganisms associated with stored grain and their management.

Unit IV: Storage structure and methods of grain storage and fundamental principles of grain store management. Important vectors of plant diseases of field crops.

LIST OF EXPERIMENTS/ PRACTICES

- Identification of different types of damage.
- Identification and study of life cycle and seasonal history of various insect pests attacking crops and their produce: (a) Field Crops;
- Identification of insect pests and Mites associated with stored grain.
- Determination of insect infestation by different methods. Assessment of losses due to insects.
- Calculations on the doses of insecticides application

AGRICULTURAL EXTENSION

AEX.111 Rural Sociology, Education Psychology and Constitution of India (0+2)

LIST OF EXPERIMENTS/ PRACTICES

- Sociology and Rural sociology: Definition and scope, its significance in agriculture extension, Social Ecology, Rural society, Social Groups, Social Stratification, Culture concept, Social Institution, Social Change & Development.
- Educational psychology: Meaning & its importance in agriculture extension. Behavior: Cognitive, affective, psychomotor domain, Personality, Learning, Motivation, Theories of Motivation, Intelligence.
- Constitution of India: Meaning, Preamble and Characteristics of Constitution of India. Fundamental Rights and Duties. Directive Principles of State Policy.
- Constitutional provisions for welfare of SCs and STs, Minorities, Women and Children. Union Executive: President, Vice-President, Prime Minister, Council of Ministers – Powers and Functions.
- Parliament and Supreme Court of India – Powers and Functions. State Executive: Governor, Chief Minister, Council of Ministers. Legislature and Judiciary: Powers and Functions; Electoral Process; Human Rights Commission – Structure, Powers and Functions.

AEX. 121Fundamentals of Agricultural Extension Education and Rural Development

(1+1)

Unit I: Education: Meaning, definition & Types; Extension Education- meaning, definition, scope and process; objectives and principles of Extension Education; Extension Programme planning- Meaning, Process, Principles and Steps in Programme Development.

Unit II: Extension systems in India: extension efforts in pre-independence era (Sriniketan, Marthandam, Firka Development Scheme, Gurgaon Experiment) and post-

independence era (Etawah Pilot Project, Nilokheri Experiment); various extension/ agriculture development programmes launched by ICAR/ Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND,NATP, NAIP). New trends in agriculture extension: privatization of extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems.

Unit III: Rural Development: concept, meaning, definition; various rural development programmes launched by Govt. of India. Community Development-meaning, definition, concept & principles, Philosophy of C.D. Rural Leadership: concept and definition, types of leaders in rural context; extension administration: meaning and concept, principles and functions.

Unit IV: Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programmes; transfer of technology: concept and models, capacity building of extension personnel.

LIST OF EXPERIMENTS/ PRACTICES

- To get acquainted with university extension system.
- Group discussion- exercise; handling and use of audio visual equipments and digital camera and LCD projector; preparation and use of AV aids.
- Preparation of extension literature – leaflet, booklet, folder, pamphlet news stories and success stories.
- Presentation skills exercise; micro teaching exercise.
- A visit to village to understand the problems being encountered by the villagers/ farmers; to study organization and functioning of DRDA and other development departments at district level.
- Visit to NGO and learning from their experience in rural development.
- Understanding PRA techniques and their application in village development planning; exposure to mass media.

AEX. 211 Communication and Diffusion of Agricultural Innovations

(1+1)

Unit I: Communication: meaning and definition; Principles and Functions of Communication. Models and barriers to communication. Agriculture journalism; diffusion and adoption of innovation: concept and meaning, process and stages of adoption.

Unit II: Extension teaching methods: meaning, classification, individual, group and mass contact methods, ICT Applications in TOT (New and Social Media), media mix strategies.

Unit III: Diffusion and Adoption of Innovations – Meaning, Definition, Models and adoption Process, Innovation – Decision Process – Elements, Adopter categories and their characteristics, Factors influencing adoption process;

Unit IV: Capacity building of Extension Personnel and Farmers - Meaning, Definition, Types of training, Training of farmers, farm women and Rural youth – FTC and KVK.

LIST OF EXPERIMENTS/ PRACTICES

- Simulated exercises on communication; Identifying the Problems, Fixing the Priorities and selecting the most important problem for preparation of a project.
- Developing a project based on identified problem in a selected village. Organization of Group discussion and Method demonstration.
- Visit to KVK / FTC. Planning and Writing of scripts for Radio and Television. Audio Visual aids – Meaning, Importance and Classification.
- Visit to community radio and television studio for understanding the process of programme production.
- Planning & Preparation of visual aids - Charts, Posters, Over Head Projector (OHP) Transparencies, Power Point Slides.
- Planning and Preparation of Agricultural Information materials – Leaflet, Folder, Pamphlet, News Stories, Success Stories.
- Field diary and lab record; indexing, footnote and bibliographic procedures. Handling of Public Address Equipment (PAE) System, Still camera, Video Camera and Liquid Crystal Display (LCD) Projector.
- Development of schedules, Questionnaires and field visits for Data Collection.

AEX. 321 Entrepreneurship Development and Business Communication

(1+1)

Unit I: Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs; SWOT Analysis & achievement motivation

Unit II: Government policy and programs and institutions for entrepreneurship development. Impact of economic reforms on Agribusiness/Agri enterprises

Unit III: Entrepreneurial Development Process; Business Leadership Skills; Developing organizational skill (controlling, supervising, problem solving, monitoring & evaluation), Developing Managerial skills, Business Leadership Skills (Communication, direction and motivation Skills)

Unit IV: Problem solving skill. Supply chain management and Total quality management, Project Planning Formulation and report preparation. Financing of enterprise, Opportunities for agri-entrepreneurship and rural enterprise.

LIST OF EXPERIMENTS/ PRACTICES

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

AGRICULTURAL MICROBIOLOGY

AMB. 111 Fundamentals of Microbiology (1+1)

Unit I: Origin and evolution of Microbial life. Brief history of microbiology. Microscopes and microscopy. Overview of cell structure of prokaryotes and eukaryotes. General properties of viruses, overview of plant, animal and bacterial viruses, viriods and prions.

Unit II: Different groups of Microorganisms- Bacteria, Fungi, Algae and Protozoa. Microbial nutrition and culture media. Overview of microbial metabolism: glycolysis, citric acid cycle, anaerobic respiration, photosynthesis and fermentation. Microbial growth - measurement of growth, effect of environmental factors on growth.

Unit III: Qualitative and quantitative methods for the study of microorganisms. Microbial genetics: genetic recombination, conjugation, transformation, transduction, mutation and mutants, plasmids, transposons and insertion sequences, cloning vectors. Control of microbial growth: heat sterilization, radiation sterilization, filter sterilization, chemical growth control, disinfectants, antiseptics and antibiotics.

Unit IV: Microbial ecology- Microorganisms in nature and their interaction, methods in microbial ecology, Microbial interactions with higher organisms – plants and animals. Concepts of Immunology - Cells and organs of immune system, antigen- antibody reactions, types of immunity, polyclonal and monoclonal antibodies.

LIST OF EXPERIMENTS/ PRACTICES

- Equipments used in a microbiology laboratory. Microscopy– principles and applications. Preparation of different culture media and sterilization methods.
- Isolation, pure culture and preservation of microorganisms. Staining techniques- simple, negative, capsule, endospore, Gram's staining etc.
- Qualitative and quantitative methods for the study of microorganisms. Influence of environmental factors on microorganisms.
- Biochemical activities of bacteria. Microscopic observation of bacteria, fungi, algae and protozoa.

AMB. 221 Soil and Applied Microbiology (1+1)

Unit I: Occurrence and distribution of microorganisms in nature. Soil as a habitat for microbes. Soil microorganisms - bacteria, fungi, algae, protozoa and viruses. Soil enzymes. Role of microorganisms in biogeochemical cycles of carbon, nitrogen, potassium, phosphorus, sulphur and secondary and tertiary nutrients.

Unit II: Soil biotechnology - utilization of microorganisms in improving soil productivity. Microbial interactions - neutralism, commensalism, synergism, mutualism, competition, amensalism, parasitism and predation. Plant microbe interactions and their biotechnological implications, rhizosphere microflora, symbiotic and free living nitrogen fixing microorganisms, ectomycorrhizal and endomycorrhizal associations.

Unit III: Microbiology of hydrosphere and atmosphere. Microorganisms associated with animals and insects. Potentials and limitations of using microorganisms as agents of biological control of insect pests and diseases. Pesticide micro-flora interactions. Biodegradation, bioconversion of industrial, domestic and agricultural wastes.

Unit IV: Industrial use of microorganisms - biochemical processes involved and biotechnological applications. Microbiology of milk and milk products. Single cell protein. Role of microorganisms in biochemical transformation of raw and processed foods. Food spoilage, food poisoning and food borne infections. Principles and methods of Food preservation.

LIST OF EXPERIMENTS/ PRACTICES

- Determination of enzyme activities in soil.
- Mineralization of carbon, nitrogen, phosphorus and sulphur.
- Plant microbe interactions: free living nitrogen fixers, legume - Rhizobium symbiosis, mycorrhizal symbiosis, microbial inoculants, Azolla - Anabena symbiosis, Casurina - Frankia symbiosis, Study of epiphytic microorganisms.
- Study of beneficial microorganisms in Agriculture- Biofertilizer preparation, Compost making, Biogas production etc. Cultivation of mushrooms.
- Microbiological examination of water and effluents.
- Microorganisms in bread and wine making.

- Microflora associated with vertebrates and invertebrates.
- Microbiological examination of raw processed foods. Microbiological examination of milk and milk products.

ANIMAL SCIENCE

ASC. 311 Livestock, Poultry & Fish Production Management (2+1)

Unit I: Role of livestock in the national economy. Reproduction in farm animals and poultry. Housing principles, space requirements for different species of livestock and poultry. Management of calves, growing heifers and milch animals.

Unit II: Management of sheep, goat and swine. Incubation, hatching and brooding. Broiler production. Management of growers and layers. Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry.

Unit III: Improvement of farm animals and poultry. Importance of Indigenours Live stock and poultry species. Feeding principles of livestock and poultry. Feed ingredients. Feed supplements and additives for livestock and poultry ration. Study of livestock and poultry diseases.

Unit IV: Prevention, vaccination schedule and control of important diseases of livestock and poultry. Marketing and Economics of livestock and poultry. Fisheries resources of india. Importance of Inland fisheries. important fishes and their production. New vistas in Inland fish production.

LIST OF EXPERIMENTS/ PRACTICES

- External body parts of cattle, buffalo, sheep, goat, swine and poultry.
- Handling and restraining of livestock. Identification methods of farm animals and poultry.
- Visit to IDF and IPF to study breeds of livestock and poultry and daily routine farm operations and farm records. Judging of cattle, buffalo and poultry.
- Culling of livestock and poultry. Planning and layout of housing for different types of livestock and poultry.

- Computation of rations for livestock. Clean milk production, milking methods. Hatchery operations, incubation and hatching equipments.
- Management of chicks, growers and layers. De-beaking, dusting and vaccination.
- Economics of cattle, buffalo, sheep, goat, swine and poultry production. Visit to inland fisheries unit.

APICULTURE

API. 311 Introduction to Apiculture (1+1)

Unit I: Importance of Bees and Beekeeping, History and Development of Beekeeping; Species of honeybees and their colony structure; Morphology of honeybees; Anatomy of honeybees – Digestive, reproductive, nervous, Circulatory and Glandular system;

Unit II: Colony organization; Bee biology; Caste determination in honeybees; Age related activities of workers; Nest architecture; Behaviors in honeybees- Foraging, Communication, Robbing, Swarming and Homeostatis; How, when and where to start beekeeping;

Unit III: Bee flora; Seasonal management of bee colonies; Management of Robbing, Swarming and Queenless colonies; Uniting and division of honeybee colonies; Queen rearing; Bees as pollinators and pollination management;

Unit IV: Pests and Diseases of bees and their management; Hive products – Honey, Bee pollen, Bee wax, Propolis, Bee venom, Royal jelly and their extraction, processing, properties and uses; Poisoning of bees and its prevention; Economics of beekeeping.

LIST OF EXPERIMENTS/ PRACTICES

- Identification of honeybee species; Identification of honeybee castes and their stages; Study of nest architecture; Handling and inspection of bee colonies;
- Study of bee hives and bee keeping equipments;
- Dissection of worker bees to study different morphological structures; Dissection of worker bees to study different anatomical structures;

- Hiving of feral colony; Management of bee colonies - feeding, Prevention of swarming, robbing and absconding; Mass queen rearing technique;
- Fixing comb foundation sheet and providing of super chamber to the bee colonies; Uniting and dividing of colonies; Extraction and processing of honey;
- Testing of honey for its purity; Extraction and processing of other bee products; Study of bees as pollinators; Identification of bee flora.
- Identification of bee pests and diseases; Visit to important apiaries and bee keeping societies around the region; Working out economics of beekeeping.

CROP PHYSIOLOGY

CPH. 211 Fundamentals of Crop Physiology (2+1)

Unit I: Introduction: Importance of physiology in agriculture.Plant-water relations: Structure, properties and functions of water; concept of diffusion, osmosis and water potential;Water balance of plants: Water in soil; Water absorption and translocation in plant; soil-plant-atmosphere continuum; Theories explaining water translocation.

Transpiration: Significance of Transpiration; transpiration in relation to crop productivity, Stomatal physiology, Concept of water use efficiency.

Unit II: Mineral Nutrition: Importance of plant nutrients; Classification of plant nutrients; Nutrient uptake- Soil, root and microbes interaction, Microbial association for improved uptake of nutrients; Functions of plant nutrients- Deficiency and toxicity symptoms of plant nutrients; Hydroponics, aeroponics. Mechanism of ion absorption and translocation. Membrane transporters and carriers.Photosynthesis: Mechanism of carbon fixation by C_3, C_4 and CAM pathway and their significance;Plant responses to elevated $CO_{2,/}$ climate change; Relation of photosynthesis and crop productivity;Starch and sucrose synthesis; Translocation of assimilates; Source and sink concept; Photorespiration; Factors affecting photosynthesis and productivity; Dry matter partitioning; Harvest index of crops

Unit III: Respiration: Significance; Respiratory metabolism, Alternative respiration, Factors regulating respiratory rates. Plant Growth and Development: Concept of plant

growth and morphogenesis; Growth and yield parameters and their measurements; Hormones and plant growth regulators in modulating crop growth;Physiological importance of Auxins, GA, Cytokinin, ABA, Ethylene, Brassinosteroids and strigolactones; biosynthesis and mode of action of plant hormones; applications of growth regulators in agriculture, horticulture and industry.

Unit IV: Photoperiodism and vernalization: Basic concepts and their relevance in crop productivity; Phytochromes and their role. Seed dormancy and viability: Basic concepts, seed germination and seedling vigour. Stress Physiology: Plant responses to abiotic stresses; key concepts and definition; acclimation and adaptation mechanisms.

LIST OF EXPERIMENTS/ PRACTICES

- Preparation of standard solutions; Methods of measuring water status in plant tissue; Determination of soil water status;
- Determination of stomatal frequency and index; Measurement of stomatal conductance and transpiration;
- Measurement of water use efficiency at single leaf level; Extraction, separation and quantification of photosynthetic pigments
- Measurement of photosynthetic rate; Measurement of growth and yield parameters; Measurement of respiration rate;
- Deficiency symptoms of nutrients and their identification; growth hormone bioassay; Seed dormancy and methods to break seed dormancy;
- Measurement of Seed viability and seedling vigor; effect of moisture stress on seed germination and seedling vigor.

CPH. 221 Applied Plant Physiology and Crop Modeling (1+1)

Unit I: Application of growth regulators in agriculture/ horticulture/ forestry/industry: Effect of growth regulators on important plant growth and developmental processes. Synthetic growth regulators - classification and their effect on plant growth and development. Practical utility of application of plant growth regulators on farm.

Unit II: Physiological basis of commercial micro propagation: Micro- propagation techniques and its application specific to growth modulation. Macro-propagation techniques including clonal multiplication of elite material. Haploids in crop improvement. Mineral nutrition: Foliar/ soil application of nutrients to correct the deficiency symptoms. Bio-fortification of micronutrients and their importance in human health. Herbicide physiology: Classification and mode of action of herbicide and their applications. Development of herbicide tolerant crops.

Unit III: Post harvest physiology: Physiological and biochemical changes during fruit ripening and storage. Senescence and post harvest shelf life of cut flowers, vegetables and fruits. Hormonal and chemical control of post harvest deterioration of fruits, vegetables and cut flowers and its significance in storage and transport. Seed physiology: Methods to break seed/ bud dormancy of important agriculture/ horticulture plants. Seed priming/ seed encapsulation techniques to improve seed germination and seedling vigour in important agriculture crops.

Unit IV: Drought mitigation strategies: Mechanism of drought adaptations. Plant traits linked to drought adaptation. Antitranspirants and their applications in agriculture, water holding polymers and their relevance. Crop modeling: Physiological yield models, plant ideotypes.

LIST OF EXPERIMENTS/ PRACTICES

- Growth regulator formulations for specific crops.
- Demonstration of plant growth hormones on important plant growth and developmental processes.
- Micro-propagation of commercially important crops.
- Techniques to develop deficiency symptoms of nutrients. Elemental analysis in plant tissues. Bio assay of herbicides.
- Mechanisms to enhance the uptake of herbicides. Identification of physiological maturity indices in important crops.
- Demonstration of anti-ethylene agent on shelf life of flowers/ fruits. Effect of growth regulators on delaying senescence/ ripening.
- Seed hardening techniques in cereal crops.

