KALASALINGAM
ACADEMY OF RESEARCH & EDUCATION
(DEEMED TO BE UNIVERSITY)
Under sec. 3 of UGC Act 1956. Accredited by NAAC with "A" Grade

KALASALINGAM SCHOOL OF AGRICULTURE AND HORTICULTURE

DEPARTMENT OF AGRICULTURE

B. Sc. (Hons.) Agriculture

Curriculum and Syllabus
2022

KALASALINGAM SCHOOL OF AGRICULTURE AND HORTICULTURE
KALASALINGAM ACADEMY OF RESEARCH AND EDUCATION
(Deemed to be University)
Krishnankoil - 626126, Virudhunagar District.
(Website: www.kalasalingam.ac.in)

KALASALINGAM ACADEMY OF RESEARCH AND EDUCATION

VISION

To be a Center of Excellence of International Repute in Education and Research

MISSION

To Produce Technically Competent, Socially Committed Technocrats and Administrators through Quality Education and Research

KALASALINGAM SCHOOL OF AGRICULTURE AND HORTICULTURE

VISION

To meet an expanding demand of Agriculture and Horticulture Specialists to promote food security and food safety on National and Global scale.
To create a knowledge base in Agriculture, Horticulture and Allied Sciences relevant to make the Second Green Revolution a reality especially in dry land pockets of India.
To prepare the Young Generation ready to face challenges of increasing the production and income of future farms.

MISSION

To set the career trajectory of Agriculture and Horticulture professionals by imparting theoretical knowledge and hands-on skills in Agriculture, Horticulture and allied sciences by way of well-defined degree courses in each discipline.

KALASALINGAM
ACADEMY OF RESEARCH AND EDUCATION
(DEEMED TO BE UNIVERSITY)
Under sec. 3 of UGC Act 1956. Accredited by NAAC with "A" Grade
Anand Nagar, Krishnankoil - 626126. Srivilliputtur (Via), Virudhunagar (Dt), Tamil Nadu | info@kalasalingam.ac.in | www.kalasalingam.ac.in

KALASALINGAM SCHOOL OF AGRICULTURE AND HORTICULTURE

DEPARTMENT OF AGRICULTURE

PROGRAMME: B.Sc. (Hons.) AGRICULTURE

VISION

To be a Centre of Excellence in Education and Research in the field of Agriculture to meet the global requirement of industry and society.

MISSION

To impart quality education and research in Agriculture through excellence in teaching-learning process and state of art facilities to the students.

To inculcate students with ethical values and innovative ideas for future leadership in agriculture-based industries and to face societal challenges.

PROGRAMME OUTCOMES (PO)

PO1: **Domain Knowledge:** Apply the knowledge of biology, natural science, physics and chemistry fundamentals to the solution of day to day problems in agricultural production.

PO2: **Problem analysis:** Review, identify, formulate and analyze problems in the agricultural production and post production systems.

PO3: **Problem solutions:** Design solutions even for complex but specific problems of the farming system with due consideration of public health and safety, cultural, societal, and environmental issues of the offered solution.

PO4: **Conduct surveys and investigations:** Use research-based knowledge and methods to synthesize and interpret available information to make viable conclusions.

PO5: **Usage of Modern Tools:** Create, select, and apply appropriate techniques, resources, and modern tools and software for prediction and forecast of outcomes based on the information generated.

PO6: **Societal role:** Apply reasoning to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional practice in agriculture.

PO7: **Environment and Sustainability:** Understand the impact of the offered professional scientific solutions on societal and environmental issues and implement corrective measures towards sustainable development.

PO8: **Ethics:** Apply ethical principles and commit themselves to responsibilities and norms of professional practice.

PO9: **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: **Communication:** Comprehend and write concise documents, make effective presentations, and communicate clear instructions in the context of challenges and problems of Agriculture

PO11: **Project Management and Finance:** Demonstrate knowledge and understanding of the scientific and management principles in the required solutions, as an individual or a leader in a team of multidisciplinary nature.

PO12: **Life-long learning:** Recognize the need for preparing oneself continually to engage in life-long learning of the science.

PROGRAMME SPECIFIC OUTCOMES (PSO)

- An ability to identify the problems in Agriculture and allied sectors.
- An ability to review, analyze, plan, design and solve the problems in agriculture and allied sectors through hands on training.
- An ability to adopt modern techniques to solve agro-industrial and societal problems.
- An ability to serve as a member of a multidisciplinary team.

PROGRAMME EDUCATIONAL OUTCOMES (PEO)

The PEOs are aligned with the Vision and Mission of KSAH and the Programme.

- Graduates from the B.Sc., (Hons.) Agriculture programme would take up responsibilities to serve and feed the society.
- Graduates trained to initiate research and implement innovative ideas in the field of Agriculture and allied sectors.
- Graduates pursue advanced techniques in farming and post-harvest practices.
- Graduates acquire good communication skills and ethics.
- Graduates would perform well in public and private sectors with good competence level and also pursue knowledge and get equipped for Service Commission Examinations.

KALASALINGAM
ACADEMY OF RESEARCH & EDUCATION
(DEEMED TO BE UNIVERSITY)
Under sec. 3 of UGC Act 1956. Accredited by NAAC with "A" Grade

KALASALINGAM SCHOOL OF AGRICULTURE AND HORTICULTURE
DEPARTMENT OF AGRICULTURE
B. Sc. (Hons.) AGRICULTURE
CURRICULUM STRUCTURE

DISCIPLINE-WISE COURSE

Agronomy

S. No.	SUB. CODE	SUBJECT NAME	T	P	C
1	AGR101	Fundamentals of Agronomy (2+1)	2	1	3
2	AGR103	Introductory Agro-meteorology & Climate Change (1+1)	1	1	2
3	AGR201	Crop Production Technology – I (Kharif crops) (1+1)	1	1	2
4	AGR202	Crop Production Technology – II (Rabi crops) (1+1)	1	1	2
5	AGR203	Farming System and Sustainable Agriculture (1+1)	1	1	2
6	AGR301	Rainfed Agriculture and Watershed Management (1+1)	1	1	2
7	AGR322	Practical Crop Production - I (Kharif crops) (0+2)	0	2	2
8	AGR304	Principles of Organic Farming (1+1)	1	1	2
9	AGR325	Practical Crop Production - II (Rabi crops) (0+2)	0	2	2
Total			8	11	19

Genetics and Plant Breeding

S. No.	SUB. CODE	SUBJECT NAME	T	P	C
1	PBG101	Introduction to Agricultural Botany (1+1)	1	1	2
2	PBG103	Fundamentals of Genetics (2+1)	2	1	3
3	PBG201	Fundamentals of Plant Breeding (2+1)	2	1	3
4	SST202	Principles of Seed Technology (1+2)	1	2	3
5	PBG301	Crop Improvement (2+1)	2	1	3
			8	6	14

Soil Science and Agricultural Chemistry

S. No.	SUB. CODE	SUBJECT NAME	T	P	C
1	SAC101	Fundamentals of Soil Science (2+1)	2	1	3
2	SAC211	Problematic Soils and their Management (2+0)	2	0	2
3	SAC301	Manures, Fertilizers and Soil Fertility Management (2+1)	2	1	3
4	NST111	Fundamentals and Applications of Nano–technology (1+0)	1	0	1
Total			7	2	9

Entomology

S. No.	SUB. CODE	SUBJECT NAME	T	P	C
1	AEN201	Fundamentals of Entomology (2+1)	2	1	3
2	AEN203	Management of Beneficial and Harmful insects (2+1)	2	1	3
3	AEN301	Pest of field crops, stored grains and their management (1+1)	1	1	2
4	AEN303	Pest of Horticultural crops and their management (2+1)	2	1	3
Total			7	4	11

Agricultural Economics

S. No.	SUB. CODE	SUBJECT NAME	T	P	C
1	AEC101	Fundamentals of Agricultural Economics (1+1)	1	1	2
2	AEC201	Agricultural Finance and Cooperation (2+1)	2	1	3
3	AEC202	Agricultural Marketing Trade and Prices (2+1)	2	1	3
4	AEC301	Farm Management, Production and Resource Economics (1+1)	1	1	2
Total			6	4	10

Plant Pathology

S. No.	SUB. CODE	SUBJECT NAME	T	P	C
1	PAT201	Fundamentals of Plant Pathology (2+1)	2	1	3
2	PAT203	Principles of Integrated Plant Disease Management (1+1)	1	1	2
3	PAT301	Diseases of Field and Horticultural Crops and their Management-I (2+1)	2	1	3
4	PAT303	Diseases of Field and Horticultural Crops and their Management-II (2+1)	2	1	3
Total			7	4	11

Horticulture

S. No.	SUB. CODE	SUBJECT NAME	T	P	C
1	HOR101	Fundamentals of Horticulture (1+1)	1	1	2
2	HOR102	Production Technology for Fruits and Plantation Crops (1+1)	1	1	2
3	HOR201	Production Technology for Vegetables and Spices (1+1)	1	1	2
4	HOR202	Production Technology for Ornamental Crops, MAPs and Landscaping (1+1)	1	1	2
5	HOR301	Post-harvest Management and Value Addition of Fruits and Vegetables (1+1)	1	1	2
6	HOR302	Precision Farming and Protected Cultivation (1+1)	1	1	2
Total			6	6	12

Food Science and Technology

S. No.	SUB. CODE	SUBJECT NAME	T	P	C
1	FSN101	Principles of Food Science and Nutrition (1+1)	1	1	2

Agricultural Extension and Communication

S. No.	SUB. CODE	SUBJECT NAME	T	P	C
1	AEX111	Rural Sociology and Educational Psychology (2+0)	2	0	2
2	AEX103	Fundamentals of Agricultural Extension Education (2+1)	2	1	3
3	AEX201	Communication Skills and Personality Development (1+1)	1	1	2
4	AEX301	Entrepreneurship Development and Business Communication (1+1)	1	1	2
5	AEX421	Rural Agricultural Work Experience and Agro-industrial Attachment (RAWE &AIA) (0+20)	0	20	20
Total			6	23	29

Agri-Business Management

S. No.	SUB. CODE	SUBJECT NAME	T	P	C
1	ABM421	Modules for Skill Development and Entrepreneurship-I (0+20)	0	10	10
2	ABM422	Modules for Skill Development and Entrepreneurship-II (0+20)	0	10	10
Total			**0**	**0**	**20**

Biochemistry/Physiology/Microbiology/Environmental sciences

S. No.	SUB. CODE	SUBJECT NAME	T	P	C
1	FOR101	Introduction to Forestry	1	1	2
2	BIC101	Fundamentals of Plant Biochemistry and Biotechnology	2	1	3
3	AGM102	Agricultural Microbiology	1	1	2
4	CRP101	Fundamentals of Crop Physiology	2	1	2
5	ENS201	Environmental Studies and Disaster Management	2	1	3
Total			**8**	**5**	**13**

Agricultural Engineering

S. No.	SUB. CODE	SUBJECT NAME	T	P	C
1	SWE201	Introductory Soil and Water Conservation Engineering (1+1)	1	1	2
2	FMP201	Farm Machinery and Power (1+1)	1	1	2
3	AGE301	Post-harvest Management of Field crops (1+1)	1	1	2
4	ERG301	Renewable Energy and Green Technology (1+1)	1	1	2
Total			4	4	8

Statistics, Computer and IPR

S. No.	SUB. CODE	SUBJECT NAME	T	P	C
1	STA201	Statistical Methods and Designs (1+1)	1	1	2
2	COM301	Agri-Informatics (1+1)	1	1	2
3	AEC312	Intellectual Property Rights (1+0)	1	0	1
Total			3	2	5

Animal Production

S. No.	SUB. CODE	SUBJECT NAME	T	P	C
1	AMP201	Livestock and Poultry Management (2+1)	2	1	3
Total			2	1	3

Language

S. No.	SUB. CODE	SUBJECT NAME	T	P	C
1	ENG101	Comprehension and Communication Skills in English (1+1)	1	1	2
2	TAM121/ ENG123	தமிழ் இலக்கியங்களில் வேளாண்மையும் அறிவியல் தமிழ் பயன்பாடும்: /Developmental Education (0+1)	0	1	1
Total			1	2	3

Remedial Course

S. No.	SUB. CODE	SUBJECT NAME	T	P	C
1	AGR112	Agricultural Heritage (1+0)	1	0	1
2	MAT111	Elementary Mathematics (2+0)	2	0	2
Total			3	0	3

Non-Credit courses

S. No.	SUB. CODE	SUBJECT NAME	T	P	C
1	NCC121/NSS122	NCC/ NSS (0+1)	0	1*	1
2	PED121	Physical Education (0+1)	0	1*	1
3	AEX114	Human Value & Ethics (1+0)	1*	0	1*
4	AGR224	Short Tour (0+1)	0	1*	1*
5	AEX423	Educational Tour (0+1)	**0**	**1***	1*
Total			**1***	**4***	5*

KALASALINGAM
ACADEMY OF RESEARCH & EDUCATION
(DEEMED TO BE UNIVERSITY)
Under sec. 3 of UGC Act 1956. Accredited by NAAC with "A" Grade

KALASALINGAM SCHOOL OF AGRICULTURE AND HORTICULTURE
DEPARTMENT OF AGRICULTURE
B. Sc. (Hons.) Agriculture
SEMESTER WISE DISTRIBUTION OF COURSES

SEMESTER I

S. No.	SUB. CODE	SUBJECT NAME	T	P	C
1	AGR101	Fundamentals of Agronomy (2+1)	2	1	3
2	AEX111	Rural Sociology and Educational Psychology (2+0)	2	0	2
3	PBG101	Introduction to Agricultural Botany (1+1)	1	1	2
4	MAT111	Elementary Mathematics (2+0)	2	0	2
5	ENG101	Comprehension and Communication Skills in English (1+1)	1	1	2
6	AGR112	Agricultural Heritage (1+0)	1	0	1
7	SAC101	Fundamentals of Soil Science (2+1)	2	1	3
8	HOR101	Fundamentals of Horticulture (1+1)	1	1	2
9	FOR101	Introduction to Forestry (1+1)	1	1	2
10	BIC101	Fundamentals of Plant Biochemistry and Biotechnology (2+1)	2	1	3
11	NCC121/ NSS122	NCC/ NSS (0+1)	0	1*	1*
12	PED121	Physical Education (0+1)	0	1*	1*
13	TAM121/ ENG123	தமிழ் இலக்கியங்களில் வேளாண்மையும் அறிவியல் தமிழ் பயன்பாடும் /Developmental Education (0+1)	0	1	1
Total			15	8+2*	23+2*

***Non Credit courses**

SEMESTER II

S. No.	SUB. CODE	SUBJECT NAME	T	P	C
1	PBG103	Fundamentals of Genetics (2+1)	2	1	3
2	AGM102	Agricultural Microbiology (1+1)	1	1	2
3	AEN101	Fundamentals of Entomology (2+1)	2	1	3
4	AGR103	Introductory Agro-meteorology & Climate Change (1+1)	1	1	2
5	CRP101	Fundamentals of Crop Physiology (2+1)	2	1	3
6	AEC101	Fundamentals of Agricultural Economics (1+1)	1	1	2
7	AEX103	Fundamentals of Agricultural Extension Education (2+1)	2	1	3
8	HOR102	Production Technology for Fruits and Plantation Crops (1+1)	1	1	2
9	NST111	Fundamentals and Applications of Nano–technology (1+0)	1	0	1
10	FSN101	Principles of Food Science and Nutrition (1+1)	1	1	2
11	AEX114	Human Value & Ethics (1+0)	1*	0	1*
Total			14+1*	9	23+1*

***Non Credit courses**

SEMESTER III

S. No.	SUB. CODE	SUBJECT NAME	T	P	C
1	AGR201	Crop Production Technology – I (Kharif crops) (1+1)	1	1	2
2	SAC211	Problematic Soils and their Management (2+0)	2	0	2
3	PBG201	Fundamentals of Plant Breeding (2+1)	2	1	3
4	PAT201	Fundamentals of Plant Pathology (2+1)	2	1	3
5	SWE201	Introductory Soil and Water Conservation Engineering (1+1)	1	1	2
6	HOR201	Production Technology for Vegetables and Spices (1+1)	1	1	2
7	AEC201	Agricultural Finance and Cooperation (2+)	2	1	3
8	FMP201	Farm Machinery and Power (1+1)	1	1	2
9	ENS201	Environmental Studies and Disaster Management (2+1)	2	1	3
10	AMP201	Livestock and Poultry Management (2+1)	2	1	3
Total			16	9	25

SEMESTER IV

S. No.	SUB. CODE	SUBJECT NAME	T	P	C
1	AGR202	Crop Production Technology – II (Rabi crops) (1+1)	1	1	2
2	SST202	Principles of Seed Technology (1+2)	1	2	3
3	AGR203	Farming System and Sustainable Agriculture (1+1)	1	1	2
4	PAT203	Principles of Integrated Plant Disease Management (1+1)	1	1	2
5	AEN203	Management of Beneficial and Harmful insects (2+1)	2	1	3
6	HOR202	Production Technology for Ornamental Crops, MAPs and Landscaping (1+1)	1	1	2
7	AEC202	Agricultural Marketing Trade and Prices (2+1)	2	1	3
8	AEX201	Communication Skills and Personality Development (1+1)	1	1	2
9	STA201	Statistical Methods and Designs (1+1)	1	1	2
10	AGR224	Short Tour (0+1)	0	1*	1*
11		Elective Course (2+1)	2	1	3
Total			13	11+1*	24+1*

***Non-credit courses**

SEMESTER V

S. No.	SUB. CODE	SUBJECT NAME	T	P	C
1	AGR301	Rainfed Agriculture and Watershed Management (1+1)	1	1	2
2	AGR322	Practical Crop Production - I (Kharif crops) (0+2)	0	2	2
3	PBG301	Crop Improvement (2+1)	2	1	3
4	AEN301	Pest of field crops, stored grains and their management (1+1)	1	1	2
5	PAT301	Diseases of Field and Horticultural Crops and their Management-I (2+1)	2	1	3
6	SAC301	Manures, Fertilizers and Soil Fertility Management (2+1)	2	1	3
7	HOR301	Post-harvest Management and Value Addition of Fruits and Vegetables (1+1)	1	1	2
8	AEX301	Entrepreneurship Development and Business communication (1+1)	1	1	2
9		Elective course (1+1)	1	1	2
Total			11	10	21

SEMESTER VI

S. No.	SUB. CODE	SUBJECT NAME	T	P	C
1	AGR304	Principles of Organic Farming (1+1)	1	1	2
2	AGR325	Practical Crop Production - II (Rabi crops) (0+2)	0	2	2
3	AGE301	Post-harvest Management of Field Crops (1+1)	1	1	2
4	HOR302	Precision Farming and Protected Cultivation (1+1)	1	1	2
5	AEN303	Pest of Horticultural crops and their management (2+1)	2	1	3
6	PAT303	Diseases of Field and Horticultural Crops and their Management-II (2+1)	2	1	3
7	COM301	Agri-Informatics (1+1)	1	1	2
8	AEC301	Farm Management, Production and Resource Economics (1+1)	1	1	2
9	AEC312	Intellectual Property Rights (1+0)	1	0	1
10	ERG301	Renewable Energy and Green Technology (1+1)	1	1	2
11		Elective Course (1+1)	1	1	2
			12	11	23

SEMESTER-VII

S. No.	SUB. CODE	SUBJECT NAME		T	P	C
1.	AEX421	Rural Agricultural Work Experience and Agro-industrial Attachment (RAWE &AIA) (0+20)				
		Activities	No. of weeks			
		General orientation & On campus training by different faculties	1	0	14	14
		Village attachment	8			
		Unit attachment in University / College / KVKs / Research Stations	5			
		Plant Clinic	2	0	02	02
		Agro-Industrial Attachment	3	0	04	04
		Project Report Preparation, Presentation and Evaluation	1			
		Total weeks for RAWE & AIA	**20**			
2	AEX423	Educational Tour (0+1)		**0**	**1***	**1***
		Total		**0**	**20+1***	**20+1***

***Non-credit courses**

- **Agro-Industrial Attachment:** The students would be attached with the agro-industries for a period of 10 weeks to get an experience of the industrial environment and working**.**

Village Attachment Training Programme

Sl. No.	Activity	Duration
1	Orientation and Survey of Village	1 week
2	Agronomical Interventions	1 week
3	Plant Protection Interventions	1 week
4	Soil Improvement Interventions – (Soil sampling and testing)	1 week
5	Fruit and Vegetable Production Interventions	1 week
6	Animal Production Interventions	1 week
7	Extension and Transfer of Technology Activities	1 week

RAWE Component –II

Agro Industrial Attachment

- Students shall be placed in Agro-and Cottage industries and Commodities Boards for 10 weeks.
- Industries include Seed/Sapling production, Pesticides-insecticides, Post harvest-processing-value addition, Agri-finance institutions, etc.

Activities and Tasks during Agro-Industrial Attachment Programme

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

Evaluation of RAWE Programme

Attendance: Minimum attendance – 85%.

Records: Students would complete the record work/report writing/presentations, etc. based on daily field observations recorded in notebooks and weekly diaries maintained by them.

Evaluation Procedure: Students shall be evaluated component-wise under village attachment and agro-industrial attachment. The respective component in-charge instructor(s), agro-industrial official and course coordinator will evaluate the students as under:

ACTIVITY		Max. Marks
1. Village attachment training		
a.	KVK/ARS/NGO scientist	50
b.	Report Preparation	10

c.	University Committee (Presentation and Viva-voce)	40
2. Industrial attachment training		
a.	Industry officials	50
b.	Report Preparation	10
c.	University Committee (Presentation and Viva-voce)	40

Assessment Parameters (RAWE & AIA)

	Parameters	**Marks (%)**
A	**Village Attachment**	
	Regularity	10
	Initiative and creativity	10
	General conduct and discipline	10
	Work performance	20
B.	**Industrial Attachment**	
	Initiative and compliance	10
	General conduct and discipline	10
	Project planning and implementation	10
	Work performance	20

SEMESTER VIII

S. No.	**SUB. CODE**	**SUBJECT NAME**	**T**	**P**	**C**
1.	ABM421	Modules for Skill Development and Entrepreneurship-I (0+10)	0	10	10
2.	ABM422	Modules for Skill Development and Entrepreneurship-II (0+10)	0	10	10
Total			**0**	**20**	**20**

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.