- Application of stable isotopes techniques in agriculture. Computer applications in plant physiology, crop productivity and modeling.

CPH. 222 Nanotechnology in Agriculture (0+1)

Unit I: Basic concepts of Nanoscience and Nanotechnology: Introduction, definition and meaning of nanotechnology, classification of nanomaterials, scientific revolutions – time and length scale in structures. Size effects on structure and morphology of nanoparticles. Synthesis of nano material: Physcial, chemical and biological methods. Role in social, economic, ethical and ecological spheres. Green nanotechnology.

Unit II: Application of nanotechnology in Agriculture: Effects of seed priming and foliar applications of nanomaterial on growth and productivity of crops. Uptake and translocation of nanoparticles. Quantification of enahnced nano-nutrient content in edible parts.

Unit III: In vitro and field efficacy of nanoparticles (pesticides) against plant pathogens. Bioassy of nano-formulations of insecticide.

Unit IV: Bio-safety of nano-formulations on natural enimes. Study the fate and behavior of nano fertilizers in soils. Application of nano technology in recycling of Agriculture waste. Safety, toxicity and adoption of nano particles in the soil and aquatic life. Nano sensors in agriculture- nutrient, water, soil.

FOOD SCIENCE AND NUTRITION

FSN. 111 Principles of Foods Science & Nutrition (2+0)

Unit I: Concepts of Food Science (definitions, measurements, density, phase, change, pH, Osmosis, Surface tension, colloidal systems etc.): Food composition and chemistry (water, carbohydrates, proteins, fats, vitamins, minerals, flavours, colours, miscellaneous bioactives, important reactions):

Unit II: Food microbiology (bacteria, yeast, moulds, spoilage of fresh & processed foods,

Production of fermented foods);

Unit III: Principles and methods of food processing and preservation (use of heat, low temperature, chemicals, radiation, drying etc.);

Unit IV: Food and nutrition, Malnutrition (over and under nutrition), nutritional disorders; Energy metabolism (carbohydrate, fat, proteins); Balanced/modified diets, Menu planning, New Trends in food science and nutrition.

FSN. 321 Food Processing, Food Safety Standards and Value Addition (1+1)

Unit I: Status of food processing in India. Food processing and distinctive features of food commodities. Primary, secondary and tertiary processing.

Unit II: Processing of -cereals, legumes, fats and oilseeds, fruits and vegetables, milk. Role of additives in value addition, packaging and labeling.

Unit III: Food Safety- Definition, Importance, Scope and Factors affecting food safety, health risks, Types of hazards: Biological, Chemical, Physical hazards. Food storage, Hygiene and Sanitation. Sources of contamination and their control. Personal Hygiene.

Unit IV: Food Safety management tools- basic concepts, PRPs, GHPs, GMPs, SSOPs etc. HACCP, ISO series and TQM. Food laws and Standards-Indian Food Regulatory Regime, FSSAI, Global Scenario- CAC, BIS, AGMARK

LIST OF EXPERIMENTS/ PRACTICES

- Processed and value added foods (cereals, pulses, fruits, vegetables).
- Planning and preparation of weaning and supplementary foods.
- Planning of balanced diet. Development of teaching models for community nutrition education –

a) Protein energy malnutrition.

b) Micronutrient deficiencies

- Preparation of different types of media. Microbiological examination of different food samples.
- Assessment of personal hygiene and surface sanitation. Preparation of plans for implementation HACCP.

FORESTRY AND ENVIRONMENTAL SCIENCE

FES. 111 Introduction to Forestry (1+1)

Unit I: Introduction–definitions of forest and forestry, branches of forestry, history and education of forestry in India. objectives of silviculture, forest classification, salient features of Indian Forest Policies and Acts. Forest regeneration, Natural regeneration - natural regeneration from seed and vegetative parts, coppicing, pollarding, root suckers;

Unit II: Artificial regeneration – objectives, choice between natural and artificial regeneration, essential preliminary considerations. Crown classification. Tending operations–weeding, cleaning, thinning–mechanical, ordinary, crown and advance thinning. Forest mensuration–objectives, diameter measurement, instruments used in diameter measurement; Non instrumental methods of height measurement - shadow and single pole method;

Unit III: Instrumental methods of height measurement-geometric and trigonometric principles, instruments used in height measurement; tree stem form, form factor, form quotient, measurement of volume of felled and standing trees, age determination of trees. Indian wild life and management. Social forestry and its branches.

Unit IV: Agroforestry – definitions, importance, criteria of selection of trees in agroforestry, different agroforestry systems prevalent in the country, shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens. Cultivation practices of two important tree species of the region (Teak & Casurina).

LIST OF EXPERIMENTS/ PRACTICES

- Identification of tree-species, seedlings, seed and non- wood timber forest products.
- Diameter measurements using calipers and tape, diameter measurements of forked, buttressed, fluted and leaning trees.
- Height measurement of standing trees by shadow method, Pencil method, single pole method and hypsometer.
- Volume measurement of logs using various formulae. Nursery lay out, seed sowing, vegetative propagation techniques.
- Forest plantations and their management.
- Visits of nearby forest based industries or National park/Agroforestry system/JFPM.

FES. 221 Environmental Studies and Disaster Management (2+0)

Unit I: Multidisciplinary nature of environmental studies Definition, scope and importance. Natural Resources: Renewable and non- renewable resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, mining, and their effects on forest b) Water resources: Use and over-utilization of surface and ground water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. d) Energy resources: Growing energy needs, use of alternate energy sources. e) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

Unit II: Ecosystems: Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystemb. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) Biodiversity and its conservation: - Introduction, definition, genetic, species & ecosystem. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels, India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit III: Environmental Pollution: definition, cause, effects and control measures of: a. Air pollution b. Water pollution c. Soil pollution d. Marine pollutione. Noise pollution f. Thermal pollution. Solid Waste Management: causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.Social Issues and the Environment: From Unsustainable to Sustainable development, Urban problems related to energy, Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion. Wasteland reclamation. Consumerism and waste products.

Unit IV: Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest

Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness. Human Population and the Environment: population growth, variation among nations, population explosion, Environment and human health: Role of Information Technology in Environment and human health. Disaster Management: Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, avalanches, volcanic eruptions. Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, forest fire, road accidents, rail accidents, air accidents, sea accidents. Disaster Management- Effect to mitigate natural disaster at national and global levels. International strategy for disaster reduction. Role of NGOs, and media. Central, state, district and local administration; Disaster response of Armed forces, Police and other organizations.

GENETICS AND PLANT BREEDING

GPB. 121 Fundamentals of Cytogenetics

(1+1)

Unit I: Ultra structure of cell, cell organelles and their functions, structure of chromosome; chromonemata, chromosome matrix, chromomeres, centromere, secondary constriction and telomere.

Unit II: special types of chromosomes, chromosomal theory of inheritance- cell cycle and cell division- mitosis and meiosis and their significance.

Unit III: DNA: types, structure, replication, function, RNA: structure, types and function

Unit IV: life cycle of angiosperms: megasporogenesis and microsporogenesis and fertilization, structural and numerical variations in chromosome and their implications.

LIST OF EXPERIMENTS/ PRACTICES

- Study of microscope, study of cell structure, mitosis and meiosis cell division.
- preparation and use of fixatives and stains for microscopy.
- preparation of slides for identification of mitotic and meiotic .
- stages,practice on mitotic and meiotic cell division.
- measurements of microstructures.

GPB. 211 Fundamentals of Genetics

(1+1)

Unit I: Pre-and Post-mendelian concepts of heredity, Mendelian principles of heredity. Probability and -Chi-square.

Unit II: Types of dominance, epistatic interactions with examples. Multiple alleles, pleiotropism, Sex determination and sex linkage, sex limited and sex influenced traits, Blood group genetics, Linkage and its estimation, crossing over mechanisms,

Unit III: chromosome mapping. Mutation, classification, mutagenic agents and induction of mutation. Qualitative & Quantitative traits, Polygenes and continuous variations, multiple factor hypothesis, cytoplasmic inheritance. Protein synthesis,

Unit IV: Transcription and translational mechanism of genetic material, gene concept: gene structure, function and regulation, Lac and Trptophan operons.

LIST OF EXPERIMENTS/ PRACTICES

- Solving problems on monohybrid, dihybrid, trihybrid, test cross and back cross.
- Solving problems on epistatic interactions including test cross and back cross.
- Concepts of probability and chi- square test and their application in genetics.
- Detection and estimation of linkage through two point test cross and three point test cross data.
- Solving problems of sex linkage.

GPB. 221 Fundamentals of Plant Breeding (2+1)

Unit I: Definition, history, objectives and accomplishments of plant breeding, modes of reproduction-its relevance on genetic consequences, breeding methods and cultivar options and its of plant breeding, pollination control systems-self-incompatibility and male sterility. Domestication, Acclimatization and Introduction; Centers of origin/diversity,

Unit II: Plant genetic resources, their conservation and utilization, genetic basis and breeding methods in self- pollinated crops - mass and pure line selection, components of genetic variation; heritability and genetic advance; hybridization techniques and handling of segregating populations; multiline concept, concepts of population genetics and Hardy-Weinberg Law, Genetic basis and methods of breeding cross pollinated crops, modes of

selection;

Unit III: Populationimprovement methods- Ear to row method, modified Ear to Row, recurrent selection schemes; heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties; Breeding methods in asexually propagated crops, clonal selection and hybridization;

Unit IV: wide hybridization and pre-breeding; polyploidy in relation to plant breeding, mutation breeding-methods and uses; Breeding for important biotic and abiotic stresses; Biotechnological tools-DNA markers and marker assisted selection. Participatory plant breeding; Intellectual Property Rights, Patenting, Plant Breeders and & Farmer's Rights.

LIST OF EXPERIMENTS/ PRACTICES

- Plant Breeder's kit, Study of germplasm of various crops.
- Study of floral structure of self-pollinated and crospollinated crops.
- Emasculation and hybridization techniques in self & cross pollinated crops.
- Study of male sterility system. Methods of calculating mean, range, variance, standard deviation, heritability.
- Designs used in plant breeding experiments, analysis of Randomized Block Design.
- prediction of performance of double and three-way cross hybrids

GPB. 311 Crop Breeding 1+1

Unit I: Centers of origin, distribution of species, wild relatives and major breeding objectives and procedures including conventional

Unit II: Modern innovative approaches for development of varieties and hybrids for improved yield, adaptability, stability, biotic and abiotic stress tolerance

Unit III: Quality (physical, chemical and nutritional) of different cereals-rice, wheat, maize, sorghum, bajra and ragi; pulses- redgram, breengram, blackgram, chickpea, soybean;

Unit IV: Oilseeds- sunflower, niger, groundnut, sesame, castor, rapeseed and mustard, fibre crops- jute and cotton; cash crops- sugarcane, potato and tobacco.

LIST OF EXPERIMENTS/ PRACTICES

- Floral biology, emasculation and hybridization techniques in cereals-rice, wheat, maize, sorghum, bajra and ragi; pulses-redgram, breengram, blackgram, chickpea, soybean; oilseeds- sunflower,groundnut, sesame, castor, rapeseed and mustard
- fibre crops- jute and cotton; cash crops- sugarcane, potato and tobacco.
- Estimation of heterosis, inbreeding depression and heritability
- Layout of field experiments
- study of quality characters, sources of genes of important characters
- Visit to AICRP plots of different field crops.

GPB. 321 Intellectual Property Rights

1+0

Unit I: Introduction and meaning of intellectual property, brief introduction to GATT, WTO, TRIPs and WIPO, Treaties for IPR protection: Types of Intellectual Property and legislations covering IPR in India:-Patents, Copyrights, Geographical indications, Trade secrets.

Unit II: Patents Act 1970 and Patent system in India, patentability, process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement, compulsory licensing, Patent Cooperation Treaty, Patent search and patent database.

Unit III: Origin and history including a brief introduction to UPOV for protection of plant varieties, Protection of plant varieties under UPOV and PPV&FR Act of India, Plant breeder's rights, Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights.

Unit IV: Traditional knowledge-meaning and rights of TK holders. Convention on Biological Diversity, International treaty on plant genetic resources for food and agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features access and benefit sharing.

HORTICULTURE

HRT. 121 Fundamentals of Horticulture and Fruit Crops Production (1+1)

Unit I: Horticulture - Definition and branches, Importance and scope, Classification of horticultural crops; Plant propagation - methods and propagating structures

Unit II: Principles of orchard establishment; Principles and methods of training and pruning Unfruitfulness; Pollination, pollinizers and pollinators

Unit III: Fertilization and Parthenocarpy; Importance of plant bio-regulators in horticulture; Importance of rootstocks; Origin, distribution, uses, area and production, soil and climatic requirements, commercial varieties/ hybrids, planting methods, nutrition, irrigation, weed management, pruning and training, inter

Unit IV: Mixed cropping, harvesting and yield of Mango, Banana, Citrus, Grapes, Guava, Papaya, Sapota, Pineapple, Pomegranate and Jackfruit.

LIST OF EXPERIMENTS/ PRACTICES

- Identification of garden tools
- Identification of fruits
- Preparation of potting mixture
- Layout and planting of orchard
- Bearing habits
- Propagation methods and physiological disorders of above fruits
- Methods of irrigation and fertilizer application in above fruits
- Visits to commercial orchards.

HRT. 211 Production Technology of Vegetable Crops (1+1)

Unit I: Importance of vegetables in human nutrition and national economy; Kitchen gardening

Unit II: Origin, distribution, uses, area and production, soil and climatic requirements, commercial varieties/ hybrids, time of sowing, transplanting techniques, planting

distance, fertilizer requirements

Unit III: irrigation, weed management, physiological disorders, harvesting and yield of Potato, Tomato, Brinjal, Chilli, Capsicum, Cucumber, Watermelon, Ridge gourd, Bitter gourd

Unit IV: yield of French bean, Cabbage, Cauliflower, Onion, Garlic, Carrot, Radish, Palak, Amaranthus, and Drumstick. Protected cultivation of Capsicum and European Cucumber.

LIST OF EXPERIMENTS/ PRACTICES

- Identification of vegetables and their seeds
- Study of morphological characters of different vegetables
- Seed extraction
- Seed viability tests
- Nursery raising
- Direct seed sowing and transplanting
- Harvesting and grading of vegetables

HRT.221 Production Technology of Flower Crops and Landscaping

(1+1)

Unit I: Importance and scope of flower crops; Classification of ornamental plants Principles of landscaping

Unit II: Garden features and adornments; Garden styles and designs, Lawn and its maintenance

Unit III: Protected cultivation of Rose, Gerbera, Carnation, Anthurium and Orchids

Unit IV: Open cultivation of Gladiolus, Tuberose, Chrysanthemum, Marigold, Jasmine, Aster and Crossandra.

LIST OF EXPERIMENTS/ PRACTICES

- Identification of Ornamental plants
- Nursery bed preparation and seed sowing

- Planning, designing and layout of garden
- Physiological disorders of above flower crops
- Post harvest handling of cut and loose flowers
- Visit to commercial flower production units and nurseries

HRT.311 Production Technology of Plantation Crops, Spices, edicinal and Aromatic Plants

(1+1)

Unit I: Origin, distribution, uses, area and production, soil and climatic requirements, c

Unit II: Commercial varieties, planting methods, nutrition, irrigation, weed management, inter and mixed cropping, harvesting

Unit III: yield of Coconut, Arecanut, Cashew, Tea, Coffee, Rubber, Pepper, Cardamom, Ginger, Turmeric, Coriander and Fenugreek Ashwagandha,

Unit IV: yield of Aloe, Periwinkle, stevia, Mints, Lemongrass, Ocimum, Patchouli and Geranium.

LIST OF EXPERIMENTS/ PRACTICES

- Identification, propagation, physiological disorders, processing and value addition of above crops.
- Extraction methods for essential oils.
- Visits to commercial Plantation.

HRT.321 Post Harvest Management and Value Addition of Fruits and Vegetables

(1+1)

Unit I: Importance of post-harvest processing of fruits and vegetables; Extent and possible causes of post-harvest losses

Unit II: Pre harvest factors affecting postharvest quality, maturity, ripening and changes occurring during ripening; Respiration and factors affecting respiration rate

Unit III: Harvesting and field handling; Storage (ZECC, Cold storage, CA, MA and Hypobaric); Value addition concept; Principles and methods of preservation; Minimal

processing; Intermediate moisture foods- Jam, Jelly

Unit IV: Marmalade – Concepts and Standards; Fermented and non-fermented beverages; Drying/ Dehydration of fruits and vegetables – Concept and methods; Canning - Concepts and Standards, Packaging of products.

LIST OF EXPERIMENTS/ PRACTICES

- Containers for shelf life extension
- Effect of temperature on shelf life and quality of produce
- Chilling and freezing injury in vegetables and fruits
- Extraction and preservation of pulps and juices
- Preparation of Jam, Jelly, RTS, Nectar, Squash, Wine, Fruit bar, Candy, Tomato products
- Quality evaluation of products- physico- chemical and sensory
- Visit to processing unit/ industry.

PLANT BIOTECHNOLOGY

PBT.121 Fundamentals of Plant Biotechnology (2+1)

Unit I: Concept of Plant Biotechnology – History of Plant Tissue Culture and Plant Genetic Engineering; Scope and importance in Crop Improvement – Totipotency and Morphogenesis, Nutritional requirements of in-vitro cultures

Unit II: Techniques of in-vitro cultures; Micro-propagation, Anther culture, Pollen culture, Ovule culture, Embryo culture, Endosperm Culture and its applications. Somaclonal variation: Types, Reasons. Somatic embryogenesis and synthetic seed production technology

Unit III: Protoplast isolation, Culture, Manipulation and fusion; Products of somatic hybrids and cybrids, Applications in crop improvement. Genetic engineering: Restriction enzymes; vectors for gene transfer- Gene cloning, direct and indirect method of gene transfer,Transgenic plants and their applications.

Unit IV: Blotting techniques- DNA finger printing, DNA based markers- RFLP, AFLP, RAPD, SSR and DNA probes. Marker-assisted selection and its recent advances

LIST OF EXPERIMENTS/ PRACTICES

- Requirements for plant tissue culture laboratory
- Techniques in plant tissue culture
- Media components and preparations, Sterilization techniques and Inoculation of various explants
- Aseptic manipulation of various explants; Callus induction and Plant regeneration;
- Micro-propagation of important crops, Anther, Embryo and Endosperm culture; Hardening/ Acclimatization of regenerated plants
- Somatic embryogenesis and synthetic seed production
- Isolation of protoplast, demonstration of culturing of protoplast
- demonstration of isolation of DNA
- Demonstration of gene transfer techniques- direct methods and indirect methods;
- Demonstration of confirmation of Genetic transformation,
- Demonstration of gel electrophoresis techniques.
- Restriction enzymes for digestion of DNA. Polymorphism, monomorphism, hybridity testing.

PLANT PATHOLOGY

PAT. 211 Fundamentals of Plant Pathology (2+1)

Unit I: Introduction: Importance of plant diseases, scope and objectives of Plant Pathology. History of Plant Pathology with special reference to Indian work. Terms and concepts in Plant Pathology. Cause and classification of plant diseases. Important plant pathogenic organisms, fungi, bacteria, fastidious vascular bacteria, phytoplasmas, spiroplasmas, viruses, viroids, algae, protozoa, phanerogamic parasites and nematodes with examples of diseases caused by them.

Unit II: Diseases and symptoms due to abiotic agents.Fungi: general characters, somatic structures, types of fungal thalli, fungal tissues, modifications of thallus, reproduction (asexual and sexual). Binomial system of nomenclature, rules of nomenclature. Classification of fungi, keys to phylum, classes, order and families.Bacteria and mollicutes: general morphological characters. Basic methods of classification and reproduction. Keys to

major plant pathogenic bacteria genera.

Unit III: Viruses: nature, morphology, replication and transmission and classification of plant viruses. Keys to important plant virus families /genera. Nematodes: General morphology and reproduction, classification, keys to important plant pathogenic nematode genera, symptoms and nature of damage caused by plant nematodes.

Phanerogamic plant parasites: Common characteristic of important parasites, disease development, survival and spread. Growth and reproduction of plant pathogens.

Unit IV: Liberation / dispersal and survival of plant pathogens. Types of parasitism and variability in plant pathogens. Pathogenicity: phenomenon of host infection by Fungi, Bacteria, Viruses, molicutes and nematodes. Pathogenesis**:** Penetration and colonization. Role of enzymes, toxins and growth regulators in disease development and their classification.

LIST OF EXPERIMENTS/ PRACTICES

- Acquaintance with various laboratory equipments and microscopy.
- Study of symptoms of various plant diseases caused by fungi, viruses, bacteria, nematodes and mollicutes.
- Field visit to get acquaint with plant disease symptom.
- Collection and preservation of plant disease specimens.
- Study of morphology of fungi, viruses, bacteria, nematodes and phytoplasma.
- Study of life cycle/disease cycle of major fungal, bacterial, viral, nematode and phanerogamic plant parasites diseases.
- Macroscopic and microscopic examination of plant pathogens including staining techniques for bacteria.
- Preparation of culture media and sterilization.
- Different methods of isolation and purification of fungi, bacteria, viruses and extraction of nematodes.
- Study of different methods of artificial inoculation / transmission and proving Koch's postulates for different plant pathogens.
- Study of liberation of fungal spore. Study of micrometry

PAT. 221 Principles of Plant Disease Management (1+1)

Unit I: Defence mechanism in plants: structural, biochemical (pre and post-infection) and host plant resistances. Effect of pathogens on plant physiological processes viz., photosynthesis, respiration, translocation and transcription.Epidemiology: Epidemics and factors affecting disease development, patterns of epidemics and disease progress curves. Assessment of disease severity and crop losses.

Unit II: Survey, surveillance, remote sensing and forecasting of plant diseases Principles and methods of plant disease management: *Avoidance of the pathogen*: Choice of geographical area, selection of field and planting stock *etc., Exclusion of inoculum:* Plant quarantine regulations and inspections, post entry quarantine. *Eradication* of the pathogen: Cultural and physical methods of eradication and inoculum reduction; Biological methods of disease control: Crop rotation, use of trap crops, plant and plant products, use of biological control agents, mechanisms of biocontrol, cross protection.

Unit III: Breeding for disease resistance: Types of resistance, Development of resistant varieties, Induced resistance. Biotechnological approaches of diseases management. IPR and related issues. Chemical methods; nature, chemical combination, classification, mode of action and formulations of fungicides, bactericides, nematicides and antibiotics. Methods of application of chemicals. Insect vector management. Diagnosis of plant diseases. Seed pathology; importance of seed health to man and animals. seed borne nature of pathogens; Identification and detection of seed borne pathogens.

Unit IV: IDM: Introduction, history, importance & concepts. Economic importance diseases. Epidemiology and crop loss assessment methods with case studies. IDM module for important cereal (Rice), pulse (pigeon Pea), oil seeds (Sunflower and Groundnut) and vegetable (Tomato and Potato) and horticulture/plantation crops.

LIST OF EXPERIMENTS/ PRACTICES

- Methods of detection of different plant pathogens.
- Methods of estimation crop disease severity
- Methods of estimation of crop losses

- Methods of detection and identification of seed borne pathogens
- Isolation of biocontrol agents
- Testing the efficacy of biocontrol agents by dual culture technique.
- Mass multiplication of bioagents
- Methods of application of bioagents
- Study of fungicides, bactericides, nematicides and their formulations.
- Preparation of Bordeaux mixture and calculation of fungicide spray concentration. Bioassay of fungicide and antibiotics.
- Methods of application of chemicals
- Study of pesticide compatibility and their safe use
- Study of plant protection equipment's.
- Methods of screening for disease resistances.
- Visit to pesticide companies.

PAT. 311 Diseases of Field Crops and Their Management (2+1)

Unit I: Diseases of cereals, millets, pulses, oil seeds and cash crops with respect to economic importance, incidence, symptoms, etiology, disease cycle/life cycle and management practices.

Unit II: Cereals and Millets: Rice, Sorghum, Maize, Wheat, Bajra, Navane, & Ragi. Pluses: Pigeon pea, Chickpea, Blackgram and Greengram, Cowpea, & Soybean.

Unit III: Oilseed crops: Groundnut, Sunflower, Sesamum, Safflower, Mustard, Linseed, & Castor.

Unit IV: Cash crops: Sugarcane, Cotton, Tobacco, Chilli, Ginger, Turmeric, & Mulberry. Important post-harvest diseases of field crops.

LIST OF EXPERIMENTS/ PRACTICES

- Study of symptoms, etiology and disease cycles / life cycles of selected diseases of field crops covered in theory.
- Field visit for the diagnosis of field problems.
- Collection and preservation of plant diseased specimens.

PAT. 321 Diseases of Horticultural Crops and their Management

(1+1)

Unit I: Diseases of fruit crops, plantation crops, vegetables crops, flower crops, Aromatic and Medicinal plants with respect to economic importance, incidence, symptoms, etiology, disease cycle/life cycle and management practices.

Unit II: Fruit crops: Mango, Apple, Papaya, Citrus, Guava, Pomegranate, Grapes, Pineapple Sapota, Peach &Banana. Plantation crops: Coffee, Tea, Rubber, Coconut, Arecanut, Cardamom, Beetle vine, Pepper & Vanilla.

Unit III: Vegetable crops: Tomato, Potato, Brinjal, Crucifers, Cucurbits, Bhendi, Leafy vegetable diseases, Carrot, Onion, Garlic, Cassava, Beans, Peas & Capsicum. Flower crops: Rose, Jasmine, Tuberose, Crossandra, Chrysanthemum & Gladioli.

Unit IV: Medicinal and Aromatic crops: Periwinkle, Dioscorea, Solanum, Coleus, Davana, Citronella, Sandle, Geranium & Patchouli. Important post-harvest diseases of horticultural crops.

LIST OF EXPERIMENTS/ PRACTICES

- Study of symptoms, etiologyand disease cycle / life cycles of selected diseases of horticultural crops covered in theory.
- Field visit for the diagnosis of field problems.
- Collection and preservation of plant diseased specimens.

(Note: Students should submit 50 pressed and well mounted specimens.)

SEED SCIENCE & TECHNOLOGY

SST. 311 Principles and Practices of Seed Production (1+1)

Unit-I: Introduction to seed science and technology, seed and its importance. Seed quality – characteristics of quality seeds, factors affecting seed quality and its maintenance. History and development of seed industry, Seed programmers, types, planning and execution. Different classes of seed, generation system of seed multiplication, seed replacement and varietal replacement rates- seed multiplication ratio, seed renewal and seed plan, Agencies involved in seed production at state and national level. Seed certification – control of seed source, field inspection, field counts, field standards. Principles of seed production- genetic, agronomic and economic principles, Maintenance of genetic purity during seed production.

Unit-II: Deterioration of crop varieties — factors and their control, Requirements for hybrid seed production and types of hybrids. Systems and techniques of hybrid seed production, male sterility, self incompatibility, CHA and EGMS. Planning for breeder, foundation, truthfully labelled and certified class of seed production.

Unit-III: Seed production- foundation and certified seed production in maize (varieties, hybrids, synthetics and composites); rice, sorghum and bajra (varieties and hybrids); greengram, blackgram, bengalgram, cowpea (varieties) ; soybean, groundnut (varieties); sunflower (varieties and hybrids); castor (varieties and hybrids); cotton (varieties and hybrids); tomato and brinjal (varieties and hybrids): chilli and bhendi (varieties and hybrids), onion and melons and gourds (varieties and hybrids) and potato (varieties and true potato seeds), seed crop harvesting methods and management.

Seed production under protected cultivation. Seed marketing and distribution strategies– organizations, structures, sales, International trade

Unit-IV: Export and import policies for seed trade, generation activities, sales promotional media and factors affecting seed marketing. Seed Sales, License, pricing policy, cost benefit ratio, economic feasibility and factors influencing.

LIST OF EXPERIMENTS/ PRACTICES

- Identification of seeds of agricultural/ horticulture crops.Study of seed structure in monocot and dicot seeds in agricultural and horticulture crops.

- Study of floral biology in self, cross and often cross pollinated crops.Identification of sex in gourds and melons.Identification of different varieties based on seed morphological characters in agriculture and horticulture crops.Isolation types, measurement and determination in self and cross pollinated crops.
- Carrying out field inspection and taking field counts.Study of different contaminants and practicing rouging.Practicing hybrid seed production techniques – hand emasculation and pollination.
- Practicing detassling techniques.
- Diagnostic identification of A, B and R lines in hybrid seed production.
- Studies on planting ratio, border rows and synchronization and supplementary pollination techniques in hybrid seed production.
- Determination of physiological maturity in agri- horticultural crops.Visit to KSSOCA and grow out test farms.
- Visit to seed production plots (OPV and hybrids) of public and private organizations.Calculation of economics of seed production (OPV and Hybrids).
- Visit to seed production under protected cultivation.

SST. 321 Post Harvest Seed Technology and Quality Assurance (1+1)

Unit I: Introduction and importance of seed quality regulations- seed legislations and regulatory measures. Seeds Act (1966), Seed Rules (1968), Seed Control Order (1983), Central Seeds Committee, Central Seed Certification Board, OECD Seed Certification Schemes State Seed Certification Agency – Central and State Seed Testing Laboratories and their functions, New Seed Policy (1988), The plants, fruits and seeds (regulation of import into India), Order (1989).

Unit II: DUS testing principles and applications, PPV and FRA (2001 and 2003), National Seed Policy (2002) and the Seed Bill (2004). Seed Drying importance, principles and methods. Psychrometric chart and its use in seed drying process. Seed processing -objectives and principles. Air screen cleaner and its working principles, different upgrading equipments and their use.

Unit III: Seed treatment- importance and types, equipments used for seed treatment, Seed

testing - objectives, history, sampling procedures, testing for moisture, physical purity, germination, viability, vigour and seed health. Seed quality regulation systems (Grow out test and molecular markers). GM crop testing. Seed packaging -principles, procedures and types of containers.

Unit IV: Varietal release, notification – seed certification, history, phases and procedures, field inspection, field counts, field and seed standards, Post harvest inspections and seed quality assurance. Seed storage - general principles, stages, factors affecting seed longevity, conditions required for safer storage, measures for humidity, moisture and temperature control, mid storage corrections and seed quality enhancement techniques.

LIST OF EXPERIMENTS/ PRACTICES

- Study of instruments used in Seed testing laboratory.Visit to seed testing laboratories.
- Visit to seed processing plant.
- Study of air screen cleaner and upgrading machines.
- Practicing seed sampling methods in bulk and in containers.
- Conducting Physical purity test.
- Determination of seed moisture.Conducting standard germination test and seedling evaluation in agricultural crops.
- Assessment of seed viability through Tz test and Seed blending.Carrying out different vigor test.
- Conducting seed health test in agri-horticultural crops.Visit to grow out test plots.
- Determination of cultivar purity tests.
- Practicing pre-storage seed treatment and dormancy breaking methods.
- Studies on packaging types and methods.
- Visit to seed godowns and cold storage units.
- Visit to public and private (National and multinational) seed companies.

SERICULTURE

SER. 321 Introduction to Sericulture (1+1)

Unit-I: Introduction,origin & history,statistics and distribution of sericulture, Mulberry varieties. Types of silks, Species of silkworms and their host plants. Raising of mulberry saplings, mulberry cultivation practices for irrigated and rainfed conditions, separate chawki garden. Intergrated nutrient Management.Pests and diseases of mulberry and their management. Life cycle of silkworms.

Unit-II: Morphology and anatomy of Bombyx mori L.Commercially exploited breeds of silkworm. Steps in silkworm egg production at grainage, egg sheets and loose egg production technology. Tier system of silkworm seed multiplication, seed area concept. Preservation and handling of eggs, egg incubation. Disinfection and hygiene in silkworm rearing. Silkworm rearing plan, Rearing house plan and equipments. Importance of chawki rearing, chawki rearing centres. Harvesting, transportation and preservation of leaves. Methods of silkworm rearing, shoot feeding, shelf rearing, raering operations, environmental conditions and their management. Importance of feeding, bed cleaning, spacing, care during moulting. Picking and mounting ripened silkworms.

Unit-III: Harvesting of cocoons, grading, cocoon sorting, defective cocoons, and sale of cocoon in silk cocoon markets. Mechanization in sericulture. Pests and diseases of silkworms and their management. Post cocoon technology

Unit-IV : Steps in reeling – storage- cocoon drying/stifling, cocoon cooking, brushing, reeling and re- reeling. Different methods of silk reeling. Raw Silk Marketing- Silk Exchange– functions, Silk trade -import-export**.** Sericulture byproducts and their utilization for additional income. Economics of Sericulture.

LIST OF EXPERIMENTS/ PRACTICES

- Mulberry varieties, Host plants of non-mulberry silkworms.
- Preparation of land, preparation of planting material and planting of mulberry, pruning, harvesting and storage of mulberry leaves. Pests and diseases of mulberry.
- Species of silkworms – life cycle of *Bombyx mori* L.
- Mulberry pests and diseases.
- Identification of cocoons of important breeds.

- External morphology of life stages – egg-larva- pupa and moth of *Bombyx mori* L. Study of silk gland and digestive system of *Bombyx mori* L.
- Disinfectants - rearing bed and general disinfectants**.**
- Grainage techniques.
- Study of rearing house plan and equipments for shoot feeding and shelf rearing.
- Methods Incubation of silkworm eggs and brushing.
- Identification of silkworms settling for moult, at moult, out of moult. Feeding, bed cleaning and spacing.
- Identification and picking of ripe worms, mounting, types of mountages, cocoon harvesting and grading. Pests and diseases of mulberry silkworm.
- Identification and picking Single cocoon reeling
- Study of reeling equipment

SOIL SCIENCE & AGRICULTURAL CHEMISTRY

SAC. 121 Fundamentals of Soil Science (2+1)

Unit-I: Soil as a natural body, Pedagogical and edaphological concepts of soil; Soil genesis: soil forming rocks and minerals; weathering, processes and factors of soil formation

Unit-II: Soil Profile, components of soil; Soil physical properties: soil-texture, structure, density and porosity, soil colour, consistence and plasticity; Elementary knowledge of soil taxonomy classification and soils of India.