S. No.	**Title of the module**	**T**	**P**	**C**
1.	Production Technology for Bioagents and Biofertilizers	0	10	10
2.	Seed Production and Technology	0	10	10
3.	Mushroom Cultivation Technology	0	10	10
4.	Soil, Plant, Water and Seed Testing	0	10	10
5.	Poultry Production Technology	0	10	10
6.	Commercial Horticulture	0	10	10
7.	Floriculture and Landscaping	0	10	10
8.	Food Processing	0	10	10
9.	Agricultural Waste Management	0	10	10
10.	Organic Production Technology	0	10	10
11.	Commercial Sericulture	0	10	10
12.	Commercial Bee Keeping	0	10	10

Evaluation of Experiential Learning Programme/HOT

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

ELECTIVE COURSES

S. No.	Sub. Code	Courses	T	P	C
1.	ARM201	Agri-Business Management (2+1)	2	1	3
2.	HOR203	Landscaping (2+1)	2	1	3
3.	AEX203	Agricultural Journalism (2+1)	2	1	3
4.	SAC202	Agrochemicals (2+1)	2	1	3
5.	PBG302	Commercial Plant Breeding (1+1)	1	1	2
6.	HOR303	Protected Cultivation (1+1)	1	1	2
7.	HOR304	Hi-tech Horticulture (1+1)	1	1	2
8.	AEN303	Bio-pesticides and Bio-fertilizers (1+1)	1	1	2
9.	ABT301	Micro Propagation Technologies (1+1)	1	1	2
10.	AGR306	Weed and Water Management (1+1)	1	1	2
11.	AGR307	System Simulation and Agro-Advisory (1+1)	1	1	2
12.	FSN301	Food Safety and Standards (1+1)	1	1	2

TOTAL CREDIT HOURS

S. No.	SEMESTER	T	P	C
1.	SEMESTER I	15	8+2*	23+2*
2.	SEMESTER II	14+1*	9	23+1*
3.	SEMESTER III	16	9	25
4.	SEMESTER IV	13	11+1*	24+1*
5.	SEMESTER V	11	10	21
6.	SEMESTER VI	12	11	23
7.	SEMESTER VII	0	20+1*	20+1*
8.	SEMESTER VIII	0	20	20
	TOTAL	**81+1***	**98+4***	**179+5***

Total credits with Non-Credit courses (5 credits) as recommended by ICAR = 179+5* =184

AGR101	FUNDAMENTALS OF AGRONOMY	T	P	C
		2	1	3

THEORY

UNIT I – Agriculture Growth and Development

Agriculture - Definition - Importance and scope - Branches of agriculture - Evolution of man and agriculture - History of agricultural development in the World and India. Development of scientific Agriculture - National and International Agricultural Research Institutes in India - Indian agriculture.

UNIT II – Agronomy – Climate, Crops and Soil

Agronomy - Definition - Importance - Meaning and scope - Agro-climatic zones of Tamil Nadu - Agro ecological zones of India - Crops and their classification - Economic and agronomic - Major crops of India and Tamil Nadu- Major soils of Tamil Nadu

UNIT III – Land preparation and sowing

Factors affecting crop production - climatic - edaphic - biotic - physiographic and socio - economic factors. Tillage - Definition - Types - Objectives - Modern concepts of tillage - Main field preparations - Seeds - seed rate - sowing methods - Crop establishment methods - Planting geometry

UNIT IV – Weed and Nutrient Management

After cultivation -Thinning - Gap filling - Weeds - Definition – Importance of weeds, classification, crop weed competition - Weed control methods – physical, chemical, biological and IWM - Manures and fertilizers (organic, in-organic, green manure) - time and method of application

UNIT V – Concepts of Agriculture

Irrigation - Principles and concepts - Cropping patterns and cropping systems – Crop management technologies in problematic areas, harvesting and threshing of crops – Sustainable agriculture - integrated farming systems - Organic agriculture - Principles and concepts - Dry farming - Principles and concepts.

PRACTICAL SCHEDULE

1. Visit to college wetland farm and study of farm features and field operations of wetland
2. Visit to college garden land and dry land farm and study of farm features and field operations of garden land and dry land
3. Identification of crops and seeds.
4. Study of seed treatment practices.
5. Computation of seed rate and plant population.
6. Study of tillage implements; practicing ploughing, puddling operations,
7. Practicing different methods of sowing and planting.
8. Study and practicing inter-cultivation implements; Practicing fertilizer applications - Participation in ongoing field operations.
9. Identification of manures and fertilizers. Fertilizer calculations.
10. Methods of fertilizer applications- broadcasting, placement, foliar application and fertigation.

11. Identification of weeds in crops – skill development on different weed management practices.
12. Herbicide formulation and identification- Herbicide label information.
13. Methods of Irrigation and skill development on surface methods
14. Practicing different methods of Harvesting
15. Practising and skill development on Ongoing field operations.
16. Visit to nearby Agricultural Research station / KVKs

REFERENCE BOOKS

1. Yellamananda Reddy, T. and G.H. Sankara Reddi. 2022. Principles of Agronomy. Kalyani Publishers, New Delhi.
2. Palaniappan, S.P. and B. Balasubramaniam. 2021. Principles of Agronomy. The Bangalore Printing and Publishing Co. Ltd., Bangalore.
3. ICAR. 2011. Handbook of Agriculture. Indian Council of Agricultural Research, New Delhi.

AEX111	RURAL SOCIOLOGY AND EDUCATIONAL PSYCHOLOGY	T	P	C
		2	0	2

THEORY

UNIT I Introduction to Sociology, Social groups, Culture and Social Values

Sociology and Rural Sociology – definitions; Society – rural and urban, characteristics, differences and relationships, important characteristics of Indian rural society; Social groups – definition, classification, role of social groups in extension; Culture – concept, cultural traits, characteristics, functions, Ethnocentrism, Acculturation, Cultural lag, Cultural diffusion, Marginal man, Ethos.

UNIT II Social structure, Social Stratification and Migration

Social Values – definition, values and norms, characteristics of values, functions: Structure of Rural Society – patterns of rural settlement, social institutions, social organizations, ecological entities (Region, Community, Neighbourhood, Family); Social Stratification – concept, functions, types, differences between class and caste system; Migration – concept, factors influencing migration.

UNIT III Social Control and Social Customs

Social Control – definition; Customs – conventions, folkways, mores, rituals, taboos; Social Interaction Process – definition, basic social processes; Social Change – concept, factors influencing social change, indicators of social change; Social development.

UNIT IV Educational Psychology and Teaching Learning Process

Education – Psychology – Educational Psychology – Social Psychology – definitions, importance in extension; Basic principles of Human behaviour – Sensation, Attention, Cognitive, affective, psychomotor domain Perception – meaning, characteristics; Intelligence – concept, types, measurement, factors affecting intelligence; Personality – concept, types, measurement, factors influencing personality; Teaching–Learning Process – Teaching – definition, meaning, principles of teaching, steps in extension teaching; Learning – definition, meaning, principles, types of learning, learning situation.

UNIT V Motivation, Attitude

Motivation – concept, Maslow's hierarchy of needs, intrinsic and extrinsic motivation, techniques of motivation, importance in extension; Attitude – concept, factors influencing the development of attitudes.

REFERENCE BOOKS

1. Bhatia, H.R. 1968. *General Psychology*. Oxford and IBH Publishing Company, NewDelhi.
2. Chitambar, J.B. 1977. *Introductory rural sociology* .Wiley Eastern Ltd, New Delhi.
3. Desai, A.R. 2003. *Rural sociology in India.* Popular Prakasan, *Bo*mbay.
4. Partha Sarathi De., 2012. *Rural Sociology*. Pearson Education, New Delhi 125.
5. Plotnik, R. and Mollenauer, S. 1986. *Introduction to Psychology*. Random House, NewYork.

PBG101	INTRODUCTION TO AGRICULTURAL BOTANY	T	P	C
		1	1	2

THEORY

UNIT I Systems of classification and general morphological description

Bentham and Hooker's classification of plant kingdom — International code of nomenclature and its major guidelines – author citation – Agricultural classification of crops; General morphology: Life span, habit, root, stem, leaf - petiole, leaf margin, leaf apex, leaf shape, venation and phyllotaxy; Modification of roots and leaf; Floral morphology: Kinds of bracts, inflorescence; Structure of flower, androecium, gynoecium, placentation, types of fruits.

UNIT II Botanical description and economic uses of Poaceae

List of cultivated crops, economic parts, chromosome number and family description of Poaceae: Key botanical features of Rice, Wheat, Sorghum, Maize, Pearl millet, Finger millet, list of small millets, Guinea grass, Napier grass, *Cenchrus* and Sugarcane

UNIT III Botanical description and economic uses of Papilionaceae

List of cultivated crops, economic parts, chromosome number and family description of Papilionaceae: Key botanical features of Red gram, Bengal gram, Soybean, Black gram, Green gram, Cowpea, Lablab, Horse gram, Groundnut, Lucerne, *Stylosanthes*, Clitoria, Agathi and Sunnhemp

UNIT IV Botanical description and economic uses of Pedaliaceae, Asteraceae, Oleaceae, Brassicaceae, Euphorbiaceae, Arecaceae and Malvaceae

List of cultivated crops, economic parts, chromosome number and family description of the following families and Key botanical features of the crops given against them:Pedaliaceae - Gingelly; Asteraceae - Sunflower, Safflower, Chrysanthemum; Oleaceae – Jasmine; Brassicaceae - Rapeseed and Mustard, Cabbage, Cauliflower; Euphorbiaceae: Castor; Jatropha and Tapioca; Arecaceae: Coconut, Arecanut, Oilpalm, Sugarpalm; Malvaceae: Cotton, Mesta and Bhendi.

UNIT V Botanical description and economic uses of Tiliaceae, Piperaceae, Chenopodiaceae, Solanaceae, Mimosae, Moraceae,Cucurbitaceae, Alliaceae, Musaceae, Rubiaceae, Theaceae

List of cultivated crops, economic parts, chromosome number and family description of the following families and key botanical features of the crops given against them. Tiliaceae: Jute; Piperaceae: Betelvine; Chenopodiaceae: Sugar beet; Solanaceae: Tobacco, Potato, Chilli, Tomato and Brinjal; Mimosae: Desmanthes, Subabul and Acacia; Moraceae: Mulberry;Cucurbitaceae: Cucumber, Pumpkin, Ashgourd; Alliaceae: Onion and Garlic; Musaceae: Banana, Manila hemp;Rubiaceae: Coffee; Theaceae: Tea

PRACTICAL

Family features - observation and description of habit, morphology of root, stem, leaves, inflorescence, flowers, floral diagram, floral formula and economic parts of

- Poaceae: Rice, Wheat, Sorghum, Maize, Pearl millet, Finger millet, Guinea grass, Napier grass, *Cenchrus* and Sugarcane*;*
- Papilionaceae:Redgram, Bengal gram, Soybean, Blackgram, Greengram, Cowpea, Lab-lab, Horse gram, Groundnut, Lucerne, *Stylosanthes*, Clitoria, Agathi and Sunnhemp; Pedaliaceae: Gingelly; Asteraceae: Sunflower, Safflower and Chrysanthemum; Oleaceae: Jasmine; Brassicaceae: Rape and Mustard, Cabbage, Cauliflower;Euphorbiaceae: Castor, Jatropha, Tapioca; Arecaceae: Coconut, Arecanut, Oilpalm and Sugar palm;
- Malvaceae: Cotton, Mesta, Bhendi; Tiliaceae: Jute; Piperaceae: Betelvine; Chenopodiaceae: Sugar beet;
- Solanaceae: Tobacco, Potato, Chilli, Tomato and Brinjal; Mimosae: Desmanthes, Subabul and Acacia;
- Moraceae: Mulberry;Cucurbitaceae: Cucumber, Pumpkin, Ashgourd; Alliaceae: Onion and Garlic;
- Musaceae: Banana, Manila hemp; Rubiaceae: Coffee; Theaceae: Tea

Practical schedule

1. Observing general morphology of roots, stems and leaves.
2. Observing general morphology of inflorescence - flowers, stamens and pistils.
3. Family characters, Botany, Economic parts, Floral diagram and Floral formula of the following crop plants:- Poaceae: Rice and Wheat
4. Poaceae: Sorghum, Maize, Pearl millet, Finger millet.
5. Poaceae: Guinea grass, Napier grass, *Cenchrus* and Sugarcane.
6. Papilionaceae: Redgram, Bengal gram and Soybean.
7. Papilionaceae: Blackgram, Greengram, Cowpea, Lab-lab, Horse gram and Groundnut.
8. Papilionaceae: Lucerne, *Stylosanthes*, Clitoria, Agathi, Sunnhemp, and Sesbania.
9. Pedaliaceae: Gingelly; Asteraceae: Sunflower, Safflower and Chrysanthemum; Oleaceae: Jasmine
10. Brassicaceae: Rapeseed and Mustard, Cabbage, Cauliflower.
11. Euphorbiaceae: Castor, Jatropha, Tapioca; Arecaceae: Coconut, Arecanut, Oilpalm and Sugar palm.
12. Malvaceae: Cotton, Mesta, Bhendi
13. Tiliaceae: Jute; Piperaceae: Betelvine; Chenopodiaceae: Sugar beet;
14. Solanaceae: Tobacco, Potato, Chilli, Tomato and Brinjal; Mimosae: Desmanthes, Subabul , Moraceae:Mulberry
15. Cucurbitaceae: Cucumber,Pumpkin, Ashgourd; Alliaceae: Onion and Garlic
16. Musaceae: Banana, Manila hemp; Rubiaceae: Coffee; Theaceae: Tea
17. **Final Practical Examination**

References:

1. Daniel Sundararaj, D. and G. Thulasidas, 1993. Botany of field crops. MacMillan India Ltd., New Delhi.
2. Sambamurthy, V.S. and N.S. Subramanian, 1989. Text Book of Economic Botany, Wiley Eastern, New Delhi

3. Purse glow, 1988. Tropical Crops - Monocotyledons. The Englis Language Book Society and Longman Co., Singapore
4. Purse glow. 1988. Tropical Crops - Dicotyledons. The English language book Society and Longman Co., Singapore.
5. Albert F. Hill and O.P. Sharma, 1996. Economic Botany. Tata McGraw - Hill Publishing Co. Ltd., New Delhi.
6. John Joel, A., C. Vanniarajan, T.S. Raveendran, and A. Gopalan 2006. Fundamentals of Crop Botany, Directorate of ODL, Tamil Nadu Agricultural University, Coimbatore–641 003.

MAT101	ELEMENTARY MATHEMATICS	T	P	C
		2	0	2

THEORY

UNIT I

Permutation and combination - meaning of nPr and nCr and simple problems. Progressions - arithmetic, geometric and harmonic progressions. Matrices: types - algebra of matrices - Determinants – expansion– inverse of a matrix by adjoint method - solving system of equations by Cramer's rule and matrix inverse method.

UNIT II

Review of various forms of equations of a straight line. Circles – standard and general forms of equation of a circle – Conic sections - parabola, ellipse and hyperbola in standard forms (without proof).

UNIT III

Definition – methods of differentiation. Geometrical and physical meaning of the derivative - higher order derivatives - applications of differentiation. Partial differentiation – Homogeneous functions and Euler's Theorem (without proof). Increasing and decreasing function - maxima and minima of single and several variables without constraints - physical and economic optima - applications in agriculture**.**

UNIT IV

Definition of integration - indefinite and definite integrals – formulae - methods of integration - substitution, method of partial fractions - integration by parts - Simple applications in finding the area and volume by integration.

UNIT V

Mathematical models – system – types of models and their uses in agriculture – fitting of linear, quadratic, exponential and logistic models to data from agricultural field experiments.

REFERENCE BOOKS

1. Duraipandian. 2007. Calculus and Analytical Geometry, Emerald Publishers, Chennai.
2. Suyambulingom, C. and Kailasam, C. 1990. Mathematics for Plant Sciences, Sakthi Publications, Coimbatore.
3. Mehta, B. C. and G. M. K. Madnani. 2006. Mathematics for Economists, Latest edition, Sultan Chand & Sons, New Delhi.
4. Veerarajan, T. 2004. Engineering Mathematics, Tata McGraw - Hill Publishing Company Limited, New Delhi.
5. Ranganathan, C.R. 2006. A First Course in Mathematical Models of Population Growth (with MATLAB programs), Associated publishing company, New Delhi.

ENG101	COMPREHENSION & COMMUNICATION SKILLS IN ENGLISH	T	P	C
		1	1	2

THEORY

UNIT I Listening Skills

Introduction to listening - kinds of listening, process of listening - listening mechanism listening TOEFL, IELTS, BEC.

UNIT II Reading Skills

Reading: skimming, scanning, SQ3R, intensive reading, extensive reading, critical reading, Cloze texts for integrated grammar and vocabulary, including subtle differences between synonyms, reading comprehension texts for civil service exams, Bank P.O. exams, IELTS, TOEFL and GRE.

UNIT III Techniques of Speaking

English phonemes – stress, intonation and rhythm - genres of speaking, techniques of speaking – public speaking (welcome address, vote of thanks, extempore talk).

UNIT IV Writing Skills

Mechanics of writing, writing genres, five types of writing, précis paragraph writing, essay writing – issue - based writing and argument-based writing.

UNIT V Documentation and Brainstorming

Note-taking, note - making, summarizing, brainstorming and simulation.

PRACTICAL SCHEDULE

1. Introduction to listening - kinds of listening and process of listening.
2. English phonemes.
3. Stress, intonation and rhythm.
4. Introduction to speaking skill - dialogue and monologue.
5. Reading strategies – skimming and scanning - Critical reading.
6. Introduction to writing – basic grammar in writing.
7. Genre - Mechanics of writing.
8. Welcome address, vote of thanks and extempore talk.
9. Listening comprehension.
10. Reading comprehension – (five levels of comprehension viz., factual , inferential, referential , global and attitudinal).
11. Cloze texts - grammar and vocabulary in discourse.
12. Listening cloze & Reading cloze.
13. Brainstorming, simulation for integrated skills.
14. paragraph writing and essay writing.
15. Précis writing and summarizing and Integrated skills: SQ3R, factual writing and summarizing note taking, note making.
16. Orientation to TOEFL. IELTS and BEC.

REFERENCE BOOKS

1. Peter Roach (2009): English Phonetics and Phonology, A Practical Course: (Fourth edition).CUP. U.K.

2. Steven Brown & Dorokyn Smith (2006) - Active Listening: CUP U.K.
3. Christian Evans Carter (2010) Mindscapes: Critical Reading Skills: Wadswoth Publishing Company. Belmont, Calif. USA.
4. Kory Floid (2008) Interpersonal Communication: the Whole Story Tata McGraw Hill Publishers.

AGR112	AGRICULTURAL HERITAGE	T	P	C
		1	0	1

THEORY

UNIT I Indian Agricultural Heritage

Introduction of Indian agricultural heritage, status of farmers in society, advice by sages to kings on their duties towards farmers.

UNIT II Ancient Crop Management Practices

Soil management in ancient, medieval & pre-modern India and its relevance in modern day sustainable agriculture, heritage of crop & water management, plant growth and development, plant production & plant protection through vrikshayurveda and traditional knowledge.

UNIT III Medicinal Plants and Soil Health

Heritage of medicinal plants and their relevance today, seed health in ancient & medieval history and its relevance to present day agriculture.

UNIT IV Indian Civilization

Description of Indian civilization and agriculture by travelers from China, Europe and United States, our journey in agriculture.

UNIT V National Agricultural Setup

Agricultural resources available in India. Green revolution and its impact and concerns – National agriculture setup in India – Current scenario of Indian agriculture – Indian agricultural concerns and future prospects.

REFERENCE BOOKS

1. Choudary S.L, Sharma, G.S, and Nene, Y.L (eds). 2000. Ancient and Medieval History of Indian agriculture and its relevance to sustainable agriculture in the 21st century; Proceedings of the summer school held from 28th May to 17 th June 1999. Rajasthan college of Agriculture, Udaipur.
2. Nene, Y.L (Ed). 2005. Agricultural Heritage of Asia proceedings of the international conference, 6-8 December 2004, Asian-Agri history Foundation, Secunderabad- 500 009, Andhra Pradesh, India.
3. Nene, Y.L 2007. Glimpses of Agricultural heritage of India. Asian- Agri- History Foundation, 47 – ICRISAT Colony-1 Brig sayeed Road, Secunderabad -500009 A.P India 901PP ISBN-81-903963-0-7.

		T	P	C
SAC 101	**FUNDAMENTALS OF SOIL SCIENCE**	**2**	**1**	**3**

THEORY

UNIT I Pedological and edaphological concepts of soil

Soil as a natural body, Pedological and edaphological concepts of soil. Components of soil. Soil genesis: Composition of Earth's crust- soil forming rocks and minerals – Primary and secondary minerals. Weathering of rocks and minerals. Factors of soil formation. Soil forming processes. Soil Profile.

Unit II Soil Physical Properties

Soil physical properties: Soil texture, structure, density and porosity, soil colour, consistence and plasticity. Soil water retention, movement and availability. Soil air, composition, gaseous exchange-problem and its effect on crop growth. Source, amount and flow of heat in soil, Soil temperature and crop growth.

Unit III Soil Chemical Properties

Soil physico chemical and chemical properties: Soil reaction-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability. Electrical conductivity.

Unit IV Soil Colloids and Soil Organic Matters

Soil colloids - inorganic and organic. Silicate clays: constitution and properties, sources of charge, ion exchange, cation and anion exchange capacity and base saturation. Soil organic matter: composition, properties and its influence on soil properties. Humic substances - nature and properties.

Unit V Soil Biology and Soil Pollution

Soil Biology : Soil organisms : macro and micro organisms, their beneficial and harmful effects. Soil enzymes. Soil pollution – Types - Prevention and mitigation of soil pollution.