Unit-III: Soil survey, types, methods of soil survey Soil water retention, movement and availability; Soil air, composition, gaseous exchange, problem and plant growth

Unit-IV: Soil temperature; source, amount and flow of heat in soil; effect on plant growth, soil organisms: macro and micro organisms, their beneficial and harmful effects

LIST OF EXPERIMENTS/ PRACTICES

- Study of general properties of minerals
- Study of silicate and non-silicate minerals
- Study of igneous, sedimentary and metamorphic rocks
- Study of soil sampling tools and collection of representative soil samples
- Study of soil profile
- Determination of soil moisture content

- Determination of bulk density and particle density and porosity of soil
- Study of soil texture by feel and bouyoucos method
- Determination of soil colour, Study of capillary rise phenomenon of water in soil column and water movement in soil
- Demonstration of heat transfer in soil, Study of soil map, Visit to NBSS&LUP

SAC. 211 Soil Chemistry (1+1)

Unit-I: Soil chemistry- Scope and importance . components of soils – inorganic and organic components. Soil colloids – types properties and significance of soil colloids. Layer silicate clays- genesis, structure and properties.

Unit-II: Source of charges – positive and negative charges, electrical double layer – Helmholtz, Gouy – Chapman, stern theories. Ion exchange cation exchange capacity and anion exchange capacity, factors influencing ion exchange and its significance.

Unit-III: Soil organic matter – composition, decomposition, fractionation of organic matter, uses; Humus – humic substances,

Unit-IV: nature and properties ; carbon cycle, C:N ratio;Chemistry of submerged soils.

LIST OF EXPERIMENTS/ PRACTICES

- Analytical chemistry – basic concepts, techniques and calculation.
- Determination of soil Ph.
- Determination of electrical conductivity of soil.
- Determination of soil organic carbon; (Ca, Mg, K and Na).
- Determination of base saturation and exchangeable sodium percentage of soil.

SAC.311 Problematic Soils and their Management, Geoinformatics (1+1)

Unit-I: Soil quality and health, Distribution of Waste land and problem soils in India. Soil reaction-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability; Their categorization based on properties.

Unit-II: Reclamation and management of Saline and sodic soils, Acid soils, Acid

Sulphate soils, Eroded and Compacted soils, Flooded soils, Polluted soils - Soil pollution - behaviour of pesticides and inorganic contaminants, prevention and mitigation of soil pollution. Irrigation water – quality and standards, utilization of saline water in agriculture.

Unit-III: Multipurpose tree species, bio remediation through MPTs of soils, land capability and classification, land suitability classification. Problematic soils under different Agro-ecosystems. Geo-informatics- definition, concepts, tool and techniques; their use in Precision Agriculture. Crop discrimination and Yield monitoring, soil mapping fertilizer recommendation using geospatial technologies;

Unit-IV: Spatial data and their management in GIS; Remote sensing concepts and application in agriculture; Image processing and interpretation; Global positioning system (GPS), components and its functions; Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs. Remote sensing and GIS in diagnosis and management of problem soils.

LIST OF EXPERIMENTS/ PRACTICES

- Determination of Soil pH, EC, ESP, CEC, LR, GR. Quality of irrigation water .
- Determination of anion, cation, SAR in irrigation water.
- study of topographical maps.
- Use of GPS, introduction to remote sensing and GI.,
- Visit to pesticides residue lab.
- Visit to problematic soil site.
- Visit to KSRSAC.

SAC. 321 Manures, Fertilizers and Soil Fertility Management

(2+1)

Unit-I: Introduction and importance of organic manures, properties and methods of preparation of bulky and concentrated manures. Green leaf manuring. Fertilizer recommendation approaches. Integrated nutrient management.

Unit-II: Chemical fertilizers: classification, composition and properties of major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, Complex fertilizers,

nano fertilizers Soil amendments, Fertilizer Storage, Fertilizer Control Order.

Unit-III: History of soil fertility and plant nutrition. criteria of essentiality. role, deficiency and toxicity symptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants.

Unit-IV: Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients. Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil. Forms of nutrients in soil, plant analysis, rapid plant tissue tests. Indicator plants. Methods of fertilizer recommendations to crops.Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions.

LIST OF EXPERIMENTS/ PRACTICES

- Introduction of analytical instruments and their principles, calibration and applications.
- Colorimetry and flame photometry.
- Estimation of soil organic carbon.
- Estimation of alkaline hydrolysable N in soils.
- Estimation of soil extractable P in soils.
- Estimation of exchangeable K; Ca and Mg in soils .
- Estimation of soil extractable S in soils.
- Estimation of DTPA extractable Zn in soils.
- Estimation of N in plants.
- Estimation of P in plants. Estimation of K in plants. Estimation of S in plants.
- Analysis of Manures and fertilizers.
- Visit to STL/FTL.

STUDENT "READY" (RURAL ENTREPRENEURSHIP AWARENESS DEVELOPMENT YOJANA) PROGRAMME

Components of the programme :

i. Experiential Learning/Hands on Training / Skill Development Training

ii. Rural Agriculture Work Experience

iii. In Plant Training/ Industrial Attachment / Students Projects

I EXPERIENTIAL LEARNING

- To be offered during Eighth semester
- **0+20** Credit Hours
- Register for any of two modules
- Each module of **0+10** credit hours.

a) Concept

- 'Experiential' means that learning and development are achieved through personally determined experience and involvement.
- Experiential learning is a business curriculum related endeavour which is interactive.
- EL is for building (or reinforcing) skills in

✓ Project development and execution

✓ Decision-making

✓ Individual and team coordination

✓ Approach to problem solving

✓ Accounting, marketing and resolving conflicts etc.

- 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

- To provide excellent opportunity to develop analytical and entrepreneurial 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.
- To build confidence and to work in project mode.
- To acquire enterprise management capabilities.

c) Duration

- 180 days (one semester) period in the final year.
- Students and faculty are expected to attend the activities even on institutional holidays with total commitment, and without any time limit or restriction of working hours.

d) Attendance

- Minimum attendance required is 85%.
- 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.
- Assignment/allotment of the EL programme shall be based on merit of the student at the end of 5th Semester.

II RURAL AGRICULTURAL WORK EXPERIENCE

- To be offered during **S**eventh semester
- 0+20 credit hours in two parts: RAWE and AIA
- Attachment in University/ College/ KVK or a Research Station
- Helps the students primarily to understand the rural situations, status of Agricultural technologies adopted by farmers, prioritize the farmer's problems and to develop skills & attitude of working with farm families for overall development in rural area.
- Timings for RAWE can be flexible for specific regions to coincide with the main cropping season.

Objectives

- To provide an opportunity to the students to understand the rural setting in relation to agriculture and allied activities.
- To make the students familiar with socio-economic conditions of the farmers and their problems.
- To impart diagnostic and remedial knowledge to the students relevant to real field situations through practical training.
- To develop communication skills in students using extension teaching methods in transfer of technology.
- To develop confidence and competence to solve agricultural problems.
- To acquaint students with on-going extension and rural development programmes.

MODULES FOR SKILL DEVELOPMENT AND ENTREPRENEURSHIP

A student has to register 20 credits opting for two modules of (0+10) credits each (total 20 credits) from the package of modules in the

VIII semester.

Course No.	Course Title	Cr. Hrs
ESE. 421	Commercial Sericulture	0+10
EAG. 421	Organic Production Technology	0+10
EAM. 421	Production Technology for Bio-fertllizers	0+10
EAM. 422	Mushroom Cultivation Technology	0+10
EAP. 421	Commercial Beekeeping	0+10
EAS. 421	Poultry Production Technology	0+10
EEP. 421	Production Technology for Bio-agents	0+10
EFS. 421	Food Processing	0+10
EHR. 421	Commercial Horticulture	0+10
EHR. 422	Floriculture and Landscaping	0+10
ESA. 421	Soil, Plant, Water and Fertilizer Testing	0+10
ESA. 422	Agriculture Waste Management	0+10
EST. 421	Seed Production and Technology	0+10

ESE. 421 Commercial Sericulture 0+10

Mulberry Cultivation: Raising of mulberry saplings, establishment of mulberry garden for rainfed, irrigated condition and exclusive chawki garden, manure and fertilizer schedule. Integrated Nutrient management, pruning practices, mechanization in mulberry cultivation, mulberry diseases and pests and their control measures.

Silkworm rearing: Planning and preparation for silkworm rearing, disinfection and hygiene in rearing house, different rearing appliances, egg transportation, egg incubation, harvest and leaf preservation, chawki rearing, late age silkworm rearing methods, bed spacing, feeding, care during moult. Silkworm diseases and pests and their management, mounting, harvesting, cocoon sorting, deflossing, transportation and marketing of

cocoons. Mechanization in silkworm rearing. Economics of mulberry cultivation and silkworm rearing. By-product utilization and value addition for additional income.

EAG. 421 Organic Production Technology 0+10

Production of Organic Manures: Green biomass production:

Raising sunhemp, dhaincha, and other green manure crops in 500 m2 area by each student. **Compost production:** VAT method of composting, structure requirement, substrates assembling, filling the VATS, watering, turning and removing the matured compost from the VATs,. **NADEP method of composting:** structure requirement, advantage over other composting methods, filling the substrates, watering. Judging the maturity of the compost. **Vermicompost production:** Structures in vermicompost production, earthwormsspecies, lifecycle, temperature, moisture and substrate requirements.Management aspects-size reduction of substrates, aeration, watering, protection of earthworms against natural enemies. Each student shall produce at least 0.5 tonne of vermicompost. Maturity of thevermicompost, separation of worms from the compost and bagging. Value addition-enrichment with concentrated organic sources, microbial cultures, Quality analysis of different composts, standards of different composts. **Production of biodigested liquid manures:** Structure requirements, assembling green biomass, cattle dung and cattle urine, production and use of biodigested liquid manure. Value addition of Composts:- enrichment with concentrated organic nutrient sources, microbial consortia. Value addition of biodigested liquid manures. **Production of indigenous organic additives:** Panchagavya, Beejamruta, Jeevamruta and Vermiwash. **Organic crop production:** Commercial cultivation of crops by adopting organic farming practices. Individual students shall raise short duration crops such as field bean, french bean, baby corn, vegetable cowpea, onion and other appropriate short duration crops in 500sq m2 area in the organic farming block maintained in the campus by following organic ways of nutrient and weed management and plant protection practices. **Organic certification:** Requirements for conversion from conventional farming to organic farming, **Certification:** Government and Non-Government agencies involved in certification, permitted and restricted materials in organic farming. Cares to be taken in harvesting, processing, packaging and storing of organic produce, labelling

organic produce, Organic Logos used in organic produce packages. Preparation of the project report and presentation.

EAM. 421 Production Technology for Bio-fertilizers 0+10

Different types of biofertilizers and their role in plant nutrition. Acquaintance of laboratory and mass production equipments. Preparation of different culture media and sterilization techniques. Mother culture and starter culture production and their maintenance. Isolation and examination of freeliving heterotrophic and photo autotrophic nitrogen fixing bacteria from soil. Isolation and examination of Associative Nitrogen fixing bacteria. Isolation and examination of root nodule bacteria from leguminous and nonlegumonous plants. Study of Azolla -Anabaena symbiosis. Isolation and examination of phosphate/ potassium solubilizing microorganisms. Study of mycorrhizal symbiosis and method of mass production of arbuscular mycorrhizal fungi. Study of plant growth promoting rhizobacteria. Different formulations of biofertilizers, packing and storaging methods. Production technology for carrier based and liquid biofertilizers. Quality standards for biofertilizers. Role of microorganisms in bioconversion of agricultural wastes. Principles and methods involved in Compost making. Entrepreneurship development- preparation of project proposals for setting different capacity biofertilizer units.

EAM. 422 Production Technology for Mushrooms 0+10

Characteristics and morphological features of mushrooms; Types of mushrooms cultivated, Maintenance of mushroom laboratory, Equipments used in mushroom laboratory, Preparation of culture media, Pure culture techniques, Spore print preparation, Mother culture preparation of mushroom, Spawn production, Layout of mushroom houses, Cultivation of oyster mushroom and milky mushroom, Harvesting, Processing, Packing of mushrooms. Pests, diseases and abiotic stress of cultivated mushrooms, Project preparation for spawn production and mushroom cultivation, Exposure/visits to spawn and mushroom production centers.

EAP 421 Commercial Beekeeping 0+10

Handling of bee colonies for acquainting with different castes, immature stages and different kinds of cells of honey bees. How, When and Where to start beekeeping. Ways for procuring bee colonies. Location of bee colonies in nature, hiving and transfer to bee hive. Survey on Bee flora for profitable beekeeping. Seasonal management of honey bee colonies during different seasons of the year. Management of honey bees colonies during dearth/ lean period and honey flow season. Preparation of honey bee colonies for higher honey production. Swarming, robbing, queenlessness colonies and their management. Dividing and uniting of honey bee colonies. Pests and diseases of honey bees and their management. Mass queen rearing for multiplication of colonies. Extraction, processing, testing of honey for its purity, composition and uses of honey. Extraction, processing, properties and uses of bee wax. Extraction, processing and uses of other bee hive products such as royal jelly, propolis, bee venom and pollen. Preparation of value added bee hive products.Role of honey bees in crop pollination for increasing crop productivity. Maintenance of honey bee colony records. Working out economics of beekeeping.

EAS. 421 Poultry Production Technology 0+10

History and classification of Modern Poultry breeds **–**Mankind has been rearing Poultry for game, eggs meat and as a companion bird and providing food, nutrition & financial security. ***Archaeopteryx*** is said to be the origin for all modern class of birds Aves. It is said to have teeth ,tail like structure and used to fly. Wild jungle fowl from Southeast Asia is said to be the origin,however, the Red jungle fowl Gallus gallus is predominant. All the Four modern breeds belongs to Genus namely, ***Gallus*** and four species ***gallus, varius, sonneratti*** and ***lafayetti*** The general classification is based on the type for which they are maintained like Egg type, Meat type, Dual purpose and Game type .

The modern classification is based on the origin and has Four Classes namely ***English, American, Mediterranean and Asiatic. Egg – parts of egg and formation of egg .***In Nature, Egg is a complete unit of all the nutrients required for development of an embryo. It has all the nutrients except Calcium, water soluble and fat soluble vitamins and is termed as unadulterated Shape of an egg is termed as ***prolate spheroid*** Pigments Ooporphyrins and Xanthophylls are responsible for shell and yolk colour, respectively.

Broiler and layer industry – COLOURED broiler rearing The TWO distinct commercial activities are rearing birds for Meat and Egg. Poultry meat is the cheapest animal protein and has no religious stigma for it's use and has remained a favorite among all religions and regions globally. Broilers are meat type birds reared for 5-6 weeks which are tender, juicy, succulent , low in fat (lean meat) and nutritious. Thus a farmer can raise 5-6 crops in a year completely depending and earning livelihood. Broiler chicks are bred for faster growth achieving a growth of 2000g from a 40 g chick in 40 days ie. a growth of 50 times in 40days.A Feed Conversion Ratio (FCR) of 1.7-1.8 is achieved with a mortality rate of less than 2 %. Still the per capita poultry meat consumption is about 2 kgs against an ICMR recommendation of 15 kgs.India stands 4th in Poultry Meat production.

Layer farming- In poultry females are exclusively maintained commercially for Eggs (table eggs) for providing wholesome and nutritious eggs for use in various farms both in fresh and egg white and yellow in powder farms. A per capita consumption of 45 eggs is achieved against the recommendation of 180 eggs leaving a huge gap leaving scope for growth in layers.

Housing principles- Orientation, Brooder houses, grower houses, layer houses The Poultry sheds are to be in elevated places, rat proofed, oriented in East-West direction enabling a good cross ventilation with a width of not more than 25 ft ,overhang of 2-2.5 ft and any required length. Gable type sheds with side wall of 8 ft & center height of 12 ft with asbestos roofing is ideal. Quality water supply to be ensured. Depending upon the type /age of birds brooder ,grower & layer sheds are built. Care must be taken to spend least on sheds but ensure technical specifications.

Management practices – scientific principles, litter management feeding & watering, lighting and bio-security

Poultry farming is not only a science but also an art and incorporates the basics of birds behavior,needs and comforts that makes poultry a successful livestock business.right from brooding -providing heat initially for chicks (2-3 weeks),providing feed ***ad libitum*** ,cool and quality water,light for visibility, turning (raking) the litter to maintain it with optimum moisture –neither dusty that may lead to respiratory diseases or wet that may result in diseases. Sanitary and Bio security measures such as washing, disinfection,

white wash, flaming, movement of workers,entry of vehicles and outsiders are to be monitored. Need based Feeding timely with right type of feeds restraining wastage is of paramount importance. Incase of broilers light during night for visibility and 8 hrs of artificial light in layers is essential for birds maturity and consistent maintenance of egg production at 1 ft.candle at bird level.

Poultry Nutrition and feeding principles- feed ingredients ,types of feed, feed formulation In poultry nearly 70 % of the cost of production I on feed alone hence utmost care to be exercised in selection of feed ingredients, macro & micro nutrients, feed mixing depending upon the age of the birds. The require protein ,energy & other nutrients are provided by mixing various feed ingredients like maize, soya extract, cotton, sunflower cake,rice polish, mineral mixture etc.,Types of feed are Broiler pre-starter,starter, finisher ration , grower and layer feeds.

Standard Feeds are available in the market and a large farmer will have own feed mixing plant for better economics.