Practical schedule

1. Identification of Glasswares, instruments, equipments for Soil analysis
2. Study of soil sampling tools, collection of representative soil sample, its processing and storage.
3. Study of rocks and minerals.
4. Study of soil forming and soil profile in field
5. Determination of soil density and porosity.
6. Determination of soil colour and moisture content
7. Determination of soil texture by feel and Bouyoucos Methods
8. Determination of soil texture by International pipette method.
9. Studies of capillary rise phenomenon of water in soil column and water movement in soil (Infiltration Rate)
10. Studies of capillary rise phenomenon of water in soil column and water movement in soil (Hydraulic conductivity)
11. Determination of soil temperature and demonstration of heat transfer.
12. Preparation and standardization of laboratory reagents, indicators and buffers
13. Determination of soil pH and electrical conductivity.
14. Determination of cation exchange capacity of soil

15. Estimation of soil organic carbon.
16. Study of soil map (India and Tamil Nadu)
17. Visit to Soil Testing Laboratory

References

- Brady, N.C. and Raymond, C.Weil. 2013. The Nature and Properties of Soils (14th Edition). Pearson Education, Inc. Publishing as Prentice Hall.
- Fundamentals of Soil Science. 2009. ISSS Publication, .New Delhi.
- Sehgal, J. 2005. Pedology concepts and applications, Kalyani Publishers, New Delhi.
- Das, D.K. 2013. Introductory Soil science, Kalyani Publishers, New Delhi.

e-references

- http://www.sciencedirect.com/science/books
- http://202.200.144.17/sykc/hjx/content/ckzl/6/2.pdf
- http://www.pedosphere.com/volume01/pdf/Section._01.pdf
- http://waterquality.montana.edu/docs/homeowners/Septic Drain field Soil Suitability, Presentations /6 _Soil Texture and_Structure.pdf
- http://wfrec.ifas.ufl.edu/landscape_horticulture/PDFdocuments/SoilProp.pdf
- http://www.rootsofpeace.org/assets/Soil%Testinq%Manual%20V6%20(Feb%208).pdf
- http://www.soils.wisc.edu/courses/SS325/morphology.htm
- http://www.soils.wis.edu/courses/SS325/morphology.htm
- http://landresources.montana.edu/
- http://ftp.wcc.nrcs.usda.goV/H....soil Other/soil-USDA-textural-class.pd

HOR101	FUNDAMENTALS OF HORTICULTURE	T	P	C
		1	1	2

THEORY

UNIT I Scope and Importance of Horticultural crops

Horticulture – origin, definition, scope and importance, nutritive value of horticultural crops – classification of horticultural crops – climatic zones of India and Tamil Nadu in relation to horticulture.

UNIT II Factors of Crop Production

Factors limiting growth and development – climate and soil - light, temperature, wind, humidity, rainfall and frost – soil factors – kind of soil, chemical composition and reaction, soil depth, texture and soil fertility - physiology of flowering, pollination, fruit set, fruit ripening and senescence – Fruitfulness and causes of unfruitfulness – Growth regulators and growth hormones – Classification and applications.

UNIT III Propagation

Propagation – definition – methods - seed propagation – merits and demerits – Propagation through seeds - dormancy and methods of overcoming dormancy – vegetative propagation – merits and demerits – cutting, layering, grafting and budding – rootstock influence – stock/scion relationship - Specialized plant parts – micro - propagation.

UNIT IV Cropping and cropping systems

Cropping systems - planting methods – Crop geometry - intercultural operations – weed, water and fertilizer management – bearing habits – crop regulatory practices for fruit crops and vegetables – training, pruning, and special practices - off season production – Basics of protected cultivation.

UNIT V Post Harvest handling

Pre-harvest operations – maturity indices – climacteric and non-climacteric fruits - harvesting methods – pre-cooling – sorting – grading – standards for domestic and export consumption – packing – storage – transport.

PRACTICAL SCHEDULE

1. Visit to Orchard and study of different features of an orchard.
2. Planning, layout and planting of horticultural crops.
3. Machineries, tools and implements used for various horticultural operations.
4. Preparation of potting mixture, potting and repotting of plants.
5. Plant propagation structures including mist chamber, shade net, glass houses and poly houses.
6. Preparation of growth regulators and method of application in horticultural crops.
7. Demonstration of propagation through layering and cutting.
8. Demonstration of propagation through budding, grafting and top working.
9. Propagation through specialized plant parts.
10. Visit to tissue culture laboratory and study of micro-propagation protocols and hardening.
11. Nutrient and irrigation management practices.
12. Bearing habits and training practices in horticultural crops.
13. Pruning practices in horticultural crops.

14. Maturity indices for various horticultural crops.
15. Post harvest handling practices viz., grading, sorting and packing techniques.
16. Visit to private orchards and nursery.

REFERENCE BOOKS

1. Adams, C.R. and M. P. Early. 2004. Principles of horticulture. Butterworth – Heinemam, Oxford University Press.
2. Chadha, K.L. 2001. Handbook of Horticulture, ICAR, New Delhi.
3. Jitendra Singh. 2006. Basic Horticulture. Kalyani Publishers, New Delhi.
4. Rajan, S. and B.L. Markose. 2007. Propagation of horticultural crops. New India Publishing, New Delhi.
5. Singh, N.P. 2005. Basic concepts of fruit science. International Book Distributing Co., Lucknow.

TEXT BOOKS

1. Christopher, E.P. 2001. Introductory Horticulture, Biotech Books, New Delhi.
2. George Acquaah. 2002. Horticulture-principles and practices. Prentice-Half of India Pvt. Ltd., New Delhi.
3. Hartman, H.T., D.E. Kester, Davies Jr. F.T. and Geneve, RL. 2002. Plant propagation – Principles and Practices – Prentice Hall of India Ltd., New Delhi.
4. Kumar, N. 2010. Introduction to Horticulture, (7^{th} Ed.) Oxford IBH Publication, New Delhi.

FOR101	INTRODUCTION TO FORESTRY	T	P	C
		1	1	2

THEORY

UNIT I: Forest and Forestry

Introduction - Definition of Forest and Forestry - Role of Forest (Production, Protection and Amelioration) – Forest Resources of India and Tamil Nadu - Classification of Forest (Regeneration, Age, Composition. ownership, object of management, growing stock) - National Forest Policy 1988.

UNIT II: Silviculture and Forest plantation

Forest regeneration - Natural regeneration- Seeds and vegetative parts (Coppice, Root suckers) - Artificial regeneration, Objectives - Nurseries - Types of nurseries, Quality seedling production techniques - Tending operations - Weeding, Cleaning, Thinning and pruning.

UNIT III: Forest Mensuration

Forest Mensuration - Objectives- Diameter measurements, instruments used in diameter measurement-Height measurement, instrumental methods of height measurement - Tree form, form factor, Volume estimation of standing and felled trees.

UNIT IV: Agroforestry

Agroforestry - Agroforestry classification (Shifting Cultivation, Taungya, Alley cropping)- Agroforestry systems for different agro climatic zones of Tamil Nadu and India – Wind break, Shelter belt

UNIT V: Social forestry and Forest Utilization

Social Forestry concepts and applications – JFM concepts - Ecotourism concepts and applications - Extension Forestry, Urban forestry- Forest Utilization

Practical schedule

1. Identification of important farm grown trees
2. Visit to Agroforestry plantations
3. Identification of tree seeds and seedlings
4. Site selection for tree nursery and layout of nursery
5. Study of nursery techniques for Forest tree crops (*Casuarina equisetifolia, Tectona grandis)*
6. Practicing land preparation, stacking, pitting,
7. Planting techniques in plantation
8. After care operations in plantations
9. Development of Agro-forestry Models for different ACZs of Tamil Nadu
10. Height measurement in trees
11. Diameter measurement in trees
12. Volume estimation in standing and felled trees
13. Identification and study of wood products
14. Identification and study non- wood forest products
15. Visit to forest based industry
16. Study of match manufacturing process – visit to matchwood industry.

References

1. Dwivedi, A.P. 1992. Principles and Practices of Indian Silviculture. Surya publications,Dehradun.177p

2. Gupta. R.K 1993. Multipurpose trees for Agroforestry and Wasteland utilization. Oxford and IBH Publishing Company, New Delhi. 580p.

3. Nair.P.K.R. 1993. Introduction to Agroforestry. Kluwer Academic Publishers, Dordrecht, Netherlands.499p

4. Negi, S.S. 1986. A Hand book of Social Forestry. International Book Distributors, Dehradun.177p

5. Puri, S and P.K.Khosla. 1993. Nursery Technology for Agroforestry - applications in Arid and Semi arid regions. Oxford and IBH Publishing Company, New Delhi.392p

6. Khanna. L.S. 1981. Principles and Practice of Silviculture. Khanna Bandhu publications, Dehradun.472p

7. Chaturvedi, A.N and L.S.Khanna. 1982. Forest Mensuration. International Book Distributors, Dehradun.350p

8. Tirubhawan Mehta. 1981. Hand book of Forest Utilization. International Book Distributors, Dehradun.208 p.

BIC101	FUNDAMENTALS OF PLANT BIOCHEMISTRY AND BIOTECHNOLOGY	T	P	C
		2	1	3

THEORY

UNIT I

Importance of Biochemistry. Properties of Water, pH and Buffer. Carbohydrate: Importance and classification. Structures of Monosaccharides, Reducing and oxidizing properties of Monosaccharides, Mutarotation; Structure of Disaccharides and Poly saccharides. Lipid: Importance and classification; Structures and properties of fatty acids; storage lipids and membrane lipids.

UNIT II

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

UNIT III

Nucleic acids: Importance and classification; Structure of Nucleotides, A, B & Z DNA; RNA: Types and Secondary & Tertiary structure. Metabolism of carbohydrates: Glycolysis, TCA cycle, Glyoxylate cycle, Electron transport chain. Metabolism of lipids: Beta oxidation, Biosynthesis of fatty acids. Concepts and applications of plant biotechnology.

UNIT IV

Scope, organ culture, embryo culture, cell suspension culture, callus culture, anther culture, pollen culture and ovule culture and their applications; Micro-propagation methods; organogenesis and embryogenesis, Synthetic seeds and their significance; Embryo rescue and its significance; somatic hybridization and cybrids; Somaclonal variation and its use in crop improvement; cryo-preservation.

UNIT V

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

PRACTICAL SCHEDULE

1. Preparation of solution, pH & buffers.
2. Qualitative tests of carbohydrates and amino acids.
3. Quantitative estimation of glucose.
4. Quantitative estimation of proteins.
5. Titration methods for estimation of aminoacids.
6. Titration methods for estimation of lipids.
7. Effect of pH, temperature and substrate concentration on enzyme action.
8. Paper chromatography/TLC demonstration for separation of amino acids/ Monosaccharides.
9. Sterilization techniques.

10. Composition of various tissue culture media.
11. Preparation of stock solutions for MS nutrient medium.
12. Callus induction from various explants.
13. Micro-propagation, hardening and acclimatization.
14. Demonstration on isolation of DNA.
15. Demonstration of gel electrophoresis techniques.
16. DNA finger printing.

REFERENCE BOOKS

1. Conn, E.E. and Stumpf, P.K. 1996. Outlines of Biochemistry – Wiley Eastern Ltd., Fifth Edition.
2. Stryer L, Berg T, Tymoczko,J. Biochemistry. 2009. 5th Ed. Wiley Eastern Ltd, New Delhi.
3. Chawla, H.S. 2005. Introduction to Plant Biotechnology, India.
4. Chesworth, JM., Stuchbury, T. and Scaife, JR. 1998. An Introduction to Agricultural Biochemistry. Chapman and Hall.
5. Goodwin, T.W. and Mercer, E.I. 1991. Introduction to Plant Biochemistry. Pergamon Press.
6. Brown, T.A. 2006. Gene cloning - An Introduction. V Ed. Chapman Hill, U.K.

TEXT BOOKS

1. Rastogi S.D. 2010. Biochemistry, 3rd edn, Tata McGraw-Hill, Delhi.
2. Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. 2003. 26th edn, Tata McGraw-Hill, New Delhi.
3. Nelson DL, Cox MM. 2004. Lehninger Principles of Biochemistry Fourth (Indian edition) MacMillian, Worth Publishers.
4. Bhojwani, S.S. and Razdan, M.K. 2006. Plant Tissue Culture Studies – Theory and Practice. Elsevier Publication.
5. Gupta, P.K. 2005. Elements of Biotechnology. Rastogi Publication, India.

NSS122	NATIONAL SERVICE SCHEME	T	P	C
		0	1	1

I Year

Orientation – NSS origin – motto – symbol – NSS administration at different levels – programme planning – Rural Projects – Urban projects – Government schemes – Career guidance – Self-help groups – Environment protection – Use of natural energy – Conventional energy resources – Soil and Water conservation – Community health programmes – Women and child welfare – Education for all – National days – Commemorative days – NSS thematic programmes – literacy & computer awareness campaigns.

II Year

Popularization of agro techniques – Self-employment opportunities – Animal health, Dairy and Poultry farming – Road safety – Training on First aid and emergency cell. Popularization of small savings – communal harmony and National integration – Care of Senior citizens – Personality development – meditation, Yoga Art of living – Activities on the preservation of National monuments, cultural heritage and folklore – special camp activities – National days – commemorative days – NSS thematic programmes – literacy & computer awareness campaigns.

Practical Schedule

I Semester

1. Orientation of NSS volunteers and programme coordinator and Programme officers.
2. Origin of NSS in India and its development
3. NSS motto, symbol and NSS awards
4. Organizational set up of NSS at Central, State University and college levels.
5. Programme planning – Theme of the year – planning implementation at PC, PO and NSS volunteer level.
6. Visit to selected village - gathering basic data on socio economic status.
7. Participatory rural appraisal – studying the needs of the target group.
8. Visit of urban slum and gathering data on socio economic status.
9. Self-involvement and methods of creating rapport with the target group.
10. Awareness campaign on welfare schemes of the central and state government.
11. Formation career guidance group with NSS volunteers and students' welfare unit
12. Cycle rally on environmental protection.
13. Campus development activities – clean environment campaign, formation of plastic free zones.
14. Campus development, tree planting maintenance and greening the campus cleaning.
15. **Final Examination**.

II Semester

1. 1–3: Motivation of rural and urban youth for formation of SHG (Self Help Groups) in collaboration with Government machineries and NGOs.

2. Campaign on ill effects of plastics in the adjoining campus areas – Villages / urban areas.
3. Campaign on *Parthenium* eradication.
4. Cycle rally on air pollution – Vehicle exhaust and other means.
5. Popularization of biogas and smokeless chulah.
6. Demonstration on the use of wind energy and solar energy.
7. Demonstration of water harvesting techniques.
8. Demonstration on soil conservation techniques wherever possible.
9. Campaign on Community health programmes of central and state Government – involving Health department officials.
10. AIDS awareness campaign ; campaign on diabetes and healthy food habits and drug abuse
11. Planning formation of blood donors club – involving NGOs.
12. Campaign on gender equality and women empowerment.
13. Campaign on child health care – immunization, food habits and child labour abolition.

III Semester

1. Conducting field days with KVK to popularize improved agro techniques.

2. Conducing seminar / workshop in a nearby village to motivate the youth on agribusiness (involving DEE, KVK, NGO and local agro-entrepreneurs).

3–5 Campaign on self employment opportunities like Apiculture, mushroom cultivation, Food processing and value addition, production of biocontrol agents and biofertilizers, nursery techniques, seed production, tissue culture, vermicompost, manucacture of small gadgets and agricultural implements as per local needs and feasibility.

6. Animal health care campaign – Dairy and poultry farming - Forage production techniques and silage making.
7. Training the NSS volunteers on road safety measures in involving traffic wardens and RTO.
8. Training NSS volunteers on First AID and emergency call involving NGOs and organizations like St. John's Ambulance, Red Cross, etc.,
9. Organizing road safety rally.
10. Motivating NSS Volunteers on small savings concept and conveying the message to the public through them.
11. Observation of National integration and communal harmony.

12– 16. Campus development and greening activities

17. Final Examination.

IV Semester

1. Visit to orphanages and old age homes to look after their needs.
2. Personality development programmes – Building up self confidence in youth.
3. Teaching NSS volunteers on mediation Yoga and art of healthy living with trained teachers
4. Visit of nearby National Monument / Places of tourist importance and campaign on cleanliness and preservation.

5. Exploration of hidden talents of village youth and public on folklore, traditional art, sports, martial arts and cultural heritage . Campus improvement activities Visit to special camp village and pre camp planning.
6. **Final Examination.**

Besides the above, NSS volunteers will attend work during important occasions like Convocation, Farmers Day, Sports meet and other University / College functions. NSS Volunteers will attend one special camp in the selected village for a duration of 10 days and undertake various activities based on the need of that village.

For all out door regular activities villages / slums nearby the campus may be selected to avoid transport cost (cycle able distance) Special camp activity will be conducted in a village situated within a radius of 15 – 20 KM.

NCC121	NATIONAL CADET CORPS	T	P	C
		0	1	1

I Year

General - Military History – Introduction to NCC – Aims of NCC – Principles of NCC, NCC organization, Duties of good citizen – system of NCC training – Foot drill – Arms drill – Guard of Honour – Ceremonial Drill – Weapon training – First aid – Rifle and Light machine gun – Map reading – Civil defence – Leadership.

II Year

Drill – Weapon drill – Weapon training and firing – Introduction to National Integration – Historical – geographical – Religions back ground of India – Health and Sanitation – Aid to Civil Authorities – Civil defence – Ecology / Nature awareness – Map reading – Social service – Adventure Activities – Leadership qualities.

I Semester

1. NCC song – Aims and Motto of NCC – Motivation of cadets
2. History of NCC and organization of NCC
3. Food drill – General and word of Command
4. Human Resource Development – Motivation – Duties of Good citizen
5. National Integration – Indian History and Culture
6. Health and Hygiene – Structure and Function of a human body, hygiene and Sanitation
7. Social Service – weaker sections of our society and their needs
8. Self Defence – Theory and practice, prevention of untoward incidence
9. Map reading – introduction to map, and lay out of map
10. Disaster Management Civil defence organization and its duties
11. Communication – Different types – media
12. Signals – introduction to radio, telephony procedures
13. Field Engineering – principles and applications, camouflage and concealment
14. Adventure training introduction, different types
15. First Aid – methods and practices
16. Environment and Ecology – conservation
17. **Final Examination.**

II Semester

1. Drill – Weapon drill – Word of Commands
2. National integration- unity in diversity
3. Guard of Honour and Ceremonial drill
4. Types of weapon, Parts, Stripping and Assembling of light gun.
5. Rifle firing and follow up activities
6. Camps, types of Camps, Preparation and participation
7. Awards, different types, Ranks of officers and Cadets
8. Map reading – judging distance, conventional signs and uses of compass.
9. Leadership traits, types, perception

10. Fire Fighting, Role of NCC during natural hazards
11. Field Engineering – section formation
12. Obstacle training
13. Health and Sanitation – preventable diseases, Fractures and types of treatments
14. Environment and Ecology-Pollution and its control.
15. Social Service – contribution of youth towards social welfare
16. First Aid – Snake bite and other common medical Emergencies.
17. **Final Examination.**

III Semester

1. Drill – Individual word of command
2. Weapon training – parts of heavy weapons
3. Stripping and assembling of heavy weapons
4. Importance of team work values, code of ethics
5. Disaster management during Earth Quake
6. Evacuation of Causalities
7. Map reading – Camposs and Service Protractor
8. Aids to civil authority
9. Section and platoon formation
10. Social service, NGO's and their contribution to the society
11. Roll of NCC cadets in civil administration
12. Traffic rules and Road signs
13. Mines and types of mine fields
14. Dressing of Wounds, physical and mental health
15. Field signals
16. Air raid warning, Fire fighting
17. **Final Examination.**

IV Semester

1. Drill – Foot drill
2. Formation of squad and squad drill
3. Man Management, Morale
4. Time Management, stress management
5. Ecology and Environment wild life conservation
6. Adventure Activities, Trekking Camp
7. Map reading – Field to Map – Map to Field – Grids and scale systems
8. Communication systems – Internet – Faxi mail – Satellites
9. Collection and Distribution of Aid material
10. Field Engineering – Mines, anti tanks, explosives
11. Opportunities for NCC cadets in Army and other services
12. Social Service, Family Planning
13. Section battle drill
14. Roll of NCC cadets in National programmes.
15. Visit to Wellington, Coonoor.
16. Self defence mechanisms

17. Final examination.

Besides the above schedule, NCC cadets will be involved during important occasions during convocation, Independence Day, Republic Day, etc.

PED 121	PHYSICAL EDUCATION	T	P	C
		0	1	1

Practical

(17 Practical classes – 2½ hours each class – 17 classes will be converted into 40 practical hours and 2½ hours for evaluation)

I Semester (20 Hours)

Exercises for strength, agility, co-ordination, flexibility, co-operation, vitalcapacity endurance, speed and for various systems of our body and team spirit.

Exercise for Good Posture – Conditioning and calisthenics for various Athletic activities *i.e (*a) Before start – Arm stretch, hand stretch and cat stretch (b) Loosening up jogging, bending and twisting (c) Standing – Lateral Arc, triangle and hands to feet pose (d) Sitting – camel kneel, spinal twist and supine knee bend (e) Relaxation – The corpse pose, quick and deep relaxation. Basic gymnastic exercises – participation of athletic events – running, throwing and jumping events.

Skill development in anyone of the following games

Warming up, suitable exercise, lead up games, advance skill for all the games.

Basket Ball	:	Dribbling, pass, two or three men pass, pivot, lay up shot, shooting, pass break, hook pass, screening, positional play, defence and offence tactics.
Volley Ball	:	Fingering, under arm pass, over head pass, setting, spiking, back pass, jump pass, stunts, elementarty dive, flaying dive, roll, blacking and various types of services.
Ball Badminton	:	Grip, service, foot work, fore hand stroke, back hand stroke, lob, smash, volley, wall practice, spin service and defence tactics.
Foot ball	:	Dribbling, passing, dodging, kicking, heading, screening, chest pass, throwing, dragging, goal kick, defence and offence tactics.
Hockey	:	Grip, bully, dribbling, hitting, drive, push strokes, scoop, flick, stopping, various types of passes, dodging, defence and offience tactics.
Kho-Kho	:	Quadra ped, bi-ped, how to given kho, taking a direction, recede, parallel toe method, bullet tow method, distal method, foot out, dive, ring game, chains and persue and defence skills.
Chess	:	Moves, move of king, move of pawns, move of rooks, move of bishops, move of queen, move of knights, en passant, castling, check and notation.
Kabaddi	:	Raid, touch, cant, catch, struggle, various types of defence and offence tactics.
Cricket	:	Grip, bowling, spin, leg spin, off spin, medium, batting, dive, sweep, mode of delivery, fielding, rolling etc.
Tennis		Grip, forehand drive, back hand drive, stroke, backhand ground stroke, service, volley, smash, wall practice, foot work, defence and offence tactics.

Table Tennis	:	Grip, tossing and serving, spin serve, rally, smash, flick, defence and offence tactics.
Shuttle Badminton	:	Grip, foot work, service, setting, smash, volley, forehand and back hand stroke, back hand serve and defence.
Gymnastics	:	Balanced walk, execution, floor exercise, tumbling/acrobatics, grip, release, swinging, parallel bar exercise, horizontal bar exercise, flic-flac-walk and pyramids.

ATHLETICS

(a) **Sprint** : Medium start, long start, bunch start, set, pick up, finish, upsweep, downsweep, placement, receiving and exchanging.

(b) **Jumps** : Western roll, belly roll, eastern cut off, fass ferry flop, approach, take off, straddle, hitch-kick, handging, clearance, landing, strides etc.

(c) **Throws** : Grip, momentum, pre shift, sub phase, the wind up, foot work, entry to the turn, shift, angle of release, follow throw, delivery, front cross step, rear cross step, hop step, fuck method pary obraine, discoput, rotation, carry and glide.

(d) **Hurdles** : Finding lead leg, use of lead leg and trial leg, flight, clearing, finish.
Lead up games, advance skills and game for any one of the above games.

II Semester (20+ 2 ½ hours)

a. Rules and regulations of anyone of the games and athletic events.

b. Aims and objectiaves of yoga – asanas : ie. padmasana, pujankasana, sarvangasana, chakrasana,dhanurasana, halasana, mayurasana and savasana, asanas for ailments, back pain, arthritis, abdominal problesm, stress, fatiguel, Insomnia, obsity, circulation, hypertension, varicose veins, respiration, heart, digenstion, headaches, depression, addiction and eye problems.

c. Mental balance and importance – development of concentration suriyanamaskar – advance skills of any one of the games which were taught in the I semester.

TAM121	தமிழ் இலக்கியங்களில் வேளாண்மையும் அறிவியல் தமிழ் பயன்பாடும் /Developmental Education	T	P	C
		0	1	1

நோக்கம்

இளநிலை வேளாண்மை பயிலும் மாணவர்களுக்கு தமிழ் இலக்கியங்கள் வழி வேளாண்மை மற்றும் வேளாண்மை சார்ந்த தொழில்நுட்பங்களையும் செய்திகளையும் அறியச் செய்தல்- தற்கால வேளாண் தொழில்நுட்பங்களோடு பொருத்திப் பார்த்தல் - வேளாண்மை தவிர தோட்டக்கலை — வனவியல்- வேளாண்பொறியியல் - மனையியல் சார்ந்த கருத்துக்களை வெளிக்கொணர்தல் - வேளாண்துறைக்கு இன்றியமையாத கலைச்சொற்கள் - மொழிப்பெயர்ப்பு - பாரம்பரிய தொழில்நுட்பங்களை அறியச்செய்தல் - மாணவர்களின் எதிர்காலத் தேவைக்கு அடிப்படையான பேச்சுப்பயிர்ச்சி — நேர்காணலை எதிர்கொள்ளும் வகையில் மென்திறன்களான தலைமைப்பண்பு - ஆளுமைப்பண்பு - காலமேலாண்மை ஆகியவற்றில் திறம்பெறச்செய்தல் - மாணவர்களின் ஆய்வுக்கட்டுரை திறனை வளர்த்தல் - வேளாண்மை இதழ்கள், நூல்கள் குறித்து விழிப்புணர்வை வழங்குதல் - கணினி வழி தமிழில் வேளாண் செய்திகளை பதிவேற்றம், பதிவிறக்கம் செய்யும் முறைகளை அறியச்செய்தல் ஆகியவற்றை நோக்கமாக கொண்டு பாடத்திட்டத்தை வரையறை செய்தல்.

செய்முறைப் பயிற்சிகள்

1. தொல்காப்பியம் காட்டும் முதற்பொருள், கருப்பொருள், தாவரவியல் அறிவு, வேளாண் மாந்தர் குறித்த செய்திகளை அறிதல்
2. சங்க இலக்கியத்தில் வேளாண் தொழில் நுட்பங்கள் - (எட்டுத்தொகை, பத்துப்பாட்டு)
   ய. பதினெண் கீழ்க்கணக்கு நூல்களில் வேளாண்மைஅறிவியல்
   ெ. பள்ளு இலக்கியங்கள், ஏரெழுபது—உழவர் வாழ்வியல் நெறிமுறைகளும் வேளாண்மைத் தொழில் நுட்பங்களும்
3. இலக்கியத்தில் வேளாண் பொறியியல் - தோட்டவியல் - வனவியல் - மனையியல் - சூழலியல்
4. வேளாண்மைப் பழமொழிகள் - உழவு விதைஅறிவியல் - பருவம் - மழை - நாற்றுநடுதல் - எரு
5. இடுதல் - நீர்ப்பாசனம் - களைமேலாண்மை—பயிர்பாதுகாப்பு - அறுவடை—உழவர் சமுதாயம்
6. இலக்கியம் காட்டும் வாழ்வியல் நெறிமுறைகள்
7. இக்கால இலக்கியங்களில் வேளாண்மைச் சிந்தனைகள் - பாரதி, பாரதிதாசன் படைப்புகள் - புதுக்கவிதை.
8. பிழையின்றிஎழுதும் முறைகள் - எழுத்துப் பிழைகள் - சொற்பிழைகள் - சொற் பிரிப்புப்பிழை—
9. வாக்கியப்பிழை—மெய்ப்புத் திருத்தம்
10. பாரம்பரிய வேளாண்மைத் தொழில்நுட்பங்கள்
11. இலக்கியத்தில் மென்திறன்கள் - தலைமைப்பண்பு - காலமேலாண்மை
12. ஆளுமைப்பண்பு மேம்பாடு—மனித உறவுத்திறன்கள் வளர்த்தல்
13. அறிவியல் தமிழ் வளர்ச்சிநிலைகள், வேளாண் நூல்கள், வேளாண் இதழ்கள் - அலுவலகக் கடிதம்
14. கலைச்சொல்லாக்கம் - வேளாண் கலைச் சொற்களைஉருவாக்கும் முறை—தரப்படுத்துதல் -
15. இலக்கியவேளாண் கலைச்சொற்கள், வட்டாரவேளாண்மைவழக்குச் சொற்கள் -
16. அகராதியியல் மொழிபெயர்ப்பு - முக்கியவிதிகள் - படிநிலைகள் - மொழிபெயர்பாளரின் இன்றியமையாப் பண்புகள் - வேளாண் செய்திகளைமொழிபெயர்த்தல் - கட்டுரைச் சுருக்கம் எழுதுதல்
17. கணினிஉலகில் தமிழ் - விக்கிபீடியா—வேளாண் செய்திகளைப் பதிவேற்றம் செய்தல் -
18. வேளாண் செய்திகளை இணையதளவழிஅறிதல்

மேற்பார்வை நூல்கள்

- கந்தசாமி.இல.செ.வேளாண்மையும் பண்பாடும், தமிழ்நாடுவேளாண்மைப் பல்கலைக்கழகம், கோயம்புத்தூர், 1974
- கந்தசாமி. இல.செ.இலக்கியத்தில் வேளாண்மை,தமிழ்நாடுவேளாண்மைப்பல்கலைக்கழகம், கோயம்புத்தூர் 1981.
- கந்தசாமி. இல.செ. வேளாண்மைபழமொழிகள், கலைச்செல்வம் பதிப்பகம், கோயம்புத்தூர் 1983.

- குழந்தைசாமி.வா.செ.அறிவியல் தமிழ், பாரதிபதிப்பகம், சென்னை
- மீனாட்சிசுந்தரம். மா. மற்றும் ஏ.இல.விசயலட்சுமி., தகவல் தொடர்பில் தமிழ் மொழி ப் பயன்பாடு, கே.ஆர்.எ.ஆப்செட் பிரிண்டர், கோவை— 2002
- மணிமேகலை.ம.தமிழ் மொழித் தடத்தில் வேளாண் அறிவியலின் சுவடுகள், தேவிபதிப்பகம், திருச்சிராப்பள்ளி, 2002
- இலக்கியமும் வேளாண்மையும், அனைத்திந்தியஅறிவியல் தமிழ்க் கழகம், தஞ்சாவூர், 2006
- தமிழரின் மரபுச்செல்வங்கள், உலகத் தமிழராய்ச்சிநிறுவனம், சென்னை
- சந்திரசேகரன், இரா, மொழிப்பாடம் - படைப்பாக்கத்திறன் வளர்த்தல்
- வேளாண்கலைச்சொல் பேரகராதி, தமிழ் நாடுவேளாண்மைப் பல்கலைக்கழகம், கோயம்புத்தூர், 2008.
- பாவேந்தன், இரா, தமிழில் அறிவியல் இதழ்கள், சாமுவேல், ˙ பிஷ் கிறிஸ் பதிப்பகம், கோயம்புத்தூர்
- டாக்டர் இராதாசெல்லப்பன், கலைச்சொல்லாக்கம், தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்

ENG 123	DEVELOPMENTAL EDUCATION	T	P	C
		0	1	1

(Alternate course for non-Tamil students)

UNIT I Teaching and Learning

Basic principles of learning - discussion - Bloom's classification of educational objectives – cognitive, affective, psychomotor domain(s) - teaching and learning.

UNIT II Career Development

Career development – growth and development, education – for – life and life – long education, motivation and morale - occupation and profession, training and education, lateral thinking and convergent thinking.

UNIT III Entrepreneurship Development

Entrepreneur- intrapreneur – managing an intrapreneur – motivation and entrepreneurship - development – planning, monitoring and evaluation.

UNIT IV Communication Concepts

Interpersonal communication – transactional communication - role – play brainstorming – demonstration -the conduct of symposium - conferencing – the concept and presentation of a paper - scientific article writing and editing - popular article writing, editing and blogging -project proposal - project report – writing.

UNIT V Educational Simulation

Simulation - educational simulation - Interactive teaching - business simulation – company's annual report for analysis.

Practical Schedule

1. Basic principles of learning - binary terms viz., growth and development, education – for – life and life – long education, motivation and morale.
2. Occupation and profession, training and education, lateral thinking and convergent thinking, teaching and learning – discussion.
3. Bloom's classification of educational objectives – cognitive, affective, psychomotor domain(s)
4. Career development – opportunity for graduates of agriculture and allied sciences – discussion
5. Success story of a farmer / entrepreneur – factors involved – role – play.
6. Brainstorming – demonstration.
7. Simulation – Educational Simulation-Interactive Teaching - Business Simulation – Company's annual report for analysis
8. Interpersonal communication – Transactional communication – ice breaker
9. **Mid Semester Examination**
10. The conduct of a symposium
11. Conferencing – the concept and presentation of a paper
12. Scientific Article Writing and Editing
13. Popular Article Writing, Editing and Blogging
14. Project proposal
15. Project Report – writing

16. Entrepreneur – intrapreneur – Managing an intrapreneur – motivation and entrepreneurship development – planning, monitoring and evaluation.
17. **Final Practical Examination**

References

1. Sudarsanam.R 1985. “Development Education” Chapter 1,2
2. Krishna Mohan and Meera Banerji, (1990). “Developing Communication Skills”, Macmillan Pub. Co., Ch.6,9,10,13 and 15.

E-References

http://www.e-booksdirectory.com/details.php?ebook=9481

SEMESTER II

PBG103	FUNDAMENTALS OF GENETICS	T	P	C
		2	1	3

THEORY

UNIT I Cytology

Definition of genetics, heredity, inheritance, cytology, cytogenetics; Brief history of developments in genetics and cytogenetics. Physical basis of heredity. Structure and function of cell and cell organelles – Differences between Prokaryotes and Eukaryotes. Cell division – mitosis- meiosis and their significance - Gametogenesis and syngamy in Plants- identical and fraternal twins. Chromosome structure, chemical composition, nucleosome, centromere, telomere, euchromatin, heterochromatin, NOR, satellite chromosome, karyotype, ideogram. Types of chromosomes based on position of centromere, based on structure and function: normal and special chromosomes - polytene, lampbrush, B chromosomes, ring and isochromosomes. Chromosomal aberration: Variation in chromosome structure – deletion, duplication, inversion and translocation – genetic and cytological implications. Chromosomal aberration: Variation in chromosome number– euploid, aneuploid, types of aneuploids and their origin; Klinefelter syndrome and Turner syndrome; Polyploid - auto and allopolyploids, their characters; meaning of genome; evolution of wheat, triticale, cotton, tobacco, Brassica

UNIT II Mendelian laws and modifications of Mendelian laws

Pre- Mendelian ideas about heredity – Vapour and fluid theory, Magnetic power theory, Preformation theory, Lamarck's theory, Darwin's theory, Germplasm theory and Mutation theory. Mendel's experiments and laws of inheritance. Rediscovery of Mendel's work. Terminologies: gene, allele, locus, homozygous, heterozygous, hemizygous, genotype, phenotype, monohybrid, dihybrid, trihybrid, polyhybrid. Chromosomal theory of inheritance. Allelic interactions – Dominance vs recessive, complete dominance, codominance, incomplete dominance, threshold characters. Deviation from Mendelian inheritance – Non allelic interaction without modification in Mendelian ratio – Bateson and Punnett's experiment on fowl comb shape. Non allelic interaction with modification in Mendelian ratio–i) Dominant epistasis (12:3:1).ii.) Recessive epistasis (9:3:4) iii.) Duplicate and additive epistasis (9:6:1). iv.) Duplicate dominant epistasis (15:1). v) Duplicate recessive epistasis (9:7) vi.) Dominant and recessive epistasis (13:3); Summary of epistatic ratios (i)to (vi) Lethal genes, Pleiotrophy, penetrance and expressivity, Multiple alleles, blood group in human, coat colour in rabbits, self-incompatibility in plants; pseudo alleles, isoalleles.

UNIT III Quantitative inheritance, Linkage and Crossing

Quantitative inheritance – Multiple factor hypothesis – Nilsson Ehle experiment on wheat kernel colour. Polygenes – transgressive segregation, comparison of quantitatively and qualitatively inherited characters; modifiers; Linkage - coupling and repulsion; Experiment on Bateson and Punnet. Chromosomal theory of linkage of Morgan – Complete and incomplete linkage- Linkage group. Crossing over – significance of crossing over; cytological proof for crossing over - Stern's experiment - Factors controlling crossing over. Strength of linkage and recombination; Two point and three-point test cross. Double cross over, interference and coincidence; genetic map, physical map.

UNIT IV Sex determination, sex linkage and cytoplasmic inheritance

Sex determination: Autosomes and sex chromosomes - chromosomal theory of sex determination - different types – sex determination in human, fowl, butterfly, grasshopper, honey bee, fumea; Sex determination in plants – Melandrium, papaya, maize. Genic balance theory of Bridges – Gynandromorphs. Sex linked inheritance – criss cross inheritance – reciprocal difference; holandric genes; sex influenced and sex-limited inheritance -Genetic disorders. Cytoplasmic inheritance and maternal effects –features of cytoplasmic inheritance, chloroplast, mitochondrial - plastid colour in Mirabilis jalapa - cytoplasmic male sterility in maize, kappa particles of paramecium - plasmid and episomic inheritance.

UNIT V Modern concept of genetics and mutation

DNA, the genetic material – Griffith's experiment, Avery, McCleod and McCarthy Experiment – confirmation by Hershey and Chase; RNA as genetic material–Frankel, Conrat and Singer experiment. Structure of DNA– Watson and Crick model. Proof for semi conservative method of DNA replication; Models of DNA replication; steps involved in DNA replication. RNA types - mRNA, tRNA, rRNA. Protein synthesis - Regulation of gene expression–Operon model of Jacob and Monad Lac and Trpoperons. Cistron, muton and recon. Mutation– characteristics of mutation – micro and macro mutation – ClB technique - molecular basis of mutation Transition and transversion; major physical and chemical mutagens.

Practical schedule

1. Use of microscopes and study of cell shapes and cell organelles of active mitotic and meiotic tissues.
2. Principles of killing and fixing; preparation of stains and preservatives.
3. Study of the mitotic phases in root tips of onion / *Aloe sp*.
4. Study of behaviour of chromosomes in mitosis.
5. Procedure for fixing and observing different meiotic phases in the inflorescence of maize.
6. Procedure for fixing and observing different meiotic phases in the inflorescence in pearl millet/ sorghum/ forest tree.
7. Observation of bivalents, trivalents, quadrivalents and chromosome banding
8. Repetition of meiotic studies in maize/ sorghum/ pearl millet/ forest tree and making temporary and permanent slides.
9. Principles of dominance, recessive, back cross, test cross, incomplete dominance, codominance and lethal factor; Chi square test; Monohybrid genetic ratio with dominance, with incomplete dominance and test cross.
10. Dihybrid ratio with dominance, with incomplete dominance and test cross
11. Simple interaction of genes-comb character in fowls; Dominant epistasis.
12. Recessive epistasis, Duplicate and additive epistasis.
13. Duplicate dominant epistasis, Duplicate recessive epistasis, Dominant and recessive epistasis.
14. Multiple alleles and polygenic inheritance
15. Estimation of linkage with F2 and test cross data; Coupling and repulsion.
16. Problems on two point test cross and three point test cross; Working out interference, coincidence and drawing genetic maps.

REFERENCE BOOKS

1. Daniel Sundararaj, G. Thulasidas and M. Stephen Dorairaj, 1997. Introduction to Cytogenetics and Plant Breeding. Popular Book Depot, Chennai – 15.
2. Benjamin Lewin. 2005. Genes IX Oxford University Press, Oxford.
3. Gupta P.K. 1993. Genetics, Rastogi publications, Meerut.
4. Reddi, O.S. 1992. Understanding Genetics. Sunil Sachdev Publishers, New Delhi – 64.
5. Russel, P.J. 2000. Fundamentals of genetics. Addition Wesley Longman Publishers, USA.
6. Singh, R.J. 2002. Plant cytogenetics. CRC Press, USA.

TEXT BOOKS

1. Gupta P.K. 1997. Cytogenetics. Rastogi Publications, Meerut.
2. Strickberger. M.W. 1996. Genetics. Prentice-Hall of India Pvt. Ltd. New Delhi.
3. Singh, B.D. 2004. Fundamentals of Genetics, Kalyani Publishers, Chennai.
4. Verma, P.S. and V.K. Agarwal. 2007. Genetics. S.Chand and Company Ltd., New Delhi.
5. Stansfield, W.D. 1990. Theory and Problems of Genetics. Mc-Graw Hill Book Co., New York.

AGM 102	AGRICULTURAL MICROBIOLOGY	T	P	C
		1	1	2

THEORY

UNIT I Introduction

Definition and scope of Microbiology. Milestones in Microbiology; biogenesis and abiogenesis theory; contributions of Antonie Van Leeuwenhoek, Louis Pasteur, John Tyndall, Robert Koch, Edward Jenner, Joseph Lister, Alexander Fleming and Waksman. Germ theory of diseases and fermentation.

UNIT II Microbiological Techniques

General principles of light microscopy - magnification, resolving power and numerical aperture. Different types of light and electron microscopes; three-dimensional imaging - atomic force and Confocal scanning laser microscopy. Staining techniques - principle and types of stains; simple, negative, differential and structural staining. Sterilization and disinfection techniques; principles and methods of sterilization - physical methods – heat, filters and radiation; chemical methods. Isolation, enrichment and purification techniques of bacteria, yeast, molds and actinobacteria. Preservation of microbial cultures.

UNIT III Microbial World

Evolutionary relationship among the living organisms. Whittaker's five kingdom concept of living organism and Carl Woese systems. Procaryotic and eukaryotic microorganisms. Three domains of life – similarities and differences; Modern approach to the bacterial systematics. Bergey's Manual of Systematic Bacteriology. Bacteria - bacterial size, shape and arrangement; bacterial cell structure and function. Morphology of fungi and algae. General properties of viruses: different types; overview of bacteriophages; morphology of bacteriophages: Lytic and lysogenic cycles; lytic and temperate phages.

UNIT IV Microbial Growth and Metabolism

Bacterial growth- population growth- growth cycles of population; environment on growth – temperature, oxygen, pH and salts; nutritional classification – chemoautotrophy and photo autotroph. Energy generation in bacteria, Aerobic and anaerobic respiration and fermentation in bacteria.

UNIT V Microbial Genetics and Immunology

Central dogma of life. Genetic elements of bacteria; bacterial chromosomal DNA, plasmids, IS elements and transposons; Mutation - types and mutagens. Genetic recombinations; transformation, transduction and conjugation. Genetic engineering – an introduction. Basic concepts of immunology – antigen – antibody reactions and vaccines.

Practical

Microbiological safety in the laboratory; introduction to microbiology laboratory and its equipments. Microscopes- handling with microscope. Micrometry. Methods of sterilization and equipment used for sterilization. Nutritional media and their preparations. Enumeration of microbial population - bacteria, fungi and actinobacteria. Methods of purification and preservation of microbial cultures. Staining and microscopic observations; simple and differential staining - spore staining. Measurement of bacterial growth. Identification of

microorganisms - morphological identification of yeasts, molds and algae. Identification-cultural, physiological and biochemical tests for bacteria and actinobacteria. Isolation of bacteriophages. Isolation of mutants employing physical or chemical mutagens.

Practical schedule

1. Safety in Microbiology laboratory. Microscopes – handling light microscope
2. Micrometry-measurement of microorganisms
3. Aseptic techniques – working with equipment and apparatus
4. Preparation of growth media for bacteria, yeast, molds and actinobacteria
5. Isolation of microorganisms by serial dilution and plating technique
6. Purification of bacteria and actinobacteria
7. Purification of yeasts and molds
8. Preservation of bacteria, fungi and actinobacteria
9. Staining techniques - positive and negative staining
10. Differential staining - Gram staining
11. Turbidometric assessment of growth of bacteria
12. Morphological characteristics of bacteria and actinobacteria
13. Biochemical characteristics of bacteria and actinobacteria
14. Identification of yeasts, molds and algae - morphological characterization
15. Isolation of bacteriophages
16. Isolation of bacterial mutants by UV iiradiation / chemical mutagenesis
17. **Practical Examination**

Reference

1. Michael T. Madigan , Kelly S. Bender Daniel H. Buckley , W. Matthew Sattley, David A. Stahl 2017. Brock Biology of Microorganisms, 15th edition
2. ebook.:Prescott, Harley and Klein, 2013. Microbiology, 9 th edition, McGraw Hill Publishing
3. ebook: Michael J. Leboffee and Burton E.Pierce 2011. A photographic Atlas for the Microbiology Laboratory 4th edition, Marton Publishing Company
4. Hans G. Schlegel, 2012. General Microbiology, 7 th edition
5. Ronald M. Atlas, 1997. Principles of Microbiology, Second edition
6. Tortora, G.J., B.R.Funke and C.L. Case, 2009. Microbiology- An Introduction, 9 th edition
7. Stanier, R.Y., Adelberg, E.A. and Ingram, J.L. (1991). General Microbiology, 5th Ed., Prentice Hall of India Pvt. Ltd., New Delhi.