Common diseases and Vaccination programme- viral, bacterial, ecto & endo parasites Various diseases and pests have to be checked using both prophylactic and curative measures. Timely vaccination, de worming, and preventive doses of medicine in feed as well a water are administered. We are having pellet vaccines for easy administration of vaccines. Bio securi

Marketing and Economics of Poultry production Indian Poultry marketing is very interesting and 90-95 % of the birds are sold as Live and termed as WET market. Only a small portion is marketed as dressed, frozen, ready to cook meatHowever organization like NECC, NMPPB, Egg & Meat corporations have tried to contain, guide the industry which is contributing to the tune of about 60,000 crores providing food & nutrition security, employment both direct & indirect. It is highly unpredictable leaving Economists, producers a well a consumers guessing.

EEP 421 Production Technology for Bio Agents 0+10

Biological Control; definition, history, prospectus & principles and important mile stones in biological control. Mass multiplication of important bio agents, predators, parasitoids, rearing of laboratory hosts for parasitoids, predators and pathogens, Mass multiplication

of selected parasitoids such as *Trichogramma* sp., *Goniozus nephantidis, Bracon brevicornis, Cotesia plutella* etc., ; Predators (*Cryptolaemus montrouzieri, Chrysoperla carnea, Dipha aphidivora* etc., ; Insect Pathogens (Ha NPV, SL NPV, *Beauveria bassiana*, *Metarhizium anisopliae*, *Nomurea rileyi*, *Verticillium lecanii*,); Entomo pathogenic nematodes *Stinernema glaseri*, *Heterorhabditis* sp. Etc. Determination of cost of production of biocontrol agents. Visit to commercial units producing biocontrol agents. Biological control; definition and introduction from Plant Pathology perspective, Methods of isolation of biocontrol agents *viz.*, *Trichoderma, Pseudomonas, Bacillus,Paecilomyces* and *Verticillium* from rhizosphere soil, roots and foliage of different crop plants, their purification and cultural studies viz., growth phase, C, N, temperature and pH requirement. Methods of screening of biocontrol agents for their efficacy against selected fungal, nematode and bacterial plant pathogens. Interaction between different biocontrol agents. Evaluation of different solid and liquid growth media for mass multiplication. Study of methods for rapid multiplication. Formulation of mass produced biocontrol agents using different carrier and additives and packaging. Quality control: evaluation of formulated products for bioefficacy and longevity in different storage conditions. Methods of application of biocontrol agents viz., seed treatment, seedling dip, foliar application, soil application and their evaluation in vivo. Enrichment of organic manures and amendments with biocontrol agents.

EFS. 421 Food Processing 0+10

Importance of commercial processing, need for understanding market status and data analysis Different processing, methods Primary processed foods, Secondary processed foods and Tertiary processed foods. Grain quality assessment, Cereals, millets, Ragi, Wheat, Maize, Pulses, /legumes, Selection of grains: Test suitability of grains namely Rice, Wheat, Ragi, Maze, Pulses for processing as approved by (FDA/ FAO, HACCP/FSSAI, WHO/GOI/GOK/BIS/any other.) Indian regulatory agency. Primary processing of grains: dehusking /dehulling milling, roasting, popping, malting, etc. for grains, namely ragi, paddy, wheat, millets, maize, pulses, nuts, value added/fortified flours & foods: Energy food mix: Ragi/wheat maize/ millets. Malt drink, supplementary foods, fortified composite flour, and instant flour mixes. Techniques evaluation of

products Physical, Sensory & Objective evaluation methods computing nutritive value. Food Safety measures : Hygiene/ sanitation/ standards/regulations related to grains & products based on suitable methods approved by FDA/FAO/WHO/ GOI/GOK/BIS/ any other Indian regulatory agency. Shelf life of products: Grain storage practices. Use of additives & Preservatives, Labeling & its importance. Market study of exiting labeled foods, Label designing/ Packaging its requirements. Development of RTE Foods, Flour based shelf stable snack foods. Acceptability testing, project plan & Presentation By students: Product design, Machinery and equipment material & marketing supply chain. Processing & recording/book keeping, costing. Value chain of raw materials: study existing practice in industry trough visit & interaction Milling industry procurement/ milling/ marketing system. Storage & testing of raw materials testing of function & behavior of raw materials & products. Familiarization of equipment and their role, functioning, operation techniques cleaning condition regulation, maintenance handling. Baked produces. Processing of bread by different methods, importance of RH/ Temperature/pH, baking & finishing, processing of rolls/pizza/rusk/ etc., serving Techniques. Processing of biscuits: Regular biscuits fiber rich (Different fiber). Development of questionnaire for data collection. Market survey on the processed and health foods, Data computation and presentation. Industry Visits/ Food processing industries, Flourmills, Baking industries, Vegetable and fruits processing units. Student group activities.

EHR. 421 Commercial Horticulture 0+10

Study of importance, problems and prospectus of nursery industry. Study of high-tech nursery management practices, use of polyhouses and shade nets in planting materials production. Practice of propagation techniques of fruits, vegetables and plantation crops and care of nursery plants. Tissue culture techniques in rapid multiplication of horticulture crops. Practice of open and protected cultivation techniques such as bed preparation, fumigation, mulching, drip irrigation, fertigation, training, pruning, foliar application of micronutrients and other special practices, plant protection measures, harvesting, grading and packaging of important vegetable crops. Practice of pruning and training methods, fertilizers application, foliar application of micronutrients and growth

regulators, identification of symptoms of insect and disease infestation, plant protection measures, intercultural operations, harvesting, grading, marketing of important fruit crops. Roof top / terrace gardening. Practice of preparing processed products such as RTS, Jams, Ketchup, Pickles, etc., from fruits and vegetables. Estimation of cost of cultivation and economic feasibility studies of important vegetables and fruits. Visit to high tech nurseries, institutions and farmers field. Final evaluation and examination.

EHR. 422 Floriculture and Landscaping 0+10

Importance and scope of Floriculture and landscaping, practice of nursery techniques and management of ornamental crops. Propagation techniques for ornamental crops, nursery bed preparation, raising seedlings in protrays and poly bag. Production technology of flower crops like –China aster, Marigold, Tuberose and Gladiolus under open condition and Rose, Gerbera, Anthurium and Carnations under protected cultivation. Preparation of main field, application of FYM, fertilizer management, mulching, drip irrigation practices for open cultivation as well as protected cultivation. Special practices to be followed in flower crop production such as pinching, disbudding, pruning, training, desuckering, staking and wire netting etc., Maintenance of shrubs climbers and trees. Establishment of hedges, edges, flower beds and rockeries. Practices of Bonsai and flower arrangement. Establishment of Garden adornments and vertical gardens. Maintenance of lawn and its management. Visit to commercial nurseries, high tech floriculture units and farmer's field. Final evaluation and examination.

ESA. 421 Soil, Plant, Water Manure and Fertilizers Testing Good laboratory practices (GLP)

0+10

Principles of analytical chemistry

Analytical techniques, concepts of gravimetry, concepts of titrimetry (volumetric), preparation of standard solution of an acid

Instruments used in soil, plant, water, manure and fertilizer analysis

Potentiometer (pH meter), Conductometer (EC bridge), Spectrophotometer, Flame photometer, Atomic Absorption, Spectrophotometer (AAS)

Soil Analysis

Collection and preparation of soils samples, study of soil profile, physical properties of soil, mechanical analysis (soil texture), International pipette method, Hydrometer method, Determination of soil texture by feel method, density of soil, Bulk density of soil, Particle density of soil, pore space of soil, soil colour, physic chemical properties of soil, pH of soil, EC of soil, Chemical properties of soil, organic matter in soil, cation exchange capacity (CEC) of soil, Major nutrients in soil, available nitrogen in soil, available Phosphorusin soil, available potassium in soil, Secondary nutrients in soil, Determination of exchangeable calcium and magnesium in soil, available sulphur in soil, Micronutrients in soil, available micronutrient cations in soil, available boron in soil, Problematic soils and amendments, Soil acidity and lime requirement, Determination of exchangeable acidity in soil, reserve acidity in soil, extractable aluminum in soil, lime requirement of acid on soil, Soil alkalinity and gypsum requirement, Determination of lime content of soil, carbonate and bicarbonate in soil, chloride in soil, carbonate and bicarbonate in soil, chloride in soil, sodium in soil, gypsum requirement of alkali soil

Irrigation Water Analysis

Irrigation water sampling, Determination of pH irrigation water, electrical conductivity of irrigation water, carbonate and bicarbonate in irrigation water, chloride in irrigation water, calcium and magnesium in irrigation water, sodium in irrigation water, Computation of SAR and RSC of irrigation water, Determination of boron in irrigation water.

Waste Water Analysis

Collection and preservation of waste water samples, Analysis of different parameters of waste water, Determination of pH of waste water, EC in waste water, carbonate and bicarbonate in waste water, chloride in waste water, calcium and magnesium in waste water, potassium and sodium in waste water, Phosphorus in waste water, sulphur in waste water, acidity of waste water, total, suspended and dissolved solids in waste water, nitrate in waste water, dissolved oxygen in waste water, biological oxygen demand in waste water, chemical oxygen demand in waste water

Plant Analysis

Sampling handling and preparation of plant sample, Determination of Nitrogen in plant sample, Digestion of plant sample for estimation of nutrients (except nitrogen), Determination of phosphorus in plant sample, potassium in plant sample, calcium and magnesium in plant sample, sulfur in plant sample, micronutrients in plant sample

Organic Manure Analysis

Determination of pH of manure, EC of manure, organic carbon in manure, nitrogen in manure, Digestion for estimation of other nutrients in manure, Determination of phosphorus in manure, potassium in manure, calcium and magnesium in manure, sulfur in manure, micronutrients in manure

Fertilizer Analysis

Fertilizer sampling, Qualitative test for identification of fertilizer, Detection of adulterants in fertilizer, Estimation of ammonium nitrogen (NH4 - N) in ammonium fertilizer, nitrate nitrogen (NO3-N) in nitrate fertilizer, amide nitrogen (NH2-N) in amide fertilizer (urea), Determination of biuret content of urea, Estimation of phosphorus in phosphatic fertilizer, Determination of potassium in potassic fertilizer.

ESA. 422 Agriculture Waste Management / Management of organic resources in Agriculture

0+10

- Collection of crop residues – bulky organic residues, concentrated organic residues. Green manuring. Agro industrial waste urban waste, sewage and sludge.
- Composting of organic residues. Conventional and mechanized techniques of composting.
- Vermicomposting of organic residues.
- Biogas preparation using organic resource
- Analysis of physical, chemical, biological and biochemical properties of different compost and spent slurry.
- Evaluation of different types of compost and spent slurry through field study and analysis of soil and crop data and presentation of soil test results and submission of report.

EST. 421 Seed Production Technology (0+10)

1. Principles of seed production in self and cross pollinated crops
2. Land preparation and management of seed production in maize, sunflower, tomato / chilli, soybean
3. Seed production techniques in cereals, pulses, oilseeds and vegetable crops 4. Seed production techniques in hybrids and varieties
5. Seed certification principles and procedures
- Phases of seed certification
- Field inspections
- Rejection of seed field
- Awarding the labels and tags
- Indian minimum seed certification standard for important field crops
6. Harvesting of seed crop, physiological maturity index and methods of harvesting, and threshing
7. Seed processing and drying
8. Seed testing methods and procedures
- Seed sampling, method of sampling and procedures
- Seed germination
- Seed moisture determination
- Physical purity analysis
- Seed vigour and viability
- Seed health testing methods
- Genetic purity testing
9. Seed treating methods and procedures
10. Seed storage and methods of storability
11. Seed marketing channels in Karnataka
12. Visit to seed production fields and seed industries

HORTICULTURAL SCIENCES

DEPARTMENT OF FRUIT SCIENCE

FSC 102 Plant Propagation and Nursery Management 2 (1+1)

Unit I: Propagation: Need and potentialities for plant multiplication, sexual and asexual methods of propagation, advantages and disadvantages. Seed dormancy, types of dormancy (scarification & stratification) internal and external factors, nursery techniques, nursery management, apomixes – mono-embrony, polyembrony, chimera& bud sport.

Unit II: Propagation Structures: Mist chamber, humidifiers, greenhouses, glasshouses, cold frames, hot beds, poly-houses, phytotrons nursery (tools and implements), use of growth regulators in seed, types and stages of seed germination with examples and vegetative propagation, methods and techniques of division-stolons, pseudobulbs, offsets, runners, cutting, layering, grafting, formation of graft union, factors affecting.

Unit III: healing of grafting and budding physiological & bio chemical basis of rooting, factors influencing rooting of cuttings and layering, graft incompatibility. Anatomical studies of bud union, selection and maintenance of mother trees, collection of scion wood stick, scion-stock relationship and their influences, bud wood certification, techniques of propagation through specialized organs, corm, runners, suckers.

Unit IV: Micrografting, meristem culture, callus culture, anther culture, organogenesis, somaclonal variation, hardening of plants in nurseries.Nursery registration act.Insect/pest/disease control in nursery and cost of establishment of propagation structures.

LIST OF EXPERIMENTS / PRACTICES

- Media for propagation of plants in nursery beds, potting and repotting.Preparation of nursery beds and sowing of seeds.
- Raising of rootstock.
- Seed treatments for breaking dormancy and inducing vigorous seedling growth.Preparation of plant material for potting.
- Hardening plants in the nursery. Practicing different types of cuttings, layering, graftings and buddings including grafting, top grafting and bridge grafting etc.
- Use of mist chamber in propagation and hardening of plants.Preparation of plant growth regulators for seed germination and vegetative propagation.
- Visit to a tissue culture laboratory.
- Digging, labelling and packing of nursery fruit plants.
- Maintenance of nursery records.
- Use of different types of nursery tools and implements for general nursery and virus tested plant material in the nursery.

- Cost of establishment of a mist chamber, greenhouse, glasshouse, polyhouse and their maintenance.
- Nutrient and plant protection applications during nursery and study of micropropagation.
- Visit to public and private nurseries.

FSC 201 Tropical and Sub Tropical Fruits 3 (2+1)

Unit I: Horticultural classification of fruits including genome classification. Horticultural zones of India, detailed study of area, production and export potential, varieties, climate and soil requirements, use of rootstocks, propagation techniques, planting density and systems, after care, training and pruning.

Unit II: Management of water, nutrient and weeds, special horticultural techniques including plant growth regulators, their solution preparation and use in commercial orchards.Physiological disorders.

Unit III: Post-harvest technology, harvest indices, harvesting methods, grading, packaging and storage of the following crops.Mango, banana, grapes, citrus, papaya, sapota, guava, pineapple, jackfruit, avocado, mangosteen, litchi, carambola, durian, rambutan, bilimbi, loquat, roseapple, breadfruit and passion fruit. Bearing in mango and citrus, causes and control measures of special production problems, alternate and irregular bearing overcome, control measures.

Unit IV: Seediness and konkan disease in banana, citrus decline and casual factors and their management.Bud forecasting in grapes, sex expression and seed production in papaya, latex extraction and crude papain production, economics of production.Preparation of project proposal.

LIST OF EXPERIMENTS / PRACTICES

- Description and identification of varieties based on flower and fruit morphology in fruit crops.
- Training and pruning of grapes, mango, guava and citrus.
- Selection of site and planting system, pre-treatment of banana suckers, desuckering in banana, sex forms in papaya.
- Use of plastics in fruit production.
- Visit to commercial orchards and diagnosis of maladies.
- Manure and fertilizer application including bio-fertilizers in fruit crops, preparation and application of growth regulators in banana, grapes and mango.
- Latex extraction and preparation of crude papain.Ripening of fruits, grading and packaging, production economics for tropical and sub-tropical fruits.
- Botanical description and identification of crops.
- Visit to public and private orchards.

FSC 202 Temperate Fruit Crops 2 (2+0)

Unit I: Classification of temperate fruits, detailed study of areas, production, varieties, climate and soil requirements, propagation, planting density, cropping systems, after care training and pruning.

Unit II:self-incompatibility and pollinisers, use of growth regulators, nutrient and weed management, harvesting, post-harvest handling and storage of apple.

Unit III: , post-harvest handling and storage of pear, peach, apricot, plum, cherry, persimmon, strawberry, kiwi, Queens land nut (Mecademia nut), almond, walnut, pecan nut, hazel nut and chest nut.

Unit IV: Re-plant problem, rejuvenation and special production problems like pre-mature leaf fall, physiological disorders, Special production problems like alternate bearing problems and their remedies.

FSC 302 Breeding of Fruit Crops 2 (1+1)

Unit I: Importance of breeding of fruit crops, problems in fruit trees. Origin, centers of diversity and distribution of fruit species. History, hybridization and developments in fruit crops.

Unit II: Introduction, selection, identification and selection of mutants, bud sports, chimeras and their perpetuation by vegetative propagation.Variabilityforeconomic traits, breeding strategies.

Unit III: Collection and maintenance of germplasm of varieties and related species.Breedingbehaviourof fruit crops.

Unit IV: Floral biology, pollination, incompatibility in mango, banana, citrus, papaya, pineapple, sapota, grapes, guava, pomegranate, apple, nuts etc. Prospects of genetic engineering and biotechnology inimprovement of fruit crops.

LIST OF EXPERIMENTS / PRACTICES

- Description and classification of related species and varieties of fruit crops.
- Study of floral structures, biology and economic produce of crops.
- Selfing and crossing techniques.
- Use of mutagens, handling of breeding population.
- Preparation of plant descriptors for important fruit crops.
- Visit to research centers and commercial orchard.