E- Reference

1. http://www.microbes.info
2. http://aem.asm.org
3. http://microbelibrary.com
4. http://www.rapidmicrobiology.com

AEN101	FUNDAMENTALS OF ENTOMOLOGY	T	P	C
		2	1	3

THEORY

UNIT I – Insect Dominance and Moulting

History of Entomology in India. Major points related to dominance of Insecta in Animal kingdom. Classification of phylum Arthropoda upto classes. Relationship of class Insecta with other classes of Arthropoda. Insect morphology: Structure and functions of insect cuticle and molting, hormonal control of moulting.

UNIT II – Morphology of insects and its life cycle

Body segmentation. Structure of Head, thorax and abdomen. Structure and modifications of insect antennae, structure and modifications of mouth parts and its types, legs and its modifications, Wing structure, venation, modifications and wing coupling apparatus. Abdomen and its structure, pre genital and post genital segments, structure of male and female genital organ. Metamorphosis and diapause in insects, immature stages in insects, insect life cycle, types of egg, larvae and pupae.

UNIT III – Physiology of insects and receptors

Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretary (Endocrine) and reproductive system, in insects. Types of reproduction in insects. Major sensory organs, photoreceptor - simple and compound eyes, ommatidia structure and types, auditory receptor, chemoreceptor, thermoreceptor, and mechanoreceptor.

UNIT IV – Insect Taxonomy (Exopterygota)

Systematics: Taxonomy – importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order. Classification of class Insecta upto Orders, basic groups of present day insects with special emphasis to orders and families of Agricultural importance like Ephemeroptera, Orthoptera: Acrididae, Tettigonidae, Gryllidae, Gryllotalpidae; Dictyoptera: Mantidae, Blattidae; Odonata; Isoptera: Termitidae; Thysanoptera: Thripidae; Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidae, Aleurodidae.

UNIT V - Insect Taxonomy (Endopterygota)

Classification of class Insecta up to Orders, basic groups of present day insects with special emphasis to orders and families of Agricultural importance like Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papiloinidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera: Tenthridinidae, Apidae. Trichogrammatidae, lchneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae,Muscidae, Tephritidae.

Practical schedule

1. Observations on external features of grasshopper/cockroach
2. Methods of insect collection, preservation, pinning, labelling, display and storage
3. Types of insect head and antenna.

4. Mouth parts of cockroach, modifications in the mouth parts in plant bug, female mosquito, honeybee, thrips, antlion grub, housefly, moths and butterflies.
5. Structure of thorax and abdomen and their appendages —modifications in insect legs and wings — wing venation, regions and angles — wing coupling apparatus.
6. Study on the different types of insect egg, larvae and pupae.
7. Dissection of digestive system in insects (cockroach or grasshopper).
8. Dissection of male and female reproductive system in insects (cockroach or grasshopper).
9. Study on the characters of the order Orthoptera and its families Acrididae, Tettigonidae, Gryllidae and Gryllotalpidae and order Dictyoptera and its families Bladidae and Mantidae.
10. Study on the characters of the order Odonata, Isoptera and Thysanoptera and their agriculturally important families.
11. Study on the characters of the order Hemiptera - **Homoptera** and its families Cicadidae, Aphididae, Aleyrodidae, Coccidae, and Kerridae; **Heteroptera** and its families Reduviidae, Pentatomidae, Miridae, Coreidae, Pyrrhocoridae, Lygaeidae.
12. Observing the characters of Lepidoptera and its important families Nymphalidae, Pieridae, Papilionidae, Pyraustidae, Noctuidae, Arctiidae, Bombycidae, Gelechiidae, Saturniidae, Sphingidae, and Hesperidae.
13. Study on the characters of the order Neuroptera and its important families Chrysopidae, Myrmeliontidae, Mantispidae, Ascalaphidae.
14. Observing the characters of the order Coleoptera and its important families Curculionidae, Apionidae, Cicindellidae, Carabidae, Coccinellidae, Lampyriidae, Hydrophilidae, Scarabaeidae Tenebrionidae and Bruchidae.
15. Observing the characters of the order Hymenoptera and its important families Tenthredinidae, Apidae, Vespidae, Formicidae, Ichneumonidae, Braconidae, and Trichogrammitidae).
16. Observing the characters of the order Diptera and its families Cecidomyiidae, Agromyzidae, Tephritidae, Asilidae, Tabanidae, Tachinidae, Hippoboscidae, Culicidae, and Muscidae).

TEXT BOOK

1. David, B.V. and V.V. Ramamurthy. 2011. *Elements of Economic Entomology*, Namrutha Publications, Chennai, 386p. {ISBN: 978-81-921477-0-3}.
2. Richard J. Elzinga.2003. Fundamentals of Entomology, Pearson Publications 6th Edition, 512 pages, ISBN-10 : 0130480304, ISBN-13 : 978-0130480309
3. Raju S.V.S., M. Raghuraman, Tanweer Alam, and M.S. Ali. 2015. A Text Book of Fundamental and Applied Entomology, Kalyani Publishers; First Edition, 310 pages, ISBN-10 : 9327248570.
4. Nayar. K.K., T.N. Ananthakrishnan and B.V. David 1976. General and Applied Entomology. Tata Mc-Graw Hill publishing Company Ltd, New Delhi.

REFERENCE BOOKS

1. Chapman, R.F. 1998. *The Insects: Structure and Function*. Fourth Edition. Cambridge University Press. 770p. {ISBN 0 521 78732 7}.
2. Snodgrass, R.E. 1994. *Principles of Insect Morphology*. CBS publishers and distributors, New Delhi. 667p.
3. Richards O.W. and R.G. Davies. 1977. *Imm's General Text Book of Entomology*. Vol.I and II. Chapman and Hall Publication, London. 1354p. {ISBN 0412 15220 7}

AGR103	INTRODUCTORY AGROMETEOROLOGY AND CLIMATE CHANGE	T	P	C
		1	1	2

THEORY

UNIT I – Agromet Introduction – Atmospheric Pressure and Wind Types

Meaning and scope of agricultural meteorology; Earth atmosphere - its composition, extent and structure; Weather on crop growth and development; Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze.

UNIT II – Solar radiation and Temperature variation

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

UNIT III – Humidity and Precipitation

Energy balance of earth; Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud; Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail.

UNIT IV – Cloud and Weather Hazards

Cloud formation and classification Artificial rainmaking. Monsoon - mechanism and importance in Indian agriculture, Weather hazards - drought, floods and extreme weather conditions such as heat-wave and cold-wave.

UNIT V – Weather Forecasting and Climate change

Microclimate and its modifications; climatic normals. Weather forecasting - types and their uses. Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture.

PRACTICAL SCHEDULE

1. Site Selection and Layout for Agromet Observatory - Calculation of local time-time of observation of different weather elements – reviewing agromet registers.
2. Measurement of Solar Radiation (Pyranometers), Sunshine Hours (Sunshine Reorder) - Working out Weekly and Monthly Mean for Graphical Representation.
3. Measurement of Air and Soil Temperature - Grass Minimum Temperature - Thermographs and Drawing Isolines.
4. Humidity Measurements - Use of Dry Bulb and Wet Bulb Thermometers – Psychrometers – Hygrograph - Measurement of Wind direction, Speed and Conversion (Kmph, Knot and $Msec^{-1}$) - Beaufort's Scale.
5. Measurement of Atmospheric Pressure - Fortin's Barometer – Barograph - Isobars Based on past data for different seasons.
6. Measurement of Rainfall - Ordinary and Self - Recording Rain Gauges - Measurement of Dew - Dew Gauge - Study of Automatic Weather Station.
7. Measurement of Evaporation - Open Pan Evaporimeter – Application of evaporation data –Measurement of Evapotranspiration – Lysimeter.
8. Heat Unit Concept - GDD, HTU, PTU for fixing Time of Sowing.
9. Probability analysis of Rainfall for Crop Planning.

10. Drawing Synoptic Charts for Understanding Weather.
11. Preparation of Crop Weather Calendars and Forecast Based Agro Advisories.
12. Preparation of pest weather calendar and pest forewarning.
13. Estimation of Length of Growing Periods Using Weekly Rainfall Data.
14. Water balance studies.
15. Identification of efficient cropping zone –RYI, RSI.
16. Mapping of Agro climatic Zones of India and TamilNadu and its Characterization.

REFERENCE BOOKS

1. Sacheti, A.K. 1985. Agricultural Meteorological Instructional Cum Practical Manual (Ed.) NCERT Publication, New Delhi.
2. Lal. D.S. 2005. Climatology, Sharda Pustak Bhawan, Allahabad.
3. Varshneya, M.C. and Balakrishna, Pillai, 2003. Text book of Agricultural Meteorology. ICAR, New-Delhi.
4. Sahu, D.D. 2007. Agrometeorology and Remote sensing: Principles and Practices, Agrobios (India), Jodhpur.
5. Murithy, K, and Radha, V. 1995. Practical Manual on Agricultural Meteorology, Kalyani Publishers, New-Delhi
6. Panda, S.C. 2012. Modern Concepts and Advance Principles in Crop Production. Agrobios (India), Jodhpur.

CRP101	FUNDAMENTALS OF CROP PHYSIOLOGY	T	P	C
		2	1	3

THEORY

UNIT I Basics of Crop Physiology & Water Absorption

Importance of Crop Physiology in Agriculture, Role of water – Water potential and components - Definitions - field capacity, water holding capacity of soil and permanent wilting point, Absorption and translocation of water and solutes, Transpiration – significance – anti-transpirants.

UNIT II Nutrient Metabolism

Mineral nutrition – mobility and Mechanism of uptake - physiological role of nutrients, Physiological disorders - nutritional disorders (deficiencies and toxicities) - Difference between Physiological and nutritional disorders - diagnosis, identification of disorders - foliar, tissue testing. Management Techniques - foliar feeding, root feeding, trunk feeding and fertigation.

UNIT III Photosynthesis & Respiration

Photosynthesis - light reaction and Photosynthetic pathways - C3, C4 and CAM, Factors affecting photosynthesis, Photorespiration and significance - Phloem and xylem loading - Source sink relationship. Respiration: Glycolysis, TCA cycle and electron transport chain; Fat Metabolism: Fatty acid synthesis and Breakdown

UNIT IV Growth & Development

Growth - Growth analysis - Photoperiodism - Role of phytochrome in flowering - Vernalisation – devernalisation - Physiological roles and agricultural uses of Plant growth regulators and retardants - Post harvest Physiology - Physiology of seed germination, seed and bud dormancy and breaking methods, Parthenocarpy - Physiology of fruit ripening - climacteric and non-climacteric fruits - factors affecting ripening and storage, Abscission – senescence, Shelf life and quality changes – use of PGRS and nutrients.

UNIT V Stress Physiology

Environmental stresses - water stress - physiological changes - adaptation to drought and its amelioration, Temperature stress - Physiological changes - low and high temperature - chilling injury - tolerance – alleviation, Low light and UV radiation stresses - salt stress - physiological changes and alleviation, Global warming – Carbon Sequestration physiological effects on crop productivity.

PRACTICAL SCHEDULE

1. Preparation of solutions.
2. Measurement of plant water status by different methods.
3. Estimation of stomatal index and stomatal frequency.
4. Measurement of leaf area by different methods.
5. Physiological and Nutritional disorders in crops plants.
6. Rapid Tissue Tests.
7. Estimation of chlorophyll Stability Index.
8. Estimation of RWC.
9. Determination of photosynthetic efficiency in crop plants.
10. Estimation of Nitrate retuctase activity.

11. Growth Analysis - Determination of LAI, LAD, SLA, SLW, LAR, NAR, RGR, CGR and HI.
12. Bioassay of cytkinin.
13. Bioassay of GA.
14. Estimation of proline accumulation to assess the water stress in crop plants.
15. Demonstration of crop response to growth regulators.
16. Field visit for foliar diagnosis.

REFERENCE BOOKS

1. Jain, J.K. 2007. Fundamentals of Plant Physiology, S.Chand & Company Ltd., New Delhi.
2. Pandey, S. N. and B. K.Sinha. 2006. Plant Physiology. Vikas Publishing House Private Limited, New Delhi.
3. Purohit, S.S, 2005. Plant Physiology, Student edition, Jodhpur.
4. Ray Noggle, G. and Fritz, G. J. 1991. Introductory Plant Physiology. Prentice Hall of India Pvt. Ltd., New Delhi.
5. Taiz. L. and Zeiger. E., 2006. Plant Physiology. Publishers: Sinauer Associates, Inc., Massachusetts, USA.

AEC101	FUNDAMENTALS OF AGRICULTURAL ECONOMICS	T	P	C
		1	1	2

THEORY

Unit 1: Nature and Scope of Economics

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

Unit 2: Theory of Consumption

Demand: meaning, kinds of demand, law of demand, demand schedule and demand curve, determinants; *Utility theory* - cardinal and ordinal utility; law of diminishing marginal utility, equi-marginal utility principle, Indifference curve analysis and properties - budget line: definition, assumptions, limitations and applications - consumer's equilibrium and derivation of demand curve. Concept of consumer surplus and its importance. *Elasticity of demand*: concept and measurement of price elasticity, income elasticity and cross elasticity. Factors influencing elasticity of demand - Importance of elasticity of demand – Standard of Living: Definition, Engel's Law of Family Expenditure.

Unit 3: Theory of Production

Production: process, creation of utility, factors of production definition and characteristics – Input Output Relationship. *Laws of returns*: Law of variable proportions and Law of returns to scale. *Cost:* Cost concepts, short run and long run cost curves. *Supply:* Stock versus supply, law of supply, supply schedule, supply curve, determinants of supply, elasticity of supply.

Unit 4: Exchange and Theory of Distribution

Market structure: meaning and types of market, basic features of perfectly competitive and imperfect markets. Price determination under perfect competition; short run and long run equilibrium of firm and industry, shut down and break even points. *Distribution theory*: meaning, factor market and pricing of factors of production - Concepts of Rent and Quasi rent - *Wages:* Real wage and money wage - *Interest:* Pure interest and gross interest – *Profit:* Meaning of economic profit.

Unit 5: Macroeconomic Concepts

National income: Meaning and importance, circular flow, concepts of national income - accounting and approaches to measurement, difficulties in measurement. *Population:* Importance, Malthusian and Optimum population theories, natural and socio-economic determinants, current policies and programmes on population control. *Money:* Barter system of exchange and its problems, evolution, meaning and functions of money, classification of money, money supply, general price index, inflation and deflation. *Banking:* Role in modern economy, types of banks, functions of commercial and central bank, credit creation policy. *Agricultural and public finance:* meaning, micro versus macro finance, need for agricultural

finance, public revenue and public expenditure. *Tax:* meaning, direct and indirect taxes, agricultural taxation, VAT and GST. *Economic systems:* Concepts of economy and its functions, important features of capitalistic, socialistic and mixed economies, elements of economic planning.

Practical Schedule

1. Law of Diminishing Marginal Utility.
2. Law of Equi - Marginal Utility.
3. Indifference Curve analysis - Properties, budget line and consumer equilibrium.
4. Individual and market demand - Graphical derivation of individual and market demand.
5. Measurement of Arc and Point elasticities of demand - own price, income and cross price elasticities of demand.
6. Estimation of Consumer surplus.
7. Law of Diminishing Marginal Returns: Relationship among TPP, APP and MPP.
8. Cost concepts and graphical derivation of cost curves.
9. Estimation of total revenue and profit.
10. Estimation of Producer surplus.
11. Estimation of Supply elasticity.
12. Exchange: Market Structure and Price determination.
13. Computation of National Income – Analysis of Trends in National Income - Study of structural changes in the economy.
14. Estimation of Growth rate of population and Food grain production.
15. Money: Quantity theory of money.
16. Measures of standard of living – Human Development Index – Physical Quality of Life Index – Gender Development Index.
17. **Final Practical Examination.**

References

1. Dewett, K. K. 2004. Modern Economic Theory, Syamlal Charitable Trust, New Delhi.
2. Samuelson, P. 2004. Economics, (18/e), Tata Mc-graw-Hill, New Delhi
3. Seth, M. L. 2005.Principles of Economics, Lakshmi Narain Agarwal Co., Agra. New Delhi.

AEX103	FUNDAMENTALS OF AGRICULTURAL EXTENSION EDUCATION	T	P	C
		2	1	3

THEORY

Unit I Extension education and programme planning

Education- meaning, definition & types; extension education –meaning, definition, scope and process; objectives and principles of extension education. Programme planning – definition, meaning, process, principles and steps in programme development

Unit II Extension System in India

Extension efforts in pre-independence era (Sriniketan, Marthandam, Firka Development scheme, Gurgaon Experiment, etc.) Post – independence era (Etawah pilot project, Nilokheri Experiment, etc.,) Various extension/ agricultural development programmes launched by ICAR/Govt. of India(IADP, IAAP, HYVP,KVK, ORP, ND, NATP, NAIP etc.,)

Unit III Rural Development, Administration, monitoring and evaluation

Rural Development –Concept, meaning, definition: various rural development programmes launched by Govt. of India. Community development –meaning, definition, concepts and principles, physiology of community development. Rural leadership: concept and definition, types of leaders in rural context: extension administration: meaning, concept, principles and functions. Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programmes

Unit IV New Trends in Agricultural Extension

New trends in agricultural extension **–**Privatization of extension, Cyber extension/ E-extension, (Internet, cyber cafes, video and teleconferencing, Interactive Multimedia Compact disk (IMCD), Agri portals, Information Kiosks, Kisan Call Centre (KCC), Mobile phone, Village Knowledge Centre (VKC), DEMIC, Geographical Information System (GIS), market led extension, farmer led extension, expert systems etc.,

Unit V Transfer of Technology, Diffusion of Innovations and extension methods

Transfer of technology concept, models, capacity building of extension personnel, extension teaching methods: meaning, classification, individual, group and mass contact methods, media mix strategies: communication: meaning, definition, models elements, characteristics and barriers to communication Agricultural Journalism: Agricultural journalism (Print media) - definition, principles, importance, ABC of news, types of news. Diffusion of Innovations – definition, elements; Innovation – definition, attributes; Adoption – meaning, steps in adoption process, adopter categories, factors influencing adoption of innovations; process and stages of adoption, adopter categories.

Practical

To get acquainted with university extension system, group discussion- exercise, handling and use of audio visual equipments and digital camera and LCD projector: preparation and use of AV aids, preparation of extension literature-leaflet, booklet, folder, pamphlet newstories 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; visit to community radio and television studio for understanding the process of programme production: Script writing, writing for print and electronic media, developing script for radio and television.

Practical schedule:

1. Visit to State department of Agri/ Horti to understand the organizational setup, roles, functions and various schemes.
2. Study the organizational set up and functions of DRDA.
3. Visit to NGO and learning from their experience in rural development
4. Visit to KVK to study the mandated activities
5. To study the ToT system of SAUs / Agricultural colleges
6. Exercise on practicing group discussion technique and presentation skills
7. Study on Art of Photography, Video techniques and preparing multimedia presentations and handling of AV aids and LCD projectors
8. Preparation of Posters, charts, leaflet, folder, booklet and Pamphlet
9. Preparation of news stories and success stories.
10. Exercise on practicing Art of Public Speaking (micro teaching skills)
11. To visit the village and understand the socio cultural and agricultural related problems being encountered by the villagers/ farmers
12. Practicing selected PRA techniques in a village setting
13. Visit to Community Radio/ Educational Media Centre to understand the process of programme production.
14. Exercise on Script writing for Radio and TV programme
15. Visit to All India Radio Station / TV to study the various activities & programmes.
16. Visit to the News Agency /TNAU press to study the process
17. **Final Practical Examination**

References :

- Ahuja, B.N. 1997. Theory and Practice of Journalism, Surjeet Publications, New Delhi.
- Benor Daniel, Q. James Harrison and Baxter Michael. 1984. Agricultural Extension – The Training and Visit System, A World Bank Publication, Washington, USA.
- Chauhan Nikulsinh. 2013. Use of ICTs in Agricultural Extension, Biotech Books.
- Gamble Dennis, Blunden, S. and Wallace, G. 2000. A Systematic Framework for understanding and Improving a Farming or Equine System, (AgPak SA 22), University of Western Sydney, Hawkesbury, NSW, Australia.
- Hough George, A. 2004. News Writing. Kanishka Publishers, New Delhi.
- Dahama, O.P and O.P. Bhatnagar. 1985. Education and Communication for Development, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
- Dipak de, Basavaprabhu Jirli. 2010. A Handbook of Extension Education, Agrobios, India.

- Katar Singh. 1999. Rural Development – Principles, Policies and Management, Sage Publications India Pvt. Ltd., New Delhi.
- Kelsey, L.D and C.C. Hearne. 1967. Cooperative Extension Work, Cornell University Press, New York.
- Manoharan Muthiah, P. and R. Arunachalam. 2003. Agricultural Extension, Himalaya Publishing House, Mumbai.
- Narayanasamy, N. 2009. Participatory Rural Appraisal Principles, Methods and Application, Sage Publications India Pvt. Ltd., New Delhi.
- Neela Mukherjee. 1993. Participatory Rural Appraisal: Methodology and Applications, Concept Publishing Co.
- Pandey, B.K. 2005. Rural Development, ISHA Books, New Delhi.
- Pandey, V.C. 2003. Information Communication Technology and Education (The Changing World ICT Governance), Isha Publishers.
- Ray, G.L. 1999. Extension Communication and Management, Naya Prokash, 206, Bidhan Sarani, Calcutta.
- Reddy Adivi, A. 1993. Extension Education, Shree Lakshmi Press, Bapatla, Andhra Pradesh.
- Rishipal. 2011. Training and Development Methods, S.Chand and Co. Ltd., New Delhi.
- Rogers, E.M. 1995. Diffusion of Innovations, The Free Press, New York.
- Sagar Mondal and Ray, G.L. 2007. Text book of Rural Development, Kalyani Publishers, New Delhi.
- Sandhu, A.S. 1996. Agricultural Communication: Process and Methods, Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi.
- Sandhu, A.S. 1996. Extension Programme Planning, Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi.
- Sanjay Prakash Sharma. 2006. Panchayat Raj, Vista International Publishing House, New Delhi.
- Singh, A.K. 2012. Agricultural Extension, Agrobios, New Delhi.
- Sivasudevaro, B and Rajannikanthu, G. 2007. Rural Development and Entrepreneurship Development, The Associated Publications, Ambala.
- Supe, S.V. 1997. An Introduction to Extension Education, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
- Van den Ban, A.W and H.S. Hawkins. 2002. Agricultural Extension, CBS Publishers & Distributors, New Delhi.