DEPARTMENT OF VEGETABLE SCIENCE

VSC 201 Temperate Vegetables and Tuber Crops 3 (2+1)

Unit I: Importance, area, production, origin, export potentials, varieties/hybrids, climate and soil requirements, seed rate, nursery practices, field preparation, transplanting/sowing, spacing, water.

Unit II:weed and nutrient management, use of chemicals and growth regulators, physiological disorders, cropping systems, maturity standards, harvesting, yield, economics of cultivation, post-harvest handling.

Unit III:storage and marketing of cabbage, cauliflower, knol-khol, sprouting brocolli, brussels sprout, lettuce, palak, chinese cabbage, spinach, onion, garlic, leek, radish, carrot, turnip, beet root, peas, broad bean, rhubarb, asparagus, globe artichoke.

Unit IV: storage and marketing of celery, potato, sweet potato, tapioca, amorphophallus, colocassia, diascoria, horse radish, arrow root, jerusalem artichoke and xanthosoma.

LIST OF EXPERIMENTS / PRACTICES

- Botany, identification and description of varieties/hybrids of temperate vegetables and tuber crops.
- Modern nursery practices, transplanting, field preparation, sowing/planting.
- Use of herbicides.
- Top dressing of fertilizers, interculture.
- Use of growth regulators.
- Identification of nutrient deficiencies and physiological disorders.
- Pests and diseases and their managements.
- Harvest indices and maturity standards.
- Working out cost of cultivation and project preparation for commercial cultivation.
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VSC 301 Breeding and Seed Production of Vegetable Crops 3 (2+1)

Unit I: History and scope of breeding vegetable crops, methods of reproduction and breeding systems in vegetable crops.

Unit II: Genetic resources, genetics of qualitative and quantitative characters, objectives of breeding, methods of breeding, achievements, maintenance breeding, breeders, foundation and certified seed production, field (isolation distance and rouging) and seed standards for seed production of potato, tomato, chilli, sweet pepper.

Unit III: seed standards for seed production of brinjal, peas, bhendi, dolichos bean, french bean, cow pea, cucumber, musk melon, water melon.

Unit IV: seed standards for seed production of bitter gourd, onion, ridge gourd, pumpkin, squashes, cabbage, cauliflower, amaranthus, radish and carrot.

LIST OF EXPERIMENTS / PRACTICES

- Study of floral biology and pollination mechanisms in vegetable crops,
- Selfing and crossing techniques in vegetable crops
- cataloguing of released varieties and hybrids
- preparation of plant descriptors for important vegetable crops
- preparation and use of chemical and physical mutagens, heterosis breeding and techniques of F1 hybrid seed production
- study of seed structure, color, size, shape and texture, field inspection of seed crops
- practices in rouging, seed harvesting and seed extraction and germination and purity analysis.
- Visit to R & D units of MNCs involved in vegetable breeding and seed production.

DEPARTMENT OF FLORICULTURE AND LANDSCAPE ARCHITECTURE

FLA-102 Ornamental Horticulture 2 (1+1)

Unit I: Introduction, history, scope and industrial importance of ornamental horticulture,Basic elements of garden design viz., major and minor elements. Principles of garden design.Styles (formal and informal) and types of garden (features of english, japanese, mughal, french, persian and Italian gardens).

Unit II: Garden features/components (garden wall, gates, fence, paths and drives, steps, bridges, hedge, edge, borders, flower beds, carpet bed, lawn, arches and pergolas, terraces).Garden adornments (garden seats/benches, tubs/ urns/ vases, lanterns, statutes, sculptures, fountains, water basins, bird bath, floral clock, sun dials etc.,).

Unit III: Famous gardens of India.Importance, classification, design values and cultivation tips for ornamental plants *viz*. annuals, biennales, herbaceous perennials, bulbous ornamentals, shrubs, trees, climbers, palms and cycads, ferns and sellagenellas, cacti and succulents and indoor plants.Establishment of lawn and maintenance.

Unit IV: Bonsaiculture and maintenance. Flower arrangement concepts and Ikebana- techniques, types, suitable flowers and cut foliage. Dry flowers- dehydration techniques and preservation.Floral arts and adornments.

LIST OF EXPERIMENTS / PRACTICES

- Identification and description of elements, principles, features and adornments in the garden.
- Nursery practices for raising annuals and potted ornamentals.
- Planning, designing and establishment of garden features viz. lawn, hedge and edge, flower bed, carpet beds.
- Identification and description of annuals, biennials, herbaceous perennials, shrubs, trees, climbers, ferns and sellagenellas, palms and cycads, Cacti and succulents, indoor plants.
- Study of Bonsai techniques, training and maintenance.Practices on of flower arrangement, preparation of bouquets
- preparation of floral rangoli, veni*etc*.,
- Visit to gardens.

FLA-201 Commercial Floriculture 2 (1+1)

Unit I: Scope and importance of commercial floriculture in India.Area and production of flower crops in India.

Unit II: Production techniques of commercial flower crops -rose, chrysanthemum, tuberose, gladiolus, dahlia, china aster, marigold, gaillardia, jasmine, crossandra, bird of paradise, lilies, and heliconia.

Unit III: Postharvest management of flower crops.Essential oil extraction from flowers - rose, jasmine and tuberose.

Unit IV: Use of organics in flower crops.Economics and cost of cultivation.

LIST OF EXPERIMENTS / PRACTICES

- Identification of commercially importantflower crops and their varieties.
- Nurserypractices in annual flowercrops.
- Use of growth regulators in propagation by cutting, layering, grafting and budding in flower crops.
- Training and pruning operations.
- Use of chemicals and packaging material for prolonging the vase life of cut-flowers.
- Exposure visits.

FLA -202 Landscape Architecture 2 (1 +1)

Unit I: Importance and scope of Landscape Architecture.Functional uses of plants for landscape and pollution control.Steps in preparation of garden design.Use of Auto CAD and Archi CAD in designing gardens.

Unit II: Use of softwares and software tools for developing landscapes.Bio-aesthetic planning, definition, objectives.Special types of gardens (rock, water, marsh/ bog, sunken, shade, roof, terrace, vertical, instant, dish, traffic island and terrarium).

Unit III: Landscaping for specific areas (home garden, public parks, educational institutes, hospitals, religious places, play-ground, high ways, avenues, industrial area, air port, rail way station and line, bus station, historical place, cemeteries, dam site, river bank).

Unit IV: Xeriscaping- definition, principles and practice.

LIST OF EXPERIMENTS / PRACTICES

- Study of garden equipments.
- Use of drawing equipments, graphic symbols and notations in landscape designing.
- Designing gardens using Auto-CAD/ Archi-CAD.Study and designing of different styles of gardens.
- Study and designing of gardens based on different themes.Designing gardens for specific places.
- Visit to public/ institutional / botanical gardens.

FLA-301 Protected Cultivation of Flower Crops 2 (1+1)

Unit I: Importance and scope for protected cultivation.Problems, advantages and disadvantages of protected cultivation.Green house technology- Introduction, Greenhouse effect, structure and types of greenhouses.

Unit II: Equipments and materials required for green house construction and management.Factors involved in the green house production and plant response to greenhouse environment.

Unit III: Growing media and sterilization methods.Production technology for rose, carnation, gerbera, chrysanthemum, orchids and anthuriuns (preparation of beds, planting method, nutrition, irrigation, fertigatrion,

Unit IV:pest/disease management, harvest and post-harvest management).Cost estimation and economic analysis.

LIST OF EXPERIMENTS / PRACTICES

- Studies on different types of greenhouses based on shape, construction and cladding materials.
- Testing of soil and water for suitability to grow crops in greenhouses.
- Studies on growing media and sterilization process.
- Preparation of beds, planting methods and cultural operations.

- Studies on irrigation and fertigationfacilities.Economics of protected cultivation.
- Visit to commercial green houses.

FLA-302 Breeding and Seed Production of Flower Crops 2(1+1)

Unit I: History of ornamental plant breeding.Problems in flower crops breeding. Application of breeding techniques (diversity, introduction, selection, hybridization, mutation, polyploidy, biotechnological approaches and development of promising cultivars) for improvement in Rose.

Unit II: Application of breeding techniques in Carnation, Gerbera, Chrysanthemum, Orchids, Anthurium, Tuberose, Gladiolus, Dahlia, Jasmine, Crossandra, Hibiscus, Bouganvillea.

Unit III: Application of breeding techniques in China aster, Marigold, Gaillardia,Petunia, Zinnia, Cosmos, Dianthus, Antirrhinium.

Unit IV: Role of heterosis and its exploitation in flower seed production. Utilization of male sterility in F1 hybrid seed production.Production of open pollinated seeds.Harvesting,processing, certification and storage of seeds.

LIST OF EXPERIMENTS / PRACTICES

- Classification of plants and plant organs.
- Taxonomical and trait description of plant organs (roots, branches, leaves, inflorescence).
- Studies on flower parts.Taxonomy, floral biology and pollination mechanisms in important flower crops.
- Studies on pollination and fertilization methods.
- Studies on development of seed.
- Studies on seed dispersal mechanisms.
- Identification of annual flower seeds.
- Practices on seed production methods.
- Visit to tissue culture and seed production units.

DEPARTMENT OF PLANTATION, SPICES, MEDICINAL AND AROMATIC CROPS

PMA 102 Plantation Crops 3 (2+1)

Unit I: History and development, scope and importance, area and production, export and import potential, role in national and state economy, uses, industrial importance, by products utilization, soil and climate, varieties.

Unit II: propagation: principles and practices of seed, vegetative and micro-propagation, planting systems and method, gap filling, systems of cultivation, mulching, shade regulation.

Unit III: weed and water management, training, pruning and handling, nutrition, foliar feeding, role of growth regulators, soil management, liming practices, tipping practices, top working, physiological disorders.

Unit IV: harvesting, post-harvest handling and processing, packaging and marketing, yield and economics of coconut, arecanut, oil palm, cocao, cashew nut, coffee, tea and rubber.

LIST OF EXPERIMENTS /PRACTICES

- Description and identification of coconut varieties
- selection of coconut and arecanut mother palm and seed nut
- planting of seed nuts in nursery
- layout and planting of coconut, arecanut, oil palm, cashew nut, cacao gardens, manuring, irrigation
- Mulching, raising masonry nursery for palm, nursery management in cacao.
- Description and identification of species and varieties in coffee
- harvesting, grading, pulping, fermenting, washing, drying and packing of coffee, seed berry collection, seed extraction
- treatment and sowing of coffee, epicotyl, softwood, grafting and top working in cashew, working out the economics
- Project preparation for coconut, arecanut, oil palm, cashew nut and cacao.

PMA 201 Spices and Condiments 2(1+1)

Unit I: History, scope importance and constraints.Present status, area and production, uses, export potential and role in national economy.

Unit II: Classification, soil and climate, propagation-seed, vegetative and micro propagation systems and methods of planting. Nutritional management, irrigation practices, weed control, mulching and cover cropping.

Unit III: Training and pruning practices, role of growth regulators, shade crops and shade regulation. Harvesting, post-harvest technology, packaging, storage, value added products, methods of extraction of essential oil and oleoresins.

Unit IV: Economics of cultivation, role of Spice Board. Export Promotion Council, institutions and research centres in R&D. Crops: Cardamom, pepper, betel vine, ginger, turmeric, clove, nutmeg, cinnamon, kokam, curry leaf, coriander, fenugreek, fennel, mustard and vanilla.

LIST OFEXPERIMENTS /PRACTICES

- Identification of varieties: propagation, seed treatment – sowing; planting; hoeing and earthing up;
- Manuring and use of weedicides, training and pruning;
- Fixing maturity standards, harvesting, curing, processing, grading and extraction of essential oils and oleoresins.

- Visit to commercial plantations and research stations.

PMA 202 Medicinal Crops 2 (1+1)

Unit I: History, scope, opportunities and constraints in the cultivation and maintenance of medicinal plants in India.Importance, origin, distribution, area, production.

Unit II:climatic and soil requirements, propagation and nursery techniques, planting and after care, cultural practices, training and pruning, nutritional and water requirements.

Unit III: Important pests and diseases, harvesting and processing of under mentioned important medicinal plants. Therapeutic and pharmaceutical uses of important species.

Unit IV: Medicinalcrops:Withania, periwinkle, Rauvolfia, Dioscorea, Isabgol, opium poppy, coleus,stevia, long pepper,senna,asparagus,glorylilly,safedmusli , kalmegh, cinchona and Ammimajus.

LIST OF EXPERIMENTS /PRACTICES

- Study and identification of medicinal plants, their morphological description, nursery techniques, varieties.
- Study of harvesting, Identification and management of important pests and diseases of commercial medicinal crops.
- Study the concepts and layout of herbal garden.
- Visit to herbal garden and research stations

PMA 301 Aromatic Crops 2 (1+1)

Unit I: History, scope, opportunities and constraints in the cultivation and maintenance of aromatic plants in India.

Unit II: Importance, origin, distribution, area, production, climatic and soil requirements, propagation and nursery techniques, planting and after care, cultural practices, training and pruning, nutritional and water requirements.

Unit III: Important pests and diseases, harvesting and extraction methods of under mentioned important aromatic plants. Uses and economics of essential oils in aromatic plants.Storage techniques of essential oils.

Unit IV: Aromatic crops: Citronella, khus, lavender, geranium, patchouli, Lemon scented gum, Mint, ocimum,Lemongrass, palmarosa,davana ,Jasmine,tuberose,sandal wood and Rosemarry.

LIST OF EXPERIMENTS /PRACTICES

- Study and identification of medicinal plants, their morphological description, nursery techniques, varieties.

- Study of harvesting, curing and processing techniques of different species and extraction of essential oils.
- Identification and management of important pests and diseases of commercial aromatic crops.
- Visit to aromatic crop fields distillation units and research stations.

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DEPARTMENT OF POST HARVEST TECHNOLOGY

PHT 301 Post Harvest Management of Horticultural Produce 3(2+1)

Unit I: Importance of post harvest technology in horticulture crops, present status and future scope, pre-harvest factors affecting quality, post-harvest losses and factors responsible for deterioration of horticulture produce.

Unit II: Maturity indices, physiological and biochemical changes during ripening process, hastening and delaying of ripening process; Harvesting, handling, curing, grading and pre-cooling of horticulture produce.

Unit III: Packaging, types of packages, recent advances in packaging, use of grape guard in packaging, cushioning materials; Transportation and modes of transport.

Unit IV: Marketing of fresh produce; Pre and post-harvest treatments for extending storage life; Principles and methods of storage.

LIST OF EXPERIMENTS /PRACTICES

- Study of structure of fruits, vegetables and cut flowers in relation to post harvest physiology.
- Practices in judging maturity of horticulture produce.
- Harvesting, sorting and grading of horticulture produce.
- Estimation of PLW, TSS, titratable acidity, ascorbic acid.
- Post harvest treatment of horticulture produce-Hot water treatment, wax, growth regulators, calcium compounds and fungicides on shelf life and quality on horticulture produce.
- Packaging of important horticulture crops; Study of design and construction of ZECC.
- Study on cold storage of fruits, vegetables and flowers.
- Storage disorders and spoilages in horticulture produce.
- Visit to markets, packing houses and cold storage units.

PHT 302 Processing of Horticultural Produce 3 (2+1)

Unit I: History, importance, present status and future scope of fruit and vegetable preservation industry in India; Unit operations in food processing; General principles of preservation of horticulture produce; Chemical preservatives.

Unit II: Principles and methods of drying and dehydration; Preservation by heat; Preservation by use of sugar and chemicals; Preservation by salt, spices, essential oils and vinegar; Preservation by fermentation and freezing.

Unit III: Minimal processing of fruits and vegetables; Curing and processing of spices and plantation crops; Packaging of processed products; Spoilages in processed products.

Unit IV: Quality control of processed products and food laws, Government policies on import and export of processed horticulture produce; Principles and guidelines for establishment of processing industry.

LIST OF EXPERIMENTS /PRACTICES

- Study of tools and equipments used in processing of horticulture produce.
- Study of packages (rigid and flexible) used for processed foods.
- Preparation of dried and dehydrated products.
- Raisin preparation.
- Preparation of juice, RTS, nectar, cordial, squash, syrup, jam, jelly, candied and crystallized products, preserve (Murabba), tomato ketchup and sauce, pickles.
- Canning of fruits and vegetables;
- Study of spoilage in canned foods; Freezing preservation.
- Preparation of wines.
- Curing and processing of regionally important spices and plantation crops.
- Visit to processing industries.

DEPARTMENT OF ENTOMOLOGY

ENT 201 Principles of Pest Management and Productive Insect 3(2+1)

Unit I: Economic classification of Insects.Pest-definition and types of pests, types of damage caused by pests.Concept of ETL and EIL in pest management.Factors for outbreak of pest populations.Pest survey, surveillance and forecasting.Pest management-Definition and importance; Methods of pest management - Mechanical, Cultural, Physical, Legal, Biological and Chemical.Biorational and Biotechnological approaches in pest management.

Unit II: Integrated pest management- Principles and its components; advantages and disadvantages.Biological control- predators, parasitoids, entomopathogens and weedkillers and their mass production and use. Insecticides: Classifications of insecticides based on mode of entry, action and chemical nature; Insecticides formulations and their uses; safe handling of insecticides

Unit III: Importance and History of apiculture. Species of honey bees- Rock bee, Little bee, Indian bee, European bee, and Dammar bee, lifecycle and caste determination. Beekeeping Appliances.Establishment of apiary, Bee colony maintenance in different seasons.Importance of bee pollination in horticulture crops. Honey extraction, honey composition and value, bee wax and other hive products. Pests and diseases of honey bees.Economics of beekeeping.