E -Reference

1. rural.nic.in
2. www.panchayat .gov.in
3. wcd.nic.in
4. moud.nic.in
5. mhupa.gov.in
6. www.i4d.com

HOR102	PRODUCTION TECHNOLOGY FOR FRUITS AND PLANTATION CROPS	T	P	C
		1	1	2

THEORY

UNIT I Scope and Importance of fruit and plantation crops

Importance, introduction and scope of fruit and plantation crops. Classification of fruits according to climate. Selection of site, planning, establishment and layout of orchard. Propagation methods of fruit crops. Methods of training and pruning in fruit crops. Use of growth regulators in fruit production.

UNIT II Tropical Fruits

Package of practices for the cultivation of major fruits with the emphasis on botanical name, family, origin, distribution, climate, soil, varieties, propagation, planting, manures and fertilizers, irrigation, training and pruning intercultural operation, harvesting, yield and plant protection measures including physiological disorders - Mango, Banana, Guava, Sapota, Papaya

UNIT III Sub-Tropical and Temperate fruits

Package of practices for the cultivation of major fruits with the emphasis on botanical name, family, origin, distribution, climate, soil, varieties, propagation, planting, manures and fertilizers, irrigation, training and pruning intercultural operation, harvesting, yield and plant protection measures including physiological disorders – Citrus, Grapes, Pineapple and Apple.

UNIT IV Arid Fruits

Package of practices for the cultivation of major fruits with the emphasis on botanical name, family, origin, distribution, climate, soil, varieties, propagation, planting, manures and fertilizers, irrigation, training and pruning intercultural operation, harvesting, yield and plant protection measures including physiological disorders - Pomegranate, Ber, Jack fruit, Aonla, Bale.

UNIT V Plantation Crops

Package of practices for the cultivation of major fruits with the emphasis on botanical name, family, origin, distribution, climate, soil, varieties, propagation, planting, manures and fertilizers, irrigation, training and pruning intercultural operation, harvesting, yield and plant protection measures including physiological disorders - Coconut, Cashew, Areca nut, Datepalm, Oil palm and Tea.

PRACTICAL SCHEDULE

1. Identification of fruit and plantation crops.
2. Study of horticultural tools and implements and their uses.
3. Plant propagation methods by seeds.
4. Cuttings (soft wood, hard wood and semi-hardwood).
5. Method of Budding.
6. Method of Grafting.
7. Method of Layering.
8. Simple layering, Air layering other method of Layering.
9. Layout and planting systems.
10. Methods of pruning.

11. Training of important fruit crops.
12. Irrigation methods in fruit crops including drip – Micro irrigation.
13. Methods for establishment of orchard.
14. Methods of fertilizer application in fruit crops.
15. Visit to local commercial orchards with in state.
16. Preparation of growth regulator solutions for propagation; Application of growth regulators for improving fruit set, fruit size and quality.

REFERENCE BOOKS

1. Bose. T.K., Kabir. J., Das. P. and Joy P.P. 2000. Tropical Horticulture. NayaProkash. Calcutta.
2. Singh, Amar. 1986. Fruit Physiology And Production. Kalyani Publishers, New Delhi.
3. Singh. S.P. 1997. Commercial Fruits. Kalyani Publishers, New Delhi.
4. Mitra. S.K., Bose. T.K. and Rathore D.S. 1991. Temperate Fruits.Horticulture & Allied Publishers, Calcutta.
5. Parthasvathy. V. A. Chattopadhyay. P.K. and Bose T.K. 2006. Plantation Crpos. NayaProkash, Kolkatta
7. Bal. J.S. 1997. Fruit Growing. Kalyani Publisher, New Delhi.

NST 111	FUNDAMENTALS AND APPLICATIONS OF NANOTECHNOLOGY	T	P	C
		1	0	1

THEORY

Unit I - Principles of Nanoscience

History, definition, terminologies in nanoscience - Importance of Moore's law- Introduction to nanomaterials – Semiconductor – Diode – Quantum Dots- Buckyball - CNT - Polymers- types – PLGA – coreshell nanoparticles - micelle - Introduction to nanobiosensor- types- properties and applications

Unit II - Synthesis of Nanomaterials

Top-down and bottom-up approaches - Physical, Mechanical, Chemical and Biological synthesis of nanomaterials

Unit III Properties and Characterization of Nanomaterials

Physical, Mechanical, optical, magnetic, thermal and electrical properties – Characterization – SEM, TEM, AFM, FT-IR, XRD

Unit IV - Application of Nanotechnology

Agriculture and Food Systems

Unit V - Application of Nanotechnology

Energy, Environment, Health – Social, Economic and Ethical issues – Nanotoxicology

Lecture schedule

1. History, definition, terminology in nanoscience and importance of Moore's law.
2. Nanomaterials – Semiconductor – Diode – Quantum Dots - Buckyball - CNT - characteristics – Applications
3. Polymers - Types – PLGA – Coreshell nanoparticles - Micelles - characteristics – Applications
4. Biosensors – Principle, Components, Types, Applications**.**
5. Top down and Bottom up approaches - Physical method, Physical Vapour Deposition (PVD), Etching - Molecular Beam Epitoxy – Sputtering – Lithography - Mechanical synthesis - Ball milling – Types - Mechanical alloying
6. Chemical synthesis – Sol-gel Method – Chemical Vapour Deposition (CVD) – electro-deposition- thin film
8. Biological synthesis using Microorganisms and Plants Mechanical, magnetic and thermal properties of nanomaterials
9. Optical and electrical properties of nanomaterials
10. Principle, components and application of nanotechnology equipments: Scanning Electron Microscope (SEM) and Transmission Electron Microscope (TEM)
11. Principle, components and application of nanotechnology equipments: X-ray Diffraction (XRD) – Fourier Transform Infra Red Spectroscopy (FT-IR) – Atomic Force Microscope (AFM)
12. Agriculture – Nano fertilizers – Nano-herbicides – Nano-pesticides – Seed technology.

13. Nanotechnology in Food Systems – Nano foods, Nano-encapsulation of functional foods, Nano-packaging, Quality assessment.
14. Nanotechnology applications in Energy and Environment
15. Applications in Health Sciences and Nanotoxicology
16. Social, Economic and Ethical Issues in Nanotechnology

References:

1. Nano: The essentials understanding nanoscience and Nano- T.Pradeep - 2009 - Mc Graw Hill.
2. Nano materials - B.Viswanathan - 2009 -Narosa.
3. Introduction to nanotechnology - Charles P. Poole; Frank J. Owens – 2008 – Wiley.
4. Fundamentals of biomems and medical microdevices - Steven S.Saliterman – 2006 - Wiley Interscience.
5. Instrumental methods of analysis - Hobart H. Willam; Lynne L. Merrit – 2006 -CBS.
6. Fundamentals of physics - David Halliday; Robert Resnick – 2007 – Willey.
7. Chemistry Raymond Chang – 2009 - Tata Mcgraw Hill.
8. Nanomaterial chemistry - C.N. Rao, A. K . Chettam
9.
10. , A. Muller – 2007 – Wiley – VCH.
11. Nanotechnology Applications in Agriculture – C.R. Chinnamuthu, B.Chandrasekaran and C. Ramasamy – 2008.

FSN101	PRINCIPLES OF FOOD SCIENCE AND NUTRITION	T	P	C
		1	1	2

THEORY

Unit I Principles of Food Science and Nutrition

Food Science - definition – classification of foods – functional and nutritional classification. Food groups and food pyramid. Methods of cooking - moist, dry and microwave - principles, merits and demerits. Importance and scope of nutrition – relation of nutrition to health.

Unit -II Carbohydrate, Protein and Fat

Carbohydrate – classification, functions, digestion and absorption, sources and Recommended Dietary allowance (RDA). Energy value of foods – determination. Protein – classification, functions digestion and absorption, sources and requirements. Protein quality of foods – supplementary value of protein. Fat - classification functions, digestion and absorption, sources and requirements. Rancidity – types of rancidity and prevention. Deficiency states of protein, carbohydrate and fat nutrition – signs and symptoms.

Unit III Vitamin and Mineral Nutrition

Fat Soluble vitamins – A, D, E and K- functions, sources, requirements and deficiency. Water soluble vitamins – thiamine , riboflavin , niacin, pyridoxine, folic acid, cyanacobalamin, biotin, pantothenic acid ascorbic acid – functions, sources, deficiency and requirements. Minerals - calcium, iron, phosphorus, iodine, magnesium, zinc, sodium, potassium, fluorine and chlorine – functions, sources, deficiency and requirements. Importance of water – maintenance of electrolyte balance. Dietary fibre - importance, health benefits, sources and requirements.

Unit IV Food Preservation and Processing

Introduction – preservation by sugar - processing of jam, squash, jelly, marmalade and beverages. Preservation by using salt, chemicals, dehydration technology, canning technology, preservation by low temperature and irradiation techniques. Processing of puffed, flaked and extruded products. Quality control of raw and processed products.

Unit V Food Quality and Safety

Food packaging materials – requirements – methods – nutrition labeling. Food adulterants and their detection methods. Food laws and regulations and quality control standards - FSSAI, ISO, EU standards, FDA, HACCP and Codex Alimentarius Commission.

Practical

Determination of energy value of Foods, cooking quality tests – cereals and pulses. Estimation of moisture, protein and fat. Processing of jam, jelly, squash, ready to serve beverages (RTS). Preparation of flaked, puffed and extruded products. Visit to food industries and quality control laboratory.

Practical Schedule

1. Cooking tests for cereals and pulses
2. Determination of energy value of food

3. Estimation of moisture
4. Estimation of protein
5. Estimation of fat
6. Estimation of ascorbic acid
7. Estimation of iron
8. Estimation of crude fibre
9. Processing of jam and jelly
10. Processing of squash and RTS
11. Puffing of pulses
12. Extrusion of cereals and millets
13. Canning of fruits and vegetables
14. Processing of dehydrated fruits and vegetables
15. Identification of common food adulterants
16. Visit to food processing unit and quality control lab
17. **Final Practical Examination**

References

1. Srilakshmi, B. 2005. Food Science. New Age International (P) Ltd., Publishers, New Delhi.
2. Srivastava, R.P., and Sanjeevkumar. S. 2013. Fruit and Vegetable preservation. International Book Distributing Co. Lucknow.
3. Srilakshmi .B. 2015. Nutrition Science. New Age International Pvt. Ltd. New Delhi.

E- References

1. www.cellinteractive.com
2. www.nutrition.org.uk
3. www.fnic.nal.usda.gov
4. www.myfooddiary.com

AEX114	HUMAN VALUES AND ETHICS	T	P	C
		1	0	1

THEORY

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

SEMESTER III

AGR201	CROP PRODUCTION TECHNOLOGY – I (KHARIF CROPS)	T	P	C
		1	1	2

THEORY

UNIT I: Cereals

Rice, Maize, - Origin, geographic distribution, economic importance, soil and climatic requirements, varieties, cultural practices (from land preparation to harvest) and yield.

UNIT II: Millets

Sorghum, Pearl millet, Small millets - Finger millet, Foxtail millet, little millet, Kodo millet, Barnyard millet and Proso millet - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.

UNIT III: Pulses

Redgram, Blackgram, Greengram, Cowpea, - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.

UNIT IV: Oilseeds (Kharif)

Groundnut, sesame, Soybean- Origin, and geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices, yield.

UNIT V: Fibre and forage

Cotton, jute, fodder sorghum, cumbu napier- Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices, yield.

Cereals	Rice, maize
Millets	Sorghum, pearl millet, finger millet and minor millets
Pulses	Pigeonpea, green gram, black gram, cowpea,
Oilseeds	Groundnut, sesame, soybean
Fibre & Forage	Cotton, jute, fodder sorghum, Cumbu napier

PRACTICAL SCHEDULE

1. Identification of cereals, millets, pulses and oilseed crops in the crop cafeteria
2. Practicing various nursery types and main field preparation for rice crop.
3. Nursery and main field preparation for important millets, pulses and oilseeds.
4. Acquiring skill in different seed treatment techniques in important kharif crops.
5. Estimation of plant population per unit area for important kharif crops.
6. Acquiring skill in field preparation, sowing and manuring of crops under pure and intercropping situations for cereals and millets.
7. Acquiring skill in field preparation, sowing and manuring of crops under pure and intercropping situations for pulses and oilseeds.
8. Acquiring skill in using seed drill for sowing operations.
9. Acquiring skill in foliar nutrition for important field crops.
10. Observations on growth parameters of cereals and millets.
11. Observations on growth parameters of pulses and oilseeds.
12. Study of yield parameters and estimation of yield in cereals and millets.
13. Study of yield parameters and estimation of yield in pulses and oilseeds.

14. Working out cost and returns of important cereals, millets, pulses and oilseeds crops.

15. Visit to farmers field / research stations to study the cultivation techniques of cereal, millets, pulses, cotton and oilseeds.

16. Visit to nearby Agricultural Research Station / Farmer's field.

REFERENCE BOOKS

1. ICAR. 2010. Handbook of Agriculture (6th edition), Indian Council of Agricultural Research, New Delhi.
2. Panda, S.C. 2012. Modern Concepts and Advance Principles in Crop Production. Agro bios (India), Jodhpur.
3. Singh, Chhidda, Singh, Prem and Singh, Rajbir. 2003. Modern Techniques of Raising Field Crops, Oxford & IBH Publishing Co., New Delhi.
4. Singh, S.S.and Singh, Rajesh. 2013. Crop Management Under Irrigated and Rainfed Conditions. Kalyani Publishers, New Delhi.
5. Singh, S.S.and Singh, Rajesh. 2015. Principles and Practices of Agronomy (5th Re-set), Kalyani Publishers, New Delhi, Kalyani Publishers, Ludhiana.

SAC211	PROBLEMATIC SOILS AND THEIR MANAGEMENT	T	P	C
		2	0	2

THEORY

UNIT I: Soil quality and health

Soil quality and health, Distribution of Waste land and problem soils in India. Their categorization based on properties.

UNIT II: Problem soils and their management

Reclamation and management of Saline and sodic soils, Acid soils, Acid Sulphate soils, Eroded and Compacted soils, Flooded soils, Polluted soils.

UNIT III: Irrigation water and their standards

Irrigation water – quality and standards, utilization of saline water in agriculture.

UNIT IV: Remote sensing and GIS

Remote sensing and GIS in diagnosis and management of problem soils.

UNIT V: Bioremediation

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

TEXT BOOKS

1. Arun Kumar Saha and Anuradha Saha. 2012. Text book of Soil Physics. Kalyani Publishers. New Delhi.
2. Biswas T.D. and Mukherjee S.K. 1987. Text Book of Soil Science-Tata McGraw Hill Publishing Co. Ltd., New Delhi.
3. Dilip Kumar Das. 2004. Introductory Soil Science, Kalyani Publishers, New Delhi Fundamentals of Soil Science. 2009. ISSS Publication, New Delhi.
4. Steward, D.W.P. 1976. Soil Microorganisms and Plant growth, Oxford and IBH Publishing Co., New Delhi.

REFERENCE BOOKS

1. Brady, N.C. and Weil, R.C.2012.The nature and properties of soils.14 Edn, Pearson Publication.

2. Boul, S.W., R.J. Southard, R.C.Graham and P.A.Mc Daniel. 2005. Soil genesis and classification. 5th Ed. Iowa State University Press, Ames, IA.

3. Sehgal,J. 2005. A Text Book of Pedology Concepts and Application, Kalyani Publishers, New Delhi.

4. Soil Survey Staff. 2006. Keys to Soil Taxonomy. United States Department of Agriculture, Natural Resources Conservation Service.

PBG201	FUNDAMENTALS OF PLANT BREEDING	T	P	C
		2	1	3

THEORY

UNIT I: Reproductive systems in plant breeding

Objectives and role of plant breeding - historical perspective – activities in Plant Breeding. Centres of origin – contribution of Vavilov, Harlan, Zhukovosky – law of homologous series. Plant genetic resources –importance –germplasm –types – activities –gene erosion - gene bank –collection -conservation – types of conservation. Germplasm: evaluation– use of descriptors, documentation, utilization; Agencies – national and international; germplasm exchange – quarantine. Modes of reproduction – sexual – asexual – mechanisms promoting self and cross pollination – significance of pollination. Self-incompatibility – classifications – mechanisms – application – measures to overcome and limitations. Sterility – male sterility – introduction – classification – CMS, GMS, CGMS -inheritance and applications. EGMS - TGMS, PGMS, Gametocides, Transgenic Male sterility and applications. Apomixis – introduction – classification - applications; Parthenocarpy and its types.

UNIT II: Breeding methods of self pollinated crops

Polygenic variation-components of variance - phenotypic, genotypic and environmental variance heritability and genetic advance. Plant introduction as a breeding method –types of introduction – objectives – quarantine - acclimatization – achievements - merits and demerits. Genetic basis of self pollinated crops – Vilmorin's principle of progeny selection - Johannsen's pure line theory. Breeding methods for self pollinated crops without involving artificial hybridization: Pure line selection – procedure – merits and demerits – achievements; Mass selection– procedure - types – merits and demerits-achievements-comparison of mass and pureline selection. Breeding methods of self pollinated crops involving artificial hybridization: Creating variability in self pollinated crops - Hybridization and selection – objectives – steps in hybridization - choice of parents – kinds of emasculation – hybridization transgressive breeding. Handling segregating generations- Pedigree breeding – procedure – mass pedigree – merits – demerits – achievements; Bulk breeding – procedure – merits – demerits – achievements. Comparison of pedigree and bulk breeding methods. Single Seed Descent (SSD) method – procedure –application –merits and demerits. Backcross breeding –genetic basis — procedures for transferring dominant and recessive genes. Back cross breeding – merits – demerits – multilines- types procedure- merits and demerits.

UNIT III: Breeding methods of cross pollinated crops and clonally propagated crops

Genetic structure of a population in crosses pollinated crops – Hardy Weinberg law – gene frequencies in random mating population. Breeding methods of cross pollinated crops without involving artificial hybridization: Mass selection in cross pollinated crops – modified mass selection – Grid selection – progeny selection. Breeding methods of cross pollinated crops involving artificial hybridization: Recurrent selection principles –types –merits and demerits. Heterosis breeding –theories -genetic basis – hybrid vigour – estimation of heterosis – inbreeding depression. Heterosis breeding – procedure – development ofinbreds- evaluation of inbred lines –top cross method and single cross method prediction of double cross performance- hybrids – single cross- double cross- three way cross hybrids. achievements –

merits and demerits. Synthetics and composites - steps in development of synthetics and composites –achievements –merits and demerits. Genetic characters of asexual reproduction – clonal selection –hybridization and clonal selection –merits and demerits –achievements.

UNIT IV: Special breeding methods

Polyploidy breeding – classification – induction of polyploidy - achievements – limitations. Wide hybridization-importance-barriers and techniques for overcoming barriers-utilization- Pre-breeding. Mutation breeding: mutation–types –mutagens –breeding procedure –achievements –limitations. Concepts in biotic stress resistance breeding- diseases and pests - gene for gene hypothesis - mechansims of resistance - sources of resistance- multilines -gene pyramiding-gene deployment - Breeding methods. Concepts in abiotic stress resistance breeding- drought - mechansims of drought resistance–basis of drought resistance-morphological and physiological characters- sources of drought resistance-Breeding methods.

UNIT V: Varietal Release, Seed Production, Markers and IPR

Procedure for release of new varieties-stages in seed multiplication-steps in nucleus and breeder seed production. Introduction to markers – morphological – biochemical - DNA markers – advantages and disadvantages- marker assisted selection in plant breeding. Participatory plant breeding - Intellectual Property Rights – Patenting - Plant Breeders and Farmers Rights.

Practical schedule

1) Reproduction in plants - Alternation of generation and life cycle.
2) Mode of pollination - Mechanisms enforcing self and cross pollination in crops- Working out extent of natural out crossing.
3) Breeder's kit and its components
4) Basic techniques for selfing and crossing in crop plants.
5) Emasculation and pollination techniques in field crops.
6) Emasculation and pollination techniques in horticultural crops.
7) Handling of segregating populations- Layout of different yield trials-maintenance of records.
8) Study of Cytoplasmic genic male sterility system in Rice
9) Study of Genic male sterility system in Redgram
10) Mutagenesis study using physical and chemical mutagens
11) Germplasm collection and conservation.
12) Experimental designs used in plant breeding-RBD analysis
13) Calculation of mean, range, PCV, GCV, heritability, genetic advance
14) Estimation of heterosis and prediction performance of double cross hybrids
15) Screening techniques for biotic stresses in rice
16) Screening techniques for abiotic stresses in rice

REFERENCES BOOKS

1. Alard, R.W. 2000. Principles of Plant Breeding. John Willey & Sons, New York.
2. Chahel, G.S. and S.S. Ghosal. 2002. Principles and Procedures of Plant Breeding, Biotechnological and Conventional Approaches. Narosa Publishing House, New Delhi.
3. Singh, B.D. 2005. Plant Breeding. Kalyani Publishing House, New Delhi.

4. Singh, P. 2001. Essentials of Plant Breeding - Principles and Methods. Kalyani Publishing House, New Delhi.
5. Jain, H.K. and M.C. Kharkwal. 2004. Plant Breeding - Mendelian to Molecular Approach. Narosa Publishing House, New Delhi.
6. Sharma, A.K. 2005. Breeding Technology of Crop Plants (Edt.).Yash Publishing House, Bikaner.
7. Shekhawat, S. S. (ed). 2016. Advances and Current Issues in Agriculture, VoI.III. Shiksha Prakashan,S.M.S. Highway, Jaipur.

PAT 201	FUNDAMENTALS OF PLANT PATHOLOGY	T	P	C
		2	1	3

Theory

Unit I: Plant pathogenic organisms

Plant Pathology- Definition - History- Economic importance of plant diseases- Plant Pathogenic organisms – Protozoa, Phytomonas, chromista, Fungi, Bacteria, *Candidatus Phytoplasma,* Spiroplasma, Fastidious vascular bacteria, Viruses, Viroids, Algae, and Phanerogamic parasites

Unit II: Pathogenesis

Koch's postulates- Pathogenesis - Mode of infection – pre-penetration, penetration and post penetration - Role of enzymes and toxins on disease development-Effect of pathogen on physiological functions of the plants

Unit III: General characters and taxonomy of Protozoa, Chromista and fungi

General characters– somatic structures, types of mycelia - reproduction (Vegetative, asexual and sexual) –Types of parasitism. Classification (Kirk *et al.*, 2001) and symptoms of **Kingdom:Protozoa, Phylum:Plasmodiophoromycota**, *Plasmodiophora brassicae.* **Kingdom**:**Chromista, Phylum:Oomycota-***Pythium,Phytophthora, Sclerospora*, *Plasmopara* and *Albugo* **Kingdom:Fungi , Phylum:Chytridiomycota**-*Synchytrium,* **Phylum: Zygomycota** -*Mucor*, *Rhizopus*

Unit IV: General characters and taxonomy of fungi - Ascomycota and Basidiomycota

Phylum:

Ascomycota, *Taphrina, Capnodium, Mycosphaerella, Macrophomina, Cochliobolus, Lewia, Venturia, Eurotium, Talaromyces, Sclerotinia, Erysiphe, Leveillula, Phyllactinia,Claviceps, Gibberella, Ustilaginoidea, Verticillium, Glomerella, Pestalotiopsis and Magnaporthe*

Unit V: Bacteria, Phytoplasma, virus, viroid, Algae, Phanerogams and abiotic disorders

General characters and symptoms- phytopathogenic bacteria,*Candidatus Phytoplasma*, Spiroplasma, Fastidious vascular bacteria, viruses, viroids, algae, Phanerogams –Abiotic disorders.

Practical

General characters of fungi – Types of mycelia -Types of vegetative, asexual and sexual spores- asexual and sexual fruiting bodies .Study of important taxonomic characters and symptoms produced by *Plasmodiophora, Pythium Phytophthora, Sclerospora, Plasmopara* , *Albugo, Mucor, Rhizopus, Taphrina, Capnodium, Cercospora,* (*Mycospaerella*), *Botryodiplodia* (*Botryosphaeria*), *Curvularia, Drechslera* (*Helminthosporium)*, *Alternaria, Venturia, Erysiphe, Phyllactinia, Uncinula, Leveillula* and *Claviceps, Fusarium* (*Gibberella ,Nectria*), *Verticillium ,Colletotrichum (Glomerella) Pestalotia (Pestalosphaeria), Pyricularia*(*Magnoporthe*) *Sarocladium, Macrophomina, , Puccinia, Uromyces , Hemileia, Ustilago Sphacelotheca (Sporisorium), Tolyposporium (Moesziomyces), Exobasidium, Sclerotium, Rhizoctonia* (*Thanatephorus*) *Ganoderma Agaricus, Pleurotus* and *Calocybe.* Symptoms of bacterial diseases, *Candidatus Phytoplasma,* Fastidious vascular bacteria, algal parasite, phanerogamic parasites and non-parasitic diseases

Practical schedule

1. General characters of fungi – Types of mycelia -Types of vegetative, asexual and sexual spores-asexual and sexual fruiting bodies.
2. Study of important taxonomic characters and symptoms produced by *Plasmodiophora*, *Pythium* and *Phytophthora*.
3. Study of important taxonomic characters and symptoms produced by *Sclerospora Plasmopara* and *Albugo*
4. Study of important taxonomic characters and symptoms produced by *Rhizopus, Taphrina, Capnodium, Cercospora,* (*Mycospaerella*), *Botryodiplodia* (*Botryosphaeria*), *Drechslera* (*Helminthosporium)* and *Alternaria*
5. Study of important taxonomic characters and symptoms produced by *Eurotium, Talaromyces, Erysiphe, Leveillula, Phyllactinia, Uncinula , Podosphaera and Sphaerotheca*
6. Study of important taxonomic characters and symptoms produced by *Claviceps, Fusarium* (*Gibberella, Nectria*) and *Verticillim*
7. Study of important taxonomic characters and symptoms produced by *Colletotrichum (Glomerella), Pestalotia (Pestalosphaeria), Pyricularia* (*Magnoporthe*) *Sarocladium* and *Macrophomina*
8. Study of important taxonomic characters and symptoms produced by *Puccinia*, *Uromyces*, and *Hemileia*
9. Field visit for exposing students on different crop diseases
10. Study of important taxonomic characters and symptoms produced by *Ustilago, Sphacelotheca (Sporisorium), Tolyposporium (Moesziomyces),and Exobasidium*
11. Study of important taxonomic characters of *Agaricus, Pleurotus, Calocybe* and *Volvariella*
12. Study of important taxonomic characters and Symptoms produced by *Athelium, Thanetephorus* and *Ganoderma*
13. Symptoms of bacterial diseases – leaf blight, leaf streak, canker, scab, crown gall, wilt and soft rot.
14. Symptoms of *Candidatus Phytoplasma* and Algae
15. Symptoms and vectors of viral diseases – mosaic, chlorosis, leaf curl, stem pitting, spotted wilt, necrosis , ring spot, vein clearing, leaf crinkle, rosette and bunchy top\
16. Phanerogamic parasites and non-parasitic diseases
17. **Final Practical Examination.**

References

1. Alice D, and Jeyalakshmi C 2014. Plant Pathology. A.E Publications ,Coimbatore
2. Agrios, G.N. 2005. Plant Pathology – (5^{th} Edition). Academic Press, New York.

E- references

1. Agrios, G.N. 2005. Plant Pathology – (5^{th} Edition). Academic Press, New York.
2. Richard N. Strange. 2003. Introduction of Plant Pathology - John Wiley & Sons Ltd, London
3. John Webster and Ronald Weber, 2007. Introduction to fungi by Cambridge University Press, UK

SWE201	INTRODUCTORY SOIL AND WATER CONSERVATION ENGINEERING	T	P	C
		1	1	2

THEORY

UNIT I Surveying and Levelling

Surveying and Levelling – Chain, Compass and Plane Table survey – levelling – Land measurement and computation of area – Simpson's rule and Trapezoidal rule.

UNIT II Erosion and its effect

Soil Erosion – causes and evil effects of soil erosion – geologic and accelerated erosion - water erosion - causes - erosivity and erodibility - mechanics of water erosion - splash, sheet, rill and gully erosion - Ravines - Landslides – Wind erosion - factors influencing wind erosion - mechanics of wind erosion – suspension, saltation, surface creep.

UNIT III Erosion control measures

Erosion control measures for Agricultural lands – biological measures – contour cultivation – strip cropping – cropping systems – vegetative barriers - windbreaks and shelterbelts - Shifting cultivation - mechanical measures – contour bund – graded bund – broad beds and furrows – basin listing – random tie ridging – Mechanical measures for hill slopes – contour trench – bench terrace – contour stone wall – gully control structures – permanent and temporary structures. Farm ponds – percolation ponds- Watershed Management.

UNIT IV Irrigation and Drainage

Irrigation - Measurement of flow in open channels - velocity area method - rectangular weir - Cippoletti weir - V notch - Orifices - Parshall flume - Duty of water - Irrigation efficiencies - Conveyance of irrigation water - canal lining - Underground pipe line system - Surface irrigation methods - Borders, furrows and check basins - Drip and sprinkler irrigation– Agricultural drainage - Surface drainage systems – Sub-Surface drainage systems - Drainage coefficient-design of open ditches.

UNIT V Groundwater occurrence and selection of Pumps

Groundwater occurrence – aquifers – types of wells – pump types – reciprocating pumps – centrifugal pumps – turbine pumps – submersible pumps – jet pumps – airlift pumps – selection of pumps – operation and their maintenance.

PRACTICAL SCHEDULE

1. Chaining / taping on level ground
2. Survey of an area by chain survey (closed traverse)
3. Chaining across obstacles
4. Compass survey - observation of bearings - computation of angles.
5. Study of level and leveling staff
6. Differential or fly leveling – reduce levels by H.I method
7. Differential or fly leveling – reduce levels by rise and fall method
8. Calculation of soil loss using universal soil loss equation (USLE)
9. Measurement of Rain splash erosion
10. Study of different types of wells and its selection.
11. Study of reciprocating pump & centrifugal pump
12. Study of submersible pumps & jet pumps
13. Selection of pumps.

14. Layout of sprinkler and drip systems.
15. Problems on duty of water, irrigation efficiencies.

REFERENCE BOOKS

1. Kanetkar, T.P. & Kulkarni, S.V. 2004. Surveying & levelling. Part –I, A.V.G. Prakashan,
   Poona.
2. Suresh, R. 2005. Soil and Water Conservation Engineering. Standard Publishers & Distributors, New Delhi.
3. Gunshyam Das. 2005. Hydrology and Soil Conservation Engineering. Prentice-Hall of India Pvt. Ltd., New Delhi.
4. Suresh, R. 2008. Land and Water Management Principles. Standard Publishers & Distributors, New Delhi.
5. Murthy, V.V.N. 2005. Land and Water Management. Kalyani publishing, New Delhi.

HOR 201	PRODUCTION TECHNOLOGY OF VEGETABLES AND SPICES	T	P	C
		1	1	2

THEORY

Unit I: Scope, Importance and classification of vegetables

Importance of vegetable growing –area and production of vegetables in India and Tamil Nadu- National economy- nutritive value of vegetables and human nutrition.

Unit II: Production technology of tropical vegetable crops

Origin - climate and soil – varieties and hybrids – seeds and sowing – transplanting – water and nutrient management – fertigation – weed management – use of micronutrients and plant growth regulators - physiological disorders - maturity indices – harvest – pest and diseases – seed production

Crops: Tomato, chilli, brinjal, bhendi, gourds (ash gourd, pumpkin, bitter gourd, ridge gourd, bottle gourd, snake gourd and watermelon) onion, cassava, amaranthus and moringa.

Unit III: Production technology of temperate vegetable crops

Origin -climate and soil – varieties and hybrids – seeds and sowing – transplanting - water and nutrient management – fertigation – weed management – use of micronutrient and plant growth regulators-physiological disorders- maturity indices – harvest – pest and diseases – seed production

(**Crops:** Cabbage, cauliflower, potato, carrot, radish, beetroot, peas and french beans, Protected cultivation of vegetables (tomato, capsicum and cucumber).

Unit IV: Crop production techniques of major spices

Spices- scope and importance - classification of spices - origin, area and production - role of commodity boards- export potential of spices. Climate and soil - varieties - propagation - nursery management and planting – cropping systems-training practices - nutrient, water and weed management - shade regulation - maturity indices - harvest and yield - pests and diseases - processing - value addition.

Black pepper, Cardamom, Turmeric, Ginger and Garlic

Unit V: Crop production techniques in seed spices, tree spices and other spices

Climate and soil- varieties - propagation, nursery management and planting- training , pruning canopy management- weed and water management- shade regulation- nutrient management including drip and fertigation – harvest and yield – pests and diseases – processing – value addition.

Coriander, Fenugreek, Cumin, Fennel, Clove, Nutmeg, Cinnamon, Curry leaf, Tamarind and Herbal spices

Practical schedule

1. Layout of kitchen garden.
2. Seed treatment and sowing practices in direct sown vegetables
3. Nursery management of transplanted ,bulb and tuber vegetable crops
4. Grafting in vegetable crops
5. Water and nutrient management – fertigation in vegetable crops
6. Practices in use of plant growth regulators in vegetable crops

7. Special horticultural practices in vegetable production
8. Identification of physiological disorders in vegetable cropsStudy of maturity standards and harvesting of vegetables
9. Practices in protected cultivation of vegetable crops
10. Visit to vegetable nurseries/protected vegetable cultivation unit
11. Black pepper and cardamom- identification and description of varieties – seed propagation and vegetative propagation – fertilizers application - preparation of plant bio regulators and application - pests and diseases- harvest and post harvest practices.
12. Turmeric and ginger- identification and description of varieties- propagation, fertilizers application - preparation of plant bio regulators and application – pests and diseases- harvest and post harvest practices.
13. Coriander and Fenugreek - identification and description of varieties - seed treatment, sowing fertilizer application - pests and diseases- harvest and post harvest practices.
14. Clove, Nutmeg and Cinnamon - identification and description of varieties – seed collection and extraction - propagation – fertilizer application – training and pruning – pests and diseases- harvest and post harvest practices.
15. Tamarind and curry leaf - identification and description of varieties – seed collection and extraction - propagation – fertilizer - application – canopy management – pests and diseases- harvest and post harvest practices.
16. Visit to spice gardens or commodity boards and working out cost economics of spice crpops.

REFERENCES

- Gopalakrishnan, T.R. 2007. Vegetable Crops. Horticultural Science Series (Series Editor K.V.Peter). New India Publishing Agency.
- Mandal, R.C. 2006. Tropical root and tuber crops. Agrobios (India) Peter.K.V. 2000. Genetics and Breeding of Vegetables, ICAR, Publication.
- Singh, P.K., S.K. Dasgupta and S.K. Tripathi, 2006. Hybrid Vegetable Development. International Book Distributing Co.
- Mini, C. and Krishnakumar, K. 2004. Leaf Vegetables. Agro tech Publishing Academy, Udaipur Thamburaj, S. and Narendra Singh .2001. Vegetables, Tuber crops and Spices, Directorate of information and publications of agriculture, ICAR,NewDelhi.
- Veeraragavaththam ,D., M.Jawaharlal and SeemanthiniRamadas 2000 " Vegetable Culture"
- Kumar, N. 2014. Introduction to Spices, Plantation, Medicinal and Aromatic crops,
- IBH Publishing Co. Pvt. Ltd., New Delhi.
- Alice Kurian and Peter, K.V. 2007. Horticulture science series Vol. 08, New India Publishing Agency, New Delhi.
- Veeeraragavathatham, D and et al.,2004. Scientific fruit culture, Sun Associates, Coimbatore.

- Henry Louis, I. 2002. Coconut- The wonder palm. Hi - Tech Coconut Corporation, Nagercoil.

E-References

1. http://www.jhortscib.com
2. http://journal.ashspublications.org
3. http://www.actahort.org/
4..http://www.aphorticulture.com/crops.htm
5. http://cpcri.nic.in/ http://indiancoffee.org

AEC201	AGRICULTURAL FINANCE AND COOPERATION	T	P	C
		2	1	3

THEORY

Unit 1: Agricultural Finance – Nature and Scope

Agricultural Finance- meaning, scope and significance, credit needs and its role in Indian agriculture. Agricultural credit: meaning, definition, need, classification. Sources of credit - advantages and disadvantages - Rural indebtedness- History and Development of rural credit in India.

Unit 2: Financial Institutions

Sources of agricultural finance: institutional and non-institutional sources and their roles, commercial banks - social control and nationalization of commercial banks. Micro financing including KCC, Micro finance – SHG Models, Lead Bank Scheme, RRBs, Scale of finance and unit cost. Cost of credit. An introduction to higher financing institutions – RBI, NABARD, ADB, IMF, world bank, Insurance and Credit Guarantee Corporation of India. Recent development in agricultural credit: Rural credit policies of Government – Subsidized farm credit - Differential Interest Rate (DIR) Scheme – Loan relief measures

Unit 3: Farm Financial Analysis

Credit analysis: 4 R's, 7 P's and 3C's of credit. Preparation of bankable projects / Farm credit proposals – Feasibility; Appraisal - Time value of money: Compounding and Discounting - Undiscounted and Discounted measures. Preparation and analysis of financial statements – Balance Sheet, Income Statement and Cash Flow Statement. Basic guidelines for preparation of project reports - Bank norms – SWOT analysis.

Unit 4: Co-operation

Agricultural Cooperation in India – Meaning, brief history of cooperative development in India - Pre and Post - Independence periods and Co-operation in different plan periods, objectives, principles of cooperation, significance of cooperatives in Indian agriculture. Co-operating credit structure: short term and long term. Agricultural Cooperation - credit, marketing, consumer and multi-purpose cooperatives, farmers' service cooperative societies, processing cooperatives, farming cooperatives, cooperative warehousing; role of ICA, NCUI, NCDC, NAFED. Strength and weakness of co-operative credit system, Policies for revitalizing co-operative credit.

Unit 5: Banking and Insurance

Negotiable Instruments: Meaning, Importance and Types - Central bank: RBI – functions - Credit control – Objectives and Methods: CRR, SLR and Repo rate - Credit rationing - Dear money and cheap money - Financial Inclusion and Exclusion: credit widening and credit deepening monetary policies. Credit gap: Factors influencing credit gap. Non - Banking Financial Institutions (NBFI). NPA – Causes, consequences and mitigation. Crop Insurance: Schemes, Coverage, Advantages and Limitations in Implementation - Estimation of Crop Yields - Assessment of crop losses, Determination of compensation - Weather based crop insurance, features, determinants of compensation. Livestock Insurance Schemes Agricultural Insurance Company of India Ltd (AIC): Objectives and functions.

Practical

Determination of most profitable level of capital use. Optimum allocation of limited amount of capital among different enterprise. Analysis of progress and performance of cooperatives using published data. Analysis of progress and performance of commercial banks and RRBs using published data. Visit to a commercial bank, cooperative bank / cooperative society to acquire first - hand knowledge of their management, schemes and procedures. Visit to District Central Co-operative Bank (DCCB) to study its role, functions and procedures for availing loan – Fixation of Scale of Finance. Estimation of credit requirement of farm business – A case study. Preparation and analysis of Balance Sheet, and Cash Flow Statement – A case study. Exercise on Financial Ratio Analysis. Appraisal of farm credit proposals – A case study. Preparation and analysis of income statement – A case study. Preparation of Bankable projects / Farm Credit Proposals and appraisal - Undiscounted methods and Discounted methods. Techno-economic parameters for preparation of projects for various agricultural products and its value-added products. Seminar on selected topics. Analysis of Different Crop Insurance Products / Visit to crop insurance implementing agency.

Practical Schedule

1. Determination of most profitable level of capital use.
2. Optimum allocation of limited amount of capital among different enterprise.
3. Analysis of progress and performance of cooperatives using published data.
4. Analysis of progress and performance of commercial banks and RRBs using published data.
5. Visit to a commercial bank, cooperative bank / cooperative society to acquire first - hand knowledge of their management, schemes and procedures.
6. Visit to District Central Co-operative Bank (DCCB) to study its role, functions and procedures for availing loan – Fixation of Scale of Finance.
7. Guest lecture on Role and functions of Commercial Bank and Lead Bank / NABARD and its Role and Functions.
8. Estimation of credit requirement of farm business – A case study.
9. Preparation and analysis of Balance Sheet and Cash Flow Statement – A case study.
10. Exercise on Financial Ratio Analysis. Appraisal of farm credit proposals – A case study.
11. Preparation and analysis of income statement – A case study.
12. Preparation of Bankable projects / Farm Credit Proposals and appraisal.
13. Undiscounted methods and Discounted methods.
14. Techno-economic parameters for preparation of projects for various agricultural products and its value added products.
15. Analysis of Different Crop Insurance Products / Visit to crop insurance implementing agency.
16. Seminar on selected topics.
17. **Practical Examination.**

References

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

2. Subba Reddy, S and P. Raghu Ram. 2011. Agricultural Finance and Management. Oxford & IBH. New Delhi.
3. Lee, W.F., M.D. Boehlje, A.G. Nelson and W.G. Murray. 1998. Agricultural Finance. Kalyani Publishers. New Delhi.
4. Mammoria, C.B. and R.D. Saxena. 1973. Cooperation in India. Kitab Mahal. Allahabad. Patnaik, V.E. and A.K. Roy. 1988. Cooperation and Cooperative Management. Kalyani Publishers. Ludhiana.

FMP 201	FARM MACHINERY AND POWER	T	P	C
		1	1	2

THEORY

Unit I: Farm Power & IC engines

Status of Farm Power in India, Sources of Farm Power, I.C. engines, working principles of IC engines, comparison of two stroke and four stroke cycle engines, Study of different components of IC engine, I.C. engine terminology and solved problems, Familiarization with different systems of I.C. engines: Air cleaning, cooling, lubrication, fuel supply.

Unit-II : Tractor & functional components

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

Unit –III: Tillage implements

Familiarization with Primary and Secondary Tillage implement, Implement for hill agriculture.

Unit-IV: Sowing & Intercultural implements

Familiarization with sowing and planting equipment, calibration of a seed drill and solved examples, implement for intercultural operations.

Unit-V: Plant Protection and Harvesting equipments

Familiarization with Plant Protection equipment, Familiarization with harvesting and threshing equipment.

PRACTICALS

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 board 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.

PRACTICAL SCHEDULE:

1. Study of working of two and four stroke IC engines and their systems with solved problems.
2. Study of Tractor clutch, gearbox, differential and final drive. Study of brake steering, and hydraulic control.
3. Learning driving of tractor and power tiller
4. Study of tractors and power tillers – their operation and maintenance
5. Study of mould board plough, - methods of ploughing- with solved problems.

6. Disc plough and subsoiler and their components- Hitching and adjustment of plough - field operation of different tractor drawn primary tillage machinery.
7. Study of cultivator, disc harrows, Rotavator, bund former, ridger, leveller and puddling implements and their operation.
8. Study of seed drills, planters and seed-cum-fertilizer drills and their components and metering mechanisms - calibration- simple problems on calibration.
9. Study and operation of machinery for rice cultivation - puddling implements- rotary puddlers and cage wheels, tray seeder for rice nursery, transplanters- types operation and maintenance- Drum seeder, conoweeder, power weeder and finger type weeder.
10. Study of different inter-cultivation equipment for uplands - manual, animal drawn, power operated - tractor and power tiller operated - field operation
11. Study of plant protection equipment – manually operated sprayers and dusters, knapsack mist blower cum duster, tractor operated sprayers- their operation, adjustment, calibration and safety requirements
12. Study of tools for Hill agriculture and horticultural crops – propagation tools, vegetable transplanter, harvesting tools -lawn mower, hole diggers, tree climber, shredders for crop residue.
13. Threshing machinery for paddy and identification of its components- different threshing drums - calculation of efficiency and losses.
14. Study of paddy reaper and paddy combine- their systems, method of operation and adjustment.
15. Study of harvesters for root crops - turmeric and tapioca and groundnut diggers
16. Problems on cost of operation of tractor operated machinery.
17. Final practical examination

Reference Book

1. Jagadishwar Sahay, 2010 - **Elements of Agricultural Engineering**. Standard Publishers Distributers, Delhi. ISBN 978-8180140440
2. Ojha, T. P. and Michael, A.M. **Principles of Agricultural Engineering**. Vol. I, Jain Brothers, 16/893, East Park Road, Karol Bagh, New Delhi – 110005
3. S.C.Jain and C.R.Rai. **Farm Tractor – Maintenance and Repair**. Standard Publishers, 1705-B, Nai Sarak, Delhi – 110006
4. Senthilkumar, T., R. Kavitha and V.M.Duraisamy 2015. **A Text Book of Farm Machinery**, Thannambikkai Publications, Coimbatore . ISBN: 978-9381102305

E- RESOURCES:

www.agricoop.nic.in/dacdivision/Machinery1/directory.htm
www.farmmachineryshow.org
http://www.hillagric.ac.in/edu/coa/agengg/lecture/243/agriengg-243.htm
http://www.digitalbookindex.org/subject_search/search010agricultureequipmenta
http://ecoursesonline.iasri.res.in/course/view.php?id=540

ENS 201	ENVIRONMENTAL STUDIES AND DISASTER MANAGEMENT	T	P	C
		2	1	3

THEORY

UNIT I Nature of environmental studies

Multidisciplinary nature of environmental studies Definition, scope and importance. Natural Resources: Renewable and non-renewable resources, Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role of an individual in conservation of natural resources. • Equitable use of resources for sustainable lifestyles.