Unit IV: Importance, history and development of Sericulture in India, different kinds of silkworms and their host plants.Mulberry silkworm-morphology, races, rearing house and equipments.Silkworm rearing. Cocoon quality and processing. Uses of silk and by-products.Economics of silk production.Moriculture- establishment of mulberry garden and its management.Lac cultivation in India.Lac insects, biology, types, lac cultivation and host plants.Uses of lac.

LIST OF EXPERIMENTS /PRACTICES

- Assessment of pest damage/ETL.
- Pest monitoring devices and forecasting.
- Studies on Beneficial insects- Predators, Parasitoids and their mass production.
- Different entomopathogens and their mass production and usage.
- Visit to biocontrol laboratories. Classification of insecticides and their formulations.
- Preparation and usage of botanical insecticides.
- Study of plant protection appliances.
- Safe handling of pesticides and pesticide residues.
- Honey bee colony, different bee hives and apiculture equipment.
- Summer and Winter management of colony.
- Colony multiplication and uniting.
- Honey and wax extraction, Processing and bottling of honey.
- Study of pests and diseases of honeybees.
- Visit to apiary.
- Establishment and maintenance of mulberry garden.
- Study of different kinds of silkworms and mulberry silkworm morphology.
- Sericulture equipments and rearing facility.
- Rearing of silkworms.
- Study of silkworm pests, diseases and their management.
- Visit to sericulture unit.

ENT 301 Pests of Vegetable, Ornamental and Spice Crops 2(1+1)

Unit I: Economic importance of insects and mites in vegetable and spice crops -ecology and pest management with reference to these crops. Pest surveillance in important vegetable and spice crops.

Unit II: Distribution, host range, bio-ecology, injury, integrated management of important insect and mite pests affecting vegetable and spice crops like brinjal, tomato, chilli, bhendi, potato, sweet potato, onion, garlic, crucifers- cabbage and cauliflower, cucurbits- melons and gourds, leguminous and leafy vegetables, rose, jasmine, chrysanthemum, marigold, tuberose, gladiolus, carnation, gerbera, black pepper, ginger, turmeric, cardamom, curry leaves, coriander and tree spices.

Unit III: Important storage insect-pests of vegetable and spice crops, their host range, bio-ecology, injury and integrated management.

Unit IV: Insect – pests of processed vegetables and spice crops, their host range, bio-ecology, injury and integrated management. Insecticidal residue problems in vegetables and spice crops, MRL, PHI etc.

LIST OF EXPERIMENTS /PRACTICES

- Collection and preservation of damaging stages on different vegetable, ornamental and spice crops.
- Study of symptoms, damage, collection, identification, preservation, assessment of damage/population of important insect-pests affecting vegetable, ornamental and spice crops in field and during storage.
- Application of IPM components in various crops.
- Studies on pesticide residues, their MRL and PHI. Visit to Vegetable, Ornamental and spice crop fields.

ENT 302 Pests of Fruit, Plantation, Medicinal and Aromatic Crops 3 (2+1)

Unit I: Bio-ecology and management of insect and mite pests in fruit, plantation, medicinal and aromatic crops; Pest surveillance.

Unit II: Distribution, host range, bio-ecology, injury, integrated management of important insect and mite pests affecting tropical, sub-tropical and temperate fruits, plantation, medicinal and aromatic crops like mango, guava, grapes, banana, citrus, sapota, pomegranate, ber, pineapple, papaya, jamun, fig, custard apple, apple, jack, coconut, areca nut, oil palm, cashew, cacao, tea, coffee, betelvine, rubber, cinchona, ashwaghanda, senna, neem, pyrethrum, costus, mint, *Solanum*sp, lemongrass, patchouli.

Unit III: Storage insects – distribution, host range, bio-ecology, injury, integrated management of important insect pests attacking stored fruits, plantation, medicinal and aromatic crops and their processed products. I

Unit IV:nsecticide residue problems in fruits, plantation, medicinal, and aromatic crops and their maximum residue limits (MRLs).

LIST OF EXPERIMENTS /PRACTICES

- Study of symptoms of damage, collection, identification, preservation, assessment of damage and population of important insect – pests affecting fruits, plantation, medicinal and aromatic crops in field and storage.
- Installation of pest monitoring devices and decision making in various crops.
- Studies on pesticide residues, their MRL and PHI. Visit to Fruit orchards, plantations crops and medicinal and aromatic crops.
- Collection and identification of damaging stages and adult insects.

DEPARTMENT OF PLANT PATHOLOGY

PAT 201 Diseases of Fruit, Plantation, Medicinal and Aromatic Crops 3 (2+1)

UnitI: Etiology, symptoms, mode of spread, epidemiology and integrated management of the diseases of fruits, plantation, medicinal and aromatic crops *viz* mango, banana, grape, citrus, guava, sapota, papaya, jack fruit, pineapple, pomegranate.

UnitII: Etiology, symptoms, mode of spread, epidemiology and integrated management of the diseases of fruits, plantation, medicinal and aromatic crops *viz*ber, apple, pear, peach, fig, custurd apple, plum, strawberry, areca nut, coconut, oil palm.

UnitIII: Etiology, symptoms, mode of spread, epidemiology and integrated management of the diseases of fruits, plantation, medicinal and aromatic crops *viz* coffee, tea, cocoa, cashew, rubber, betel vine senna, neem, hemp, costus, datura, dioscorea, mint, opium, pachouli, citronella, davana, ocimum, sandal and*Solanumviarum*.

UnitIV: Important post-harvest diseases of fruit, plantation and medicinal and aromatic crops and their management.

LIST OF EXPERIMENTS/PRACTICES:

- Observations of disease symptoms.
- Identification of casual organisms and host parasite relationship of important diseases.
- Examination of scrapings and cultures of important pathogens of fruits, plantation, medicinal and aromatic crops .
- Field visit for acquaintance with diseases.

PAT 301 Diseases of Vegetable, Ornamental and Spice Crops 3(2+1)

UnitI: Etiology, symptoms, mode of spread, epidemiology and integrated management of diseases of the following vegetables, ornamental and spice crops: tomato, brinjal, chilli, bhindi, cabbage, cauliflower, radish.

UnitII: Etiology, symptoms, mode of spread, epidemiology and integrated management of diseases of the following knol-khol, pea, beans, beet root, onion, garlic, fenugreek, ginger, potato, cucurbits, sweet potato, carrot, turmeric, pepper, cumin, cardamom, nutmeg, coriander, clove, cinnamon.

Unit III: Etiology, symptoms, mode of spread, epidemiology and integrated management of diseases of the following jasmine, rose, crossandra, tuberose, gerbera, anthurium, geranium, marigold, chrysanthemum, carnation, gladiolus, vanilla.

UnitIV: Important post-harvest diseases of vegetables and ornamental crops and their management.

LIST OF EXPERIMENTS/PRACTICES:

- Observations of symptoms, causal organisms and host parasitic relationship of important diseases.
- Examination of cultures of important pathogens of vegetables, ornamental and spice crops in field as well as in protected cultivation.

DEPARTMENT OF BCI

CPH 102 Growth and Development of Horticulture Crops 2(1+1)

UnitI: Growth and development: Definitions, components, photosynthetic productivity, Canopy photosynthesis and productivity, leaf area index (LAI): Optimum LAI in horticultural crops, canopy development; different stages of growth, growth curves, Crop development and dynamics (Case studies of annual/perennial horticultural crops), growth analysis in horticultural crops.

UnitII: Plant bio-regulators: auxin, gibberellin, cytokinin, ethylene inhibitors and retardants, basic functions, biosynthesis, role in crop growth and development, propagation, flowering, fruit setting, fruit thinning, fruit development, fruit drop, and fruit ripening. Flowering: Factors affecting flowering, physiology of flowering.

UnitIII: Photoperiodism - long day, short day and day neutral plants, vernalisation and its application in horticulture, pruning and training- physiological basis of training and pruning, source and sink relationship, translocation of assimilates.

Unit IV: Physiology of seed development and maturation, seed dormancy and bud dormancy, causes and breaking methods in horticultural crops. Physiology of fruit growth and development, fruit setting, factors affecting fruit set and development, physiology of ripening of fruits-climatic and non-climacteric fruits. Physiology of fruits under post-harvest storage.

LIST OF EXPERIMENTS/PRACTICES:

- Estimation of photosynthetic potential of horticultural crops, leaf area index.
- growth analysis parameters including harvest index.
- bioassay of plant hormones.
- identification of synthetic plant hormones and growth retardants.
- preparations of hormonal solution and induction of rooting in cuttings.
- ripening of fruits and control of flower and fruit drop.
- Important physiological disorders and their remedial measures in fruits and vegetables.
- seed dormancy, seed germination and breaking seed dormancy with chemicals and growth regulators.

SST 202 Principles of Seed Production in Horticulture Crops 2 (1+1)

UnitI: Introduction, seed and its importance, difference between seed and grain, role of seed technology. Concept of seed quality and factors affecting to it. History and development of seed industry, new seed policy.

UnitII: National seed projects, classes of seeds, generation system of seed multiplication and agency involved in production and certification. General principles and methods of seed production in self and cross pollinated varieties and hybrids of horticultural crops.

UnitIII: Harvest and post harvest technology- principles of seed processing. Principles and methods of seed drying. Seed certification – purpose and phases of seed certification, field inspection and its importance, field and seed standards.

Unit IV: Duties and responsibilities of seed inspector and seed analyst, Seed storage- principles and methods, factors affecting the storage of certified, foundation, breeder seeds and germ plasmseeds. Seed deterioration- factors affecting seed deterioration and its control. Seed act and rules, important sections and rules. Seed control order.

LIST OF EXPERIMENTS/PRACTICES:

- Identification of seeds and varieties of important horticulture crops.
- Seed structure of dicot and monocot. Seed sampling and testing equipments.
- Testing of moisture, physical purity, germination, seedling evaluation and reporting the results.
- Viability test, vigour test, seed dormancy and breaking methods.
- Grow-out test, seed health test.
- Hybridization techniques-Emasculation and pollination.
- Field inspection- Identification of rogue and off types. Seed cleaning, seed treatment and seed packaging.
- Visit to the certified seed production plots, processing unit, storage unit, KSSC, KSSOCA, STL and private seed company.

DEPARTMENT OF NRM

SAC 302 Soil Fertility and Nutrient Management 2 (1+1)

Unit-I: Introduction to soil fertility and productivity- factors affecting; Essential plant nutrient elements- functions, deficiency systems, transformations (N, P, K & S) in soil and availability, Problematic Soils- Acid, calcareous.

Unit-II: salt affected soils and waterlogged soils– characteristics and management; Soil organic matter, humus formation, Importance of C:N ratio; Soil reaction and plant nutrition, Soil buffering capacity- Q-I relationships; Integrated plant nutrient management.

Unit-III: Soil fertility evaluation methods; Critical limits of plant nutrient elements- deficiency, hidden hunger, optimum concentration, luxury consumption and toxicity and their

remedies; Nutrient interactions; Fertilizers- classifications- straight, complex, mixed; Secondary and micronutrient fertilizer.

Unit-IV: Manufacturing processes and properties of commonly used fertilizers (Urea, DAP, SSP, MOP and SOP) and application methods; Fertilizer control order; Bio fertilizer; Organic Manures classification and importance; Nutrient use efficiency and management; Soil test crop response and targeted yield concept.

LIST OF EXPERIMENTS/ PRACTICES

- Analysis of soil for organic matter, available N,P, K Gypsum requirement of alkali soils.
- Lime requirement of acid soils.
- Sampling of organic manure and fertilizer for chemical analysis.
- Physical properties of organic manure and fertilizers.Total nitrogen in urea and farmyard manure.
- Estimation of ammonical nitrate nitrogen in N fertilizer.
- Estimation of water soluble P_2O_5, Ca and S in SSP, Lime and Gypsum.Estimation of Potassium in MOP/SOP and Zinc in zinc sulphate.
- Visiting of fertilizer testing laboratory.

AGRONOMY

AGR 302 Organic Farming 2(1+1)

Unit-I: Introduction, concept, relevance in present context; Organic production requirements; Biological intensive nutrient management-organic manures, Composting, vermicomposting, insitu vermicomposting.

Unit-II: Liquid organic manures-BDLM, Panchagavya, Jeevamrutha, Beejamrutha, vermiwash, vermicompost tea, compost tea etc., green manuring, recycling of organic residues, Biofertilizer.

Unit-III: Soil improvement and amendments; Integrated diseases and pest management – use of Biocontrol agents, Biopesticides pheromones, trap crops, bird perches.

Unit-IV: Weed management- biological and physical methods; Quality considerations, certification, labeling and accreditation procedures, marketing, exports.

LIST OF EXPERIMENTS/ PRACTICES

Preparation of panchagavya, Jeevamrutha, Beejamrutha, chilli, Onion and Garlic extract

- Preparation of Tobacco, Neem, Papaya, Lantana and custard leaf extract etc.,
- Preparation of NSKE. Analysis of Nutrient composition in organic manures.
- Raising of vegetable(Horticulture) crops organically through nutrient, diseases and pest management.
- Vermicomposting.
- vegetable and ornamental nursery raising; macro quality analysis, grading, packaging, postharvest management.
- Visit to organic farming farms.
- Visit to dairy, Sheep, Goat and poultry units to study resource allocation.
- Visit to Neem cake production units.

DEPARTMENT OF SOCIAL AND ALLIED SCIENCES

AEC 202 Horti-Business Management 2 (2+0)

Unit I: Farm management - definition, nature, characteristics and scope. Farm management principles and decision making, production function, technical relationships, cost concepts, curves and functions – factors, product, relationship – factors relationship, product relationship, optimum conditions, principles of opportunity cost-equi-marginal returns and comparative advantages, time value of money, economies of scale, returns to scale, cost of cultivation and production, break even analysis, decision making under risk and uncertainty.

Unit II: Farming systems and types.Budgeting as a tool for planning and control.Record keeping as a tool of control.Planning – meaning, steps and methods of planning, types of plan, characteristics of ideal plans. Organizations – forms of business organizations, organizational principles, division of labour.

Unit III: Unity of command, scalar pattern, job design, span of control responsibility, power, authority and accountability. Direction – guiding, leading, motivating, supervising, coordination – meaning, types and methods of controlling – evaluation, control systems and devices. Functional areas of management – operations management – physical facilities, implementing the plan, scheduling the work, controlling production in terms of quantity and quality.

Unit IV: Materials management – types of inventories, inventory costs, managing the inventories, economic order quantity (EOQ).Personnel management – recruitment, selection and training, job specialization.Marketing management – definitions, planning the marketing programmes, marketing mix and four P's.Financial management – financial statements and rations, capital budgeting. Project management - project preparation evaluation measures.

AEX 303 Agripreneurship Development and Communication Skills 1(1+0)

Theory

Agripreneurship: meaning, definition, nature, scope, importance, types, functions and dimensions, characteristics of successful entrepreneur, approaches to entrepreneurship, Factors affecting entrepreneurial growth - psychological factors, cultural factors, socialfactors, economic factors, personality factors, strategies to motivate youths towards entrepreneurship, Risks and barriers involved in entrepreneurship, Role of entrepreneurship in economic development,Women entrepreneurship-concept, importance, problems and remedies, strategies to motivate of womenentrepreneurs.

Overview of Indian social, political and economic systems and their implications for decision making by individual entrepreneurs.Social Responsibility and business ethics.Government schemes and incentives for promotion of entrepreneurship.Government policy on Small and Medium Enterprises(SMEs) / SSIs.

Communication Skills: meaning and process of communication, verbal and non-verbal communication; listening and note taking, writing skills, oral presentation skills, developing organizational and managerial skills, problem solving skills. field diary and lab record; indexing, footnote and bibliographic procedures, news writing, individual, group presentation, features of oral presentation, different types of presentation, evaluation of presentation, vocal communication techniques/cues, salient features of participation in seminars and conferences.

ANIMAL SCIENCE

ANS 202 Animal Science 2(1+1)

UnitI: Distribution of livestock and role in economy; Introductory animal husbandry; Breeds of livestock; Cattle, Buffalo, Sheep & Goat; Important traits, General management and feeding practices of animals.

UnitII: Handling of animals; Housing systems; Feed and fodders in livestock production; Common farm management practices including disinfection, isolation, quarantine and disposal of carcass; Diseases and parasite control and hygiene care.

UnitIII: Poultry- history and economic importance; Poultry breeds; Formation and structure of eggs; Important traits of poultry, Care and management of chicks, grower and layers/broiler.

UnitIV: Poultry Diseases, control and hygiene care. Fishery-inland and marine fish production concepts, management, etc.

LIST OF EXPERIEMENTS/PRACTICES

- Visit to livestock farms/demonstration centers.
- Breeds of cattle, buffalo, sheep & goat.
- Familiarization with body parts of animals.
- Handling and restraining of animals.
- Artificial Insemination.
- Feeding of livestock.
- Methods of identification.
- Milking methods; Record Keeping.
- Visit to the Poultry farm; Poultry breeds; Body parts of chicken.
- Housing, equipment.
- Methods of identification and sexing.
- Identification of diseases and control of parasites, Vaccination.
- Maintenance of farm records.

STS 101 Elementary Statistics 2(1+1)

Theory

Introduction to statistics, limitations of statistics.Basic concepts: Variable statistics, types and sources of data, classification and tabulation of data, construction of frequency distribution, tables, graphic representation of data, simple, multiple component and percentage, bar diagram, pie diagram, histogram, frequency polygon and frequency curve average and measures of location, mean, mode, median, geometric mean, harmonic mean, percentiles and quadrilles, for raw and grouped data. Dispersion: Range, standard deviation, variance, coefficient of variation for raw and grouped data. Probability: Basic concept, additive and multiplicative laws. Theoretical distributions, binominal, poison and normal distributions, sampling, basic concepts, sampling vs. complete enumeration parameter and statistic, sampling methods, simple random sampling and stratified random sampling. Tests of Significance: Basic concepts, tests for equality of means, and independent and paired t-tests, chi-square test for application of attributes and test for goodness of fit of Mendalian ratios. Correlation: Scatter diagram, correlation co-efficient and its properties, regression, fitting of simple linear regression, test of significance of correlation and regression coefficient.

Practical

Construction of frequency distribution table and its graphical representation, histogram, frequency polygon, frequency curve, bar chart, simple, multiple, component and percentage bar charts, pie chart, mean, mode for row and grouped data, percentiles, quadrille, and median for row and grouped data, coefficient of variation, ‘t’ test for independent, will equal and unequal variants, paired ‘t’ test, chi-square test for contingency tables and theoretical ratios, correlation and linear regression.

I. Students READY (Rural and Entrepreneurship Awareness Development Yojana)

Sl. No	Course No	Title	Credit Hours
01	HEL 401	ExperientialLearning in Horticulture	0+20
02	RHWE 402	Rural Horticultural Work Experience	0+20
		Total	**0+40**

HEL 401 Experiential Learning in Horticulture (0+20) [Each module 10 (0+10)]

Students will practically gain hands on expertise for a semester in **any two** options out of commercial horticulture, protected cultivation of high value horticulture crops, processing of fruits and vegetables for value addition, floriculture and landscape architecture, production of bioinputs-biofertilizers and biopesticides, mass multiplication of plants and bio-molecules through tissue culture, mushroom culture and bee keeping. In one semester students will be working with horticulture farmers/horticulture based industries in collaboration with developmental departments, extension functionaries, input suppliers, marketing and procurement functionaries, processing industries.

1. **Module-I. Commercial Horticulture**: Nursery production of fruit crops: Raising of rootstocks, grafting and budding of rootstocks, management of grafted plants, plant certification, packaging and marketing, quality control. Nursery production of ornamentals: Production of plantlets, production of potted plants, management and maintenance, sale and marketing. Protected cultivation of vegetables and flowers: Nursery raising/procurement and transplanting, management and maintenance of the crop, postharvest handling, quality control and marketing.

2. **Module-II. Protected Cultivation of High Value Horticulture Crops**: Visit to commercial polyhouses, Project preparation and planning. Specialised lectures by commercial export house. Study of designs of green- house structures for cultivation of crops. Land preparation and soil treatment. Planting and production: Visit to export houses; Market intelligence; Marketing of produce; cost analysis; Visit to export houses; Market intelligence; Marketing of produce; cost analysis; institutional management. Report writing and viva-voce.

3. **Module-III. Processing of Fruits and Vegetables for Value Addition**: Planning and execution of a market survey, preparation of processing schedule, preparation of project module based on market information, calculation of capital costs, source of finance, assessment of working capital requirements and other financial aspects, identification of sources for procurement of raw material, production and quality analysis of fruits and vegetables products at commercial scale, packaging, labelling, pricing and marketing of product.

4. **Module-IV. Floriculture and Landscape Architecture:** Preparation of project report, soil and water analysis, preparation of land and layout. Production and Management of commercial flowers. Harvesting and postharvest handling of produce. Marketing of produce, Cost Analysis, Institutional Management, Visit to Flower growing areas and Export House, Attachment with private landscape agencies. Planning and designing, site

analysis, selection and use of plant material for landscaping. Formal and informal garden, features, styles, principles and elements of landscaping. Preparation of landscape plans of home gardens, farm complexes, public parks, institutions, high ways, dams and avenues. Making of lawns, use of software in landscape. Making of bouquets, button hole, wreath, veni and gazaras, car and marriage palaces. Dry flower Technology (identification of suitable species, drying, packaging and forwarding techniques).

5. **Module-V. Bio-inputs: Bio-fertilizers and Bio-pesticides**: Isolation and pure culture establishment of fertilisers and bio-pesticides. Culture methods and substrates. Scale of methods for bio-fertilizers and bio-pesticides. Substrate preparation and mixing techniques. Quality analysis of bio-fertilizers and bio-pesticides. Testing the final product in small scale level. Storage, marketing and cost analysis of bio-fertilizers and pesticides.

6. **Module-VI. Mass Multiplication of Plants and Molecules through Tissue Culture**
Preparation of stock solutions of tissue culture media.Preparation of solid media and liquid media.Initiation of in vitro culture and multiplication (preparation of explant, inoculation and culturing) (crop to be selected). Sub-culturing, Rooting, Hardening and establishment, Initiation of callus cultures – suspension cultures, Induction of selected biomolecules in callus, Harvesting and extraction of biomolecule, Marketing and cost analysis.

7. **Module-VII. Mushroom Culture**: Construction cultivation room/structure and Disinfection. Compost preparation & pasteurization. Procurement of mother culture and spawn preparation. Procurement of casing soil and preparation for production. Mushroom seeding, Casing with soil and maintenance, Harvesting, processing, Grading, packing, marketing and Cost economics of mushroom culture.

8. **Module-VIII. Bee keeping**: Procurement and arrangement of bee keeping equipments. Location and collection of potent nectar yielding bee flora seeds from wild. Raising/ enriching the high nectar yielding bee flora in the campus. Location and hiving the natural bee colony from the wild. Establishing the apiary with suitable/favourable necessaries. Maintenance and multiplication of hived colonies. Management of natural enemies and diseases of bees. Maintenance of bee colonies during dearth and honey flow seasons. Harvesting and Processing of honey and bee wax. Marketing and cost analysis.

9. **Module-VII. Seed Production Annual Horticulture Crops.**
Book keeping of records and accounts, market demand of crop Varieties.Seed classes and its standards. Varieties and hybrid seed production techniques of okra / chilli, / tomato / brinjal/ onion, palak, coriander *etc* and their maintenance. Field inspections and harvesting.Seed processing techniques. Seed quality testing. Seed treatment, packaging, storage and marketing. Visit to farmer's seed production plots, public and private seed industries. Visit to Seed Processing Units/ Seed Testing Laboratory /Seed ware houses/ Cold storage units, *etc*. Economics of Seed Production.Report writing and submission.

RHW 402 Rural Horticultural Work Experience (0+20)

Student READY- Rural Horticulture Work Experience (RHWE) & Placement in Industries. This program will be taken up during the VIII semester for a duration of 24 weeks and will be allotted 0+20 credit hours. The program will include orientation, village stay, all India study tour, industrial placement program, report writing and final examination.

Sl. No	RHWE Programme	Duration
1	Orientation programme	2 week
2	Village stay at RSK/ Hobli level	12 weeks
3	All India study tour	2 weeks
4	Placement Programme	5 weeks
5	Report writing & final examination	3 weeks
	Total	**24 weeks**

1. Horticultural Extension Education & Project Work: 0+5

Extension programme planning and Execution, Leadership in rural areas and identification of leaders to use in Extension work, Participatory Rural Appraisal (PRA) techniques for efficient extension work, Extension teaching methods like General meeting, Farm and Home Visit, Group discussion meeting, Method Demonstration, Result Demonstration, Campaign, Farmers Training, Exhibition, Field Visits, Field days, Community work *etc*.

2. Vegetable Science: 0+1

Identifying the important commercial crops of the areas, their management practices followed by the farmers and gaps with new technologies, identification of under exploited vegetables of the area and creating awareness of their production potentiality, introduction of new non-traditional vegetable crops, establishment of nutritional gardens to the villagers, commercial vegetable nurseries, possibilities for introducing high-tech vegetable production systems.

3. Fruit Science: 0+1

Identifying the important fruit crops of the area and their orchard, layout and management, identification of problems associated with production, protection and marketing, including post-harvest management and processing. Possibilities of introducing new fruit crops suited to the areas.

4. Post-Harvest Technology: 0+1

Creating awareness programme of the losses due to present post harvest practices followed by the farmers. Creating awareness on storage of commercial horticultural produce. Demonstration with respect to value addition to the horticultural produce of the area (Jam, Jelly, Ketchup, Syrups & RTS).

5. Floriculture and Landscape Architecture: 0+1

Identifying the important commercial flower crops of the area and their production and management practices followed by the farmers. Creating awareness for improved practices of these flower crops to boost production both under open and protected conditions Demonstration of landscaping to the public premises like schools, temples, offices etc. Possibility of value addition and flower display, exhibition and flower arrangement for the locally important flower crops.

6. Medicinal and Aromatic Crops: 0+1

Identifying the important medicinal and aromatic crops suited to the area and demonstrating their production and management practices creating awareness for introduction of new medicinal and aromatic crops suited to the area processing methods of aromatic and medicinal crops.

7. Spices and Plantation Crops: 0+1

Identifying the important spice and plantation crops suited to the area and demonstrating their production and management practices, creating awareness for popularization the new spice crops and plantation crops suited to the areas for increasing production potentiality of these crops. Demonstrating the processing methods of spice crops of the area to the farmer, value added products of plantation crops and their demonstration.

8. Entomology: 0+1

Identification of local pest situations and pest management practices; Different types of nonchemical inputs used in pest management, Seed treatment with pesticides; Storage practices of farm produces to prevent insect damage; Local and traditional practices of pest management; Assessment of pest and natural enemy densities; Surveillance of pest and natural enemies, Importance of keeping record of purchases of the insecticides; Sources of information available for plant protection practices; Preparation of spray solution: Calculation of spray Volume; Harvesting and processing local plants and their products for pest management practices; Preparation of NSKE, vegetable oils and other plant sources and NPV; Use of pheromone traps for pest monitoring; Safe handling of pesticides and field release of parasites and predators; Use of nylon nets in nurseries; Root feeding and/ or stem Injection of pesticides; fumigants; rodent management. Apiculture, importance in crop pollination colony management and honey and byproducts.

9. Plant Pathology: 0+1

Plant disease details for major crops- a) Important diseases and their severity, b) Collection of diseased plants and plant parts; Disease management practices and their frequency; Use of fungicides, bactericides, antibiotics; Different types of non-chemical inputs used; Sources of information on plant protection practices. Information regarding storage practices; Information

on conventional or local practices of disease management; storage practices; Types of sprayers/dusters and their availability; Preparation of Bordeaux mixture; Cultural and biological management of soil borne disease; Seed treatment with fungicides/antibiotics; Preparation of spray solutions, proprietary fungicides and their application; Calculations of spray volume requirement –Preparation of NSKE and vegetable oils for spraying; Use of nylon nets in nurseries; Use of biological agents; Root feeding of fungicides; Hot water treatment and furadon or thimet application against nematodes.

10. Soil Science and Agril. Chemistry: 0+1

Collection and preparation of soil and water samples for analysis and recommendation based on results of analysis; STCR based methods of fertilizer application; Identification and amelioration of saline, sodic and acidic soils; Identification of nutrient deficiency/toxicity symptoms in crops and recommendations to rectify the problems, utilization of organic wastes; integrated nutrient management; Enhancement of fertilizer use efficiency, preparation of slow release fertilizers by using neem cake coated and gypsum blended urea; Scientific methods of enrichment of FYM by using weeds, rock phosphate and micronutrients.

11. Agronomy: 0+1

Collection of meteorological data, production of organic manures- selection of site for FYM/compost pit, FYM, different methods of compost production, vermicompost, liquid manures, oil cakes, green manuring in dryland agriculture, fertilizer management including secondary and micronutrients, integrated nutrient management, site specific nutrient management, integrated weed management, watershed management, soil and water conservation, integrated farming system, water management including micro irrigation, aerobic rice production, non-cash and low-cost inputs for crop production.

12. Agricultural Economics: 0+1

Introductory economic principles of practical application in micro one macro level problems faced by farmers in agriculture; Cost effectiveness of different agricultural technologies; Costing/ Valuing inputs including natural resources used in agriculture; Relative profitability of crops, livestock, horticulture, fishery enterprises; Risks and uncertainties involved in cultivation and marketing and mitigation strategies; Economic efficiency; Gaps in efficiency, productivity and how to address them. Problem statement in lay person's terms. Problem restated in economic terminology. The broad subject matter area which best describes the economic problem (classification of the problem) Gaps between targets and achievement and factors facilitating (Ex. Access to quality inputs and markers) solutions at farm Solutions at program/policy levels. Apprising the selected farmers regarding the economic solutions to the problems identified covering economic efficiency, pricing, marketing, group marketing,

backward and forward linkages, new enterprises, synergies, diversification, risk aversion strategies.

Concept of Agricultural Marketing, Significance of Marketing, Marketing function, Physical, Exchange and facilitative, Different types of Agricultural Markets, Methods of Sales of Agricultural Commodities, APMC & their objectives, Different Government Schemes in Agricultural Marketing, Marketing Institutions. Grading of Agricultural Commodities, Importance, Types, Scientific Marketing of Agricultural Commodities, Standards for Manufacture, Recent Advances in Agricultural Marketing.

13. Seed Science and Technology: 0+1

Different sources of seed and their characteristics (BS, FS, CS and TL seeds). Status of Seed replacement in RHWE villages (vegetables, flowers, Fruit and spices crops).Involvement of seed producing organization in seed production; Government sector, Private sector, Co-operative sector. Techniques followed in seed production: Hybrid, High yielding varieties and horticulture crops. Post harvest technology followed in seed crops: Method of harvest, Method of threshing. Method of pre-cleaning, Method of drying and packing, Analysis of post harvest losses at various levels. Analysis of seed quality of farmers saved seed: Collection of seed from farmer, Subjecting for seed quality parameters like G, P, M, Result communication. Demonstration of different class of seed and their identification: Breeder seed, Foundation seed, Certified seed, Truth fully labeled seed. Visit to seed processing unit: Study various activities, Involving in processing operations like grading, cleaning, storage, treating, packaging etc. Seed treatment techniques.Seed marketing and seed distribution system.

14. Biotechnology and Crop Improvement/ Crop Physiology 0+1

Introduction of latest hybrids/ varieties suited to the area. Advantages of tissue culture techniques and their practical utility with respect to horticultural crops.I.P.R. issues, and farmers right.

Nutrient elements and their importance in growth and development of crops.Deficiency and toxicity symptoms and their identification in the field and corrective measures.Foliarnutrition.Plant growth regulators and their role in plant growth and development.Use of plant growth regulators in agriculture, horticulture, forestry and industry. Demonstration of use of plant growth regulators to induce rooting of cuttings, induction of regular flowering prevent/reduce flower and fruit drops, increase in fruit size breaking seed, dormancy, fruit ripening. Importance of seed hardening and demonstration.

15. Agril Engineering: 0+1

Study on improved primary and secondary tillage implements, improved seed drill, seed-cum-fertilizer drill, planters and transplanters, improved intercultural implements like hoes, hand weeder and ridger, high-tech plant protection equipments like sprayers and dusters, improved sickles, harvesters and reapers; power operated winnowers, threshers; dryers, cleaners, graders

and improved storage bins, coconut climbers, coconut dehusker, groundnut decorticator, arecanut decorticators and maize sheller, soil and water conservation structures.

16. Agril Microbiology: 0+1

Biofertilizers usage in different crops: a) *Rhizobium* inoculation in leguminous cops b) *Azotobacter* inoculation in cereals c) *Azospiriullum* inoculation in paddy and ragi d) *Gluconobacter* inoculation in sugarcane e) Use of phosphorus solubilizing microorganisms in crop production f) Azolla and its cultivation, its importance in agriculture and husbandry g) PGPR microorganisms, AM fungi and their importance in agriculture. Use of biofertilizers in horticulture and sericulture crops Mushroom cultivation, fast organic matter decomposers and compost enriching microbes. Microbial bio-control agents like *Trichoderma*spp, Pseudomonas spp and Bacillus spp.

Evaluation of Experiential Learning (EL) / Hands on Traning (HoT) Programme

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

EVALUATION OF STUDENT READY PROGRAM

- Students shall be evaluated component-wise under village attachment/ agro-industrial attachment/ hands on training/skill development training/experiential learning/student projects.

- Each College of the University will designate a Student READY Program Coordinator and component wise evaluation committees. These committees will evolve a method of evaluation depending upon the component undertaken giving due weightage to the observations made by the Scientists/Agroindustrial Officer and the Program Coordinator with whom they are attached.
- Since the Credit Hours allotted to the Student READY program are gradial, the minimum condition of attendance and grading system will apply for the program as will be applicable to other courses.
- It is expected that at the end of Student READY program, the students should gain competency for entrepreneurship, which should be innovative and creative in nature. The evaluation committee must ensure percentage increase in this competency at the end & successful organization of all Student READY programs.

Educational Tour

Visits to national/state research institutes or centers, visit to state extension centers, visit to state Agril. Universities, visit to Govt./Private seed/processing industries, visit to progressive farmers fields and grading shall be done as Satisfactory/ Non Satisfactory.