UNIT II Ecosystems, Biodiversity and its conservation

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem. Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) Biodiversity and its conservation: - Introduction, definition, genetic, species & ecosystem diversity and biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels, India as a mega-diversity nation. Hot-sports 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

Environmental Pollution: definition, cause, effects and control measures of: a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards. Solid Waste Management: causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Social Issues and the Environment: From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management.

UNIT IV Environmental Ethics and Acts for Wildlife & Forest Protection

Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. dies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness. Human Population and the Environment: population growth, variation among nations, population explosion, Family Welfare Programme. Environment and human health:

Human Rights, Value Education, HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health.

UNIT V Disaster Management

Disaster Management - Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion. Man Made Disasters - Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, air accidents, sea accidents. Disaster Management- Effect to migrate natural disaster at national and global levels. International strategy for disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, community –based organizations and media. Central, state, district and local administration; Armed forces in disaster response; Disaster response; Police and other organizations.

PRACTICAL SCHEDULE

1. Collection, processing and storage of effluent samples.
2. Determination of Biological oxygen demand(BOD) in effluent sample.
3. Determination of Chemical oxygen demand (COD) in effluent sample.
4. Estimation of dissolved oxygen in effluent samples.
   Determination of sound level meter.
5. Estimation of respirable and non-respirable dust in the air by using portable dust sampler.
6. Determination of total dissolved.
7. Pollution case studies. Case Studies - Field work.
8. Visit to a local area to document environmental assets river and forest.
9. Visit to a local area to document environmental assets grassland, hill/ mountain.
10. Visit to a local polluted site-Urban/Rural - Visit to a local polluted site- Industrial/ Agricultural.
11. Study of common plants, common insects and common birds.
12. Study of simple ecosystems- pond, river and hill slopes.
13. Pollution case studies - Case Studies- Field work: Visit to a local area to document environmental assets hill/ mountai.
14. Pollution case studies - Case Studies- Field work: Visit to a local area to document environmental assets river/ forest/ grassland.
15. Visit to a local polluted site-Urban/Rural/Industrial/ Agricultural, study of common plants, insects, birds.
16. Visit to a local polluted site- study of simple ecosystems-pond, river, hill slopes, etc.

REFERENCE BOOKS

1. Perspective of Environmental Sciences – Kaushik & Kaushik.
2. Air Environment and Pollution – S.S. Purohit.
3. Water Pollution causes, effects and control – P.K. Goel.
4. Biodiversity and Forest genetic resource – D.N. Tiwari.
5. Biodiversity : Planning for sustainable Development – J. Singh.
6. Text Book of Ecology and Environment – S.C. Joshi.

AMP 201	LIVESTOCK AND POULTRY MANAGEMENT	T	P	C
		2	1	3

THEORY

Unit I: Introduction to Livestock Management

Significance of Livestock and Poultry in Indian Economy – Livestock and Poultry census – Different livestock development programs of Government of India and Tamil Nadu-Various systems of livestock production-extensive – semi intensive - intensive- mixed-Integrated and specialized farms.

Unit II: Dairy Cattle Management

Important White and Black cattle breeds-classification-indigenous and exotic – Breed characteristics – Breeding - Cross breeding- Upgrading - Economic traits of cattle –Culling - Estrus Cycle – Artificial Insemination – Introduction to Embryo transfer – Housing – Space requirement calf and adult stock – System and types of housing - Feeding and Management of Calf, Heifer, Pregnant, Milch animal and working animals – Nutrition – Ration – Balanced Ration - Characteristics of ration and classification of feed and fodder –Total Mixed Ration **–** composition of concentrate mixture for different stage - Milking methods - Clean milk production – Factors affecting milk composition – Common diseases of cattle – classification – symptoms - preventing and control measures.

Unit III: Sheep and Goat Management

Breeds - Sheep and goat classification — Economic traits - system of rearing - Housing Management – Floor space requirement - Care and Management of young and adult stock – Nutrition – Feed and fodders of Small ruminants – Flushing - Common diseases – prevention and control.

Unit IV: Management of Swine

Classification of breeds – Economic traits - Housing - Nutrition – creep feeding - Care and Management of Adult and Young Stock - Common disease- prevention and control.

Unit V: Poultry Management

Classification of breeds - Commercial Strains of broilers and layers – Housing – brooding – deep litter and cage system – care and Management of broilers and layers -Nutrition of Chick, grower, Layer and broiler – Incubation and Hatching of Eggs - Common Diseases - Control and prevention.

Practical

Study of external parts of Livestock - Identification of livestock and poultry-Tattooing-ear tags-wing and leg bands-Common restraining methods-Disbudding (or) Dehorning-Different methods of castration-Dentition-Study of type design of animal and poultry houses-Selection of dairy cow and work bullock-Determination of specific gravity, fat percentage and total solids of milk- Demonstration of cream separation, - Identification of feeds and fodder-Economics Dairy, Goat and Swine farming - Study of external parts of Fowl - Preparation of Brooder House - Brooder management-Identification of layer and non layer- Debeaking, delousing and deworming of poultry-Vaccination schedule for broiler and layer-Dressing of broiler chicken - Economics of Broiler and Layer Farming - Visit to a modern Dairy and commercial layer and broiler farms - Demonstration of incubator and setter.

Practical Schedule

1. Study of external parts of livestock
2. Identification of livestock and poultry
3. Common restraining methods of livestock
4. Disbudding, Dehorning, Castration and Dentition of livestock
5. Study of type design of animal and poultry houses
6. Selection of dairy cow and work bullock
7. Determination of specific gravity, fat %, total solids, solids not fat
8. Demonstration of cream separation
9. Identification of feed &fodder
10. Economics of dairy, goat and swine Farming
11. Study of external parts of fowl. Preparation of brooder house
12. Identification of layer and non- layer
13. Debeaking, delousing, deworming of poultry Vaccination schedule for broiler and layer
14. Demonstration of dressing of broiler. Economics of layer and broiler farming
15. Visit to a modern dairy and commercial layer and broiler farms
16. Demonstration of incubator and setter
17. **Practical examination**

SEMESTER IV

	COMMERCIAL PRODUCTION TECHNOLOGY – II	**T**	**P**	**C**
AGR202	**(RABI CROPS)**	**1**	**1**	**2**

THEORY

Unit I : Cereals

Wheat, barley, Oats - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices, yield.

Unit II : Pulses

Chickpea, lentil, peas - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices, yield.

Unit – III Oilseeds

Rapeseed, mustard and sunflower- Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices, yield.

Unit -IV: Sugar Crops and Narcotics

Sugarcane and Tobacco - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices, yield.

Unit V: Forage crops

Berseem, Lucerne , Fodder maize and Tree Fodders : Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices.

PRACTICAL SCHEDULE

1. Identification of rabi crops and recording their importance in the crop cafeteria.
2. Acquiring skill in field preparation, sowing and manuring of rabi crops under pure and intercropping situations.
3. Acquiring skill in different seed treatment techniques and foliar nutrition of rabi crops.
4. Estimation of plant population per unit area for rabi crops.
5. Nursery preparation for Sugarcane.
6. Acquiring skill in after - cultivation practices in sugarcane - detrashing, and Propping; Tobacco – Topping and desuckering
7. Study on growth parameters of sugarcane.
8. Study on yield parameters and estimation of yield in sugarcane.
9. Study on yield parameters and estimation of yield in rabi crops.
10. Estimating Cost and returns of important rabi crops.
11. Visit to Sugarcane Breeding Institute/ Central Tobacco Research Station to study cultivation of sugarcane and its by products.
12. Visit to - nearby sugar mill, for observing juice extraction, quality assessment, sugar manufacture and by products / tobacco curing units
13. Silage making.
14. Practicing field preparation and sowing rabi fodders.
15. Practicing cultural operations in fodder crops
16. Visit to Wheat research station, Wellington to study rabi crops – wheat, barley, rye, oats.

REFERENCE BOOKS

1. Rajendra Prasad. 2012. Text Book on Field Crop Production, Indian Council of Agrl. Research, New Delhi.
2. Ahlawat, I.P.S., Om Prakash and G.S. Saini. 2010. Scientific Crop Production in India. Rama publishing House, Meerut.
3. Chidda Singh, Prem Singh and Rajbir Singh. 2011. Modern Techniques of Raising Field Crops. Oxford and IBH Pub. Co. Pvt. Ltd., New Delhi.

SST202	PRINCIPLES OF SEED TECHNOLOGY (1+2)	T	P	C
		1	2	3

THEORY

UNIT I: Introduction to Quality Seed Production

Seed and seed technology: introduction, definition and importance. Genetical and Agronomical principles of seed production, Deterioration causes of crop varieties and their control; Maintenance of genetic purity during seed production, seed quality; Definition, Characters of good quality seed, different classes of seed.

UNIT II: Seed Production in Agricultural Crops

Foundation and certified seed production of important cereals: Wheat, Rice, Maize, Sorghum, Bajra and Ragi. pulses: Urd, Mung, Pigeonpea, Lentil, Gram, Field bean, pea. Oilseeds: Soybean, Sunflower, Rapeseed, Groundnut and Mustard. Fodder and vegetables.

UNIT III: Seed Certification and Seed Storage

Seed certification, phases of certification, procedure for seed certification, field inspection. seed treatment, its importance, method of application and seed packing, Seed Dormancy. Seed storage; general principles, stages and factors affecting seed longevity during storage. Measures for pest and disease control during storage.

UNIT IV: Seed Genetic Purity Tests

Varietal Identification through Grow Out Test and Electrophoresis, Molecular and Biochemical test. Detection of genetically modified crops, Transgene contamination in non-GM crops, GM crops and organic seed production. Seed drying, processing and their steps, seed testing for quality assessment.

UNIT V: Seed Legislation and Marketing

Seed Act and Seed Act enforcement. Duties and powers of seed inspector, offences and penalties. Seeds Control Order 1983, Seed marketing: structure and organization, sales generation activities, promotional media. Factors affecting seed marketing, Role of WTO and OECD in seed marketing. Private and public sectors and their production and marketing strategies.

PRACTICAL SCHEDULE

1. Identification of different agricultural crop seeds and seed structures.
2. Seed Replacement Rate (SRR)- Calculation
3. Planning Seed Production.
4. Seed production in Rice.
5. Seed production Wheat.
6. Seed production in Maize.
7. Seed production in Sorghum.
8. Seed production in Bajra
9. Seed production in Ragi.
10. Seed production in Urd bean, Mung bean and Pigeon pea.
11. Seed production in Field bean, cowpea and pea.
12. Seed production in Groundnut and sesamum
13. Seed production in Soybean and Sunflower

14. Seed production in Rapeseed and Mustard.
15. Seed production in solanaceous vegetable crops.
16. Seed production in major malvaceous vegetable crops.
17. Methods of Seed sampling
18. Seed Physical purity test
19. Seed germination test.
20. Seedling Evaluation and reporting result.
21. Seed viability Test.
22. Determination of Seed Moisture Content
23. Seed vigour test.
24. Seed health test
25. Genetic purity test: Grow out test and electrophoresis.
26. Visit to seed production farms- Practice Seed certification Field Inspection Procedure, and Preparation of field inspection report.
27. Visit to Assistant Director of Seed Certification (ADSC) office and seed testing laboratories
28. Visit to seed processing plant.
29. Final Practical Examination

REFERENCE BOOKS

1. Seed Technology.2008. R.L.Agarwal. Oxford and IBH publishing.
2. Principles of Seed Technology.2015. M. Kulkarni. 2nd Edition. Kalyani Publishers.

TEXT BOOKS

1. A text book of Botany: Structure Development and Reproduction in Angiosperms, 2013. V. Singh, P.C. Pande & D.K.Jain ; Rastogi publications.
2. Principles of Seed Science & Technology. 2001. L.O. Copeland & M.B. McDonald. Springer New York, NY.

AGR 203	FARMING SYSTEM AND SUSTAINABLE AGRICULTURE	T	P	C
		1	1	2

THEORY

Unit - I: Cropping System

Cropping systems - Definition - Principles - Concepts - Classification - mono cropping - intensive cropping - cropping systems of India and Tamil Nadu - Interaction between different cropping systems - Cropping system management

Unit - II: Evaluation of Cropping System

Resource management - land, nutrient, water and weed; Index for evaluation of cropping systems - Land use - yield advantages - Economic evaluation - sustainability.

Unit - III: Farming System

Farming systems - Definition - Principles - Concepts - Enterprises selection and management - interaction between different enterprises with cropping - scope and advantages of Integrated Farming system - Integrated farming system models for different agro eco-systems - interaction between enterprises.

Unit - IV: Evaluation of Farming System

Resource recycling in IFS - Evaluation indicators of integrated farming system - LEISA & HEIA - concepts and principles - Principles, concept and scope - Conservation agriculture, Sustainable Agriculture and Organic / Natural farming

Unit - V: Resource and labour management in farming system

Resource management under constraint situation – Resource Use Efficiency (Nutrient, Weed, Water) - Cost reduction strategies in crop production - Non-monetary inputs and low cost technologies - Labour management - farming system and environment.

Practical Schedule

1. Visit to cropping system experiments in wetland.
2. Visit to cropping system experiments in irrigated upland and dryland.
3. Preparation of cropping scheme for wetland and working out input requirement.
4. Preparation of cropping scheme for irrigated upland and working out input requirement.
5. Calendar of operations for wet land and irrigated upland cropping system.
6. Working out indices for evaluating the cropping system - land use, yield advantage.
7. Working out indices for evaluating the cropping system - Economics, sustainability.
8. Visit to dairy, goat and poultry units.
9. Visit to mushroom unit.
10. Visit to sericulture and biogas unit.
11. Preparation of integrated farming system models : wetland eco-system.
12. Preparation of integrated farming system models : irrigated upland and dryland eco systems.
13. Resource recycling in integrated farming system models of different eco systems.
14. Evaluation of integrated farming system models : wetland eco-system.
15. Evaluation of integrated farming system models : irrigated upland and dryland eco systems.
16. On-farm visit to cropping fields and integrated farming system units.

PAT 203	PRINCIPLES OF INTEGRATED PLANT DISEASE MANAGEMENT	T	P	C
		1	1	2

THEORY

UNIT I: Epidemiology and Diagnosis of Plant Diseases

Classification of plant diseases - Disease triangle/ Disease Pyramid - Epidemiology of plant diseases- role of weather factors in disease development - survival and dispersal of plant pathogens- Disease surveillance, assessment and forecasting– Diagnosis of plant diseases- Seed health tests- chemodiagnosis, serodiagnosis and Molecular diagnosis

UNIT II: Principles - Avoidance & Exclusion

Avoidance- Role of cultural practices in plant disease management. Exclusion- Plant quarantine – domestic, International and Embargo - Phytosanitary certificate- Quarantine in India- Post Entry Quarantine- Exotic diseases introduced into India

UNIT III: Eradication

Eradication of pathogens from seed and Planting materials – Eradication of diseased plants- Surgery and Rouging – Eradication of Alternate and Collateral host- different methods of eradication- Mechanical, physical, chemical and Biological methods.

UNIT IV: Protection

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

Unit V Immunization and Biotechnological approaches

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

Practical Schedule

1. Survey and Assessment of important plant diseases
2. Diagnosis of Plant diseases: Tetrazolium test, Iodine test , ELISA test and Ooze test, paraquat test
3. Seed health tests for diagnosis of seed borne pathogens - dry seed examination, seed washing, Blotter tests
4. Classification and grouping of fungicides.
5. Preparation of Bordeaux mixture (1%) and Bordeaux paste (10%),
6. Calculation of spray fluid and methods of application of fungicides – Seed (wet and dry) soil, foliar and post harvest dipping.
7. Special methods of application: swabbing, acid delinting, pseudostem injection, capsule application
8. Special methods of application: Corm injection, Paring and prolinage, root feeding and trunk injection.
9. *In vitro* assay of fungicides against fungal pathogens

10. *In vitro* assay of biocontrol agents and their compatibility with agrochemicals
11. *Trichoderma viride* -Mass production and methods of application
12. *Pseudomons fluorescens* and *Bacillus subtilis* -Mass production & methods of application
13. Visit to commercial biocontrol production unit /seed and pesticide testing laboratories
14. Preparation of leaf extracts, oil emulsion of neem and antiviral principles.
15. Cross protection: production of pre immunized citrus seedlings against tristeza virus.
16. Tissue culture – Production of virus free plants through meristem tip culture technique.
17. **Practical Examination**

Reference

1. Prakasam,V., T.Raguchander and K.Prabakar, 2006. Applied Plant Pathology, A.E. publications, Coimbatore.
2. Dinakaran,D, Arjunan,G and Karthikeyan,G.2003. Biological control of crop diseases

E references:

1. Agrios, G.N. 2005. Plant Pathology – (5^{th} Edition). Academic Press, New York.
2. Richard N. Strange. 2003. Introduction of Plant Pathology - John Wiley & Sons Ltd, London
3. Dale Walters (2009). Disease control in crops. Blackwell Publishing Ltd, UK

AEN 203	MANAGEMENT OF BENEFICIAL AND HARMFUL INSECTS	T	P	C
		2	1	3

THEORY

Unit I

Classification of insects based on economic importance - Apiculture - Bee species - comparison - castes of bees, bee behaviour and bee dance; Apiary management practices - bee pasturage, foraging, seasonal variations; Bee products - properties and uses; Effect of agricultural inputs on bee activity - pesticide poisoning.

Unit II

Moriculture; Silkworm rearing; Lac insect - biology-strains-natural enemies of lac insect and lac products; Weed killers, pollinators, scavengers and soil builders; Balance of life in nature – population dynamics – role of abiotic and biotic factors. Life table – interspecific and intraspecific relationships

Unit III

Pests – definition and categories – pest outbreak – factors governing pest outbreak– pest monitoring, surveillance and forecasting. Economic Threshold Level – Economic Injury Level- Integrated Pest Management – history, principles and strategies – requirements for successful pest management programme; Cultural, physical, mechanical, ecological engineering methods and host plant resistance in pest management

Unit IV

Parasitoids, predators and microbial agents in pest management. Legal methods – definition – pest introductions – quarantine – phytosanitary certificate – pest legislation. Pesticides – history, classification – mode of action of insecticides. Pesticides compatibility, safety and hazards in the use of pesticides – pesticide poisoning - impact of pesticides in agro-ecosystem.

Unit V

Insecticide act. Insecticides residues and resistance. Semiochemicals – allomones – kairomones – pheromones- semiochemicals in pest management. Sterile male technique – chemosterilants, insect growth regulators – moult inhibitors – Juvenile Hormone mimics – antifeedants and repellents. Natural pesticides. Biotechnology in pest management. Bio safety of transgenic plants. Impact of global warming on pests. Bio-intensive/Bio-rational/ Eco-friendly Integrated Pest Management – Indigenous/traditional technologies in Integrated Pest Management

Practical schedule

1. Identification, morphology and structural adaptations in honey bees
2. Bee keeping appliances, bee enemies and diseases
3. Mulberry nursery bed preparation – methods of planting - Pruning methods – leaf / shoot harvest– preservation of leaves.
4. Identification of damage symptoms of insects, diseases and nematodes of mulberry
5. Chawki rearing and shoot rearing
6. Lac insect-life history, hosts and culturing of lac, natural enemies and lac products
7. Study of useful Insects - Pollinators, weed killers, scavengers and soil builders

8. Symptoms and types of damage caused by insect pests, Assessment of insect population and their damage in rice, cotton and brinjal
9. Cultural, mechanical and physical control of insects
10. Identification and mass culturing of different types of parasitoids
11. Identification and mass culturing of different types of predators
12. Identification and mass production of entomopathogens
13. Behavioral approaches in pest management – Pheromone traps, light traps, sticky traps and others
14. Pesticide formulations and toxicity parameters
15. Pesticide application techniques, Preparation of spray fluids and botanicals for field application
16. Plant protection appliances
17. Final Practical examination

Reference Book

1. David, B.V. and V.V. Ramamurthy. 2011. *Elements of Economic Entomology*, Namrutha Publications, Chennai, 386 p. {ISBN: 978-81-921477-0-3}
1. Pedigo, L.P. and M.E.Rice.1996. *Entomology and Pest Management.* Prentice-Hall of Idia Pvt Ltd, New Delhi. 812p. {ISBN-978-8120338869}
2. Dhaliwal, G.S. and R.Arora. 2001. *Integrated Pest Management – Concepts and approaches*. Kalyani publishers, New Delhi. 427p. {ISBN: 81-7663-904-4}
3. Dandin, S.B., J. Jayaswal and K. Giridhar.2003. *Hand book of Sericulture Technologies*. Central Silk Board, Bangalore, 287 p.

e resources

1. http://www.sristi.org/hbnew
2. http://www.ncipm.org.in/recent-publications.htm
3. http://www.ipmnet.org
4. www.silkbase.org
5. www.papilo.ab.a.u.tokyo.ac.jp

HOR 202	PRODUCTION TECHNOLOGY FOR ORNAMENTAL CROPS, MAPS AND LANDSCAPING	T	P	C
		1	1	2

THEORY

Unit I: Landscaping

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

Unit II: Production technology of cut flower crops under protected conditions

Production technology of important cut flowers like rose, gerbera, carnation, lilium and orchids under protected conditions

Unit III: Production technology of flowers under open conditions and value addition in ornamental crops

Production technology of important cut flowers like gladiolus, tuberose, chrysanthemum under open conditions. Package of practices for loose flowers like marigold and jasmine under open conditions. Processing and value addition in ornamental crops.

Unit IV: Production technology of medicinal crops

Medicinal crops- importance and scope – current status - soil and climate – varieties – propagation– planting methods – nutrient, irrigation and organic practices – harvest – post-harvest handling – storage, packaging of Periwinkle, Asparagus, Aloe, Costus, Isabgol, Glory lily, extraction and value addition of medicinal crops.

Unit V: Production technology of aromatic crops

Aromatic crops - importance and scope – current status -- soil and climate – varieties – propagation– planting methods – nutrient, irrigation and organic practices – harvest – post-harvest handling – storage, packaging of Ocimum, Mint, Geranium, Citronella, Lemon grass, Palmarosa and Vetiver – Distillation of oil and value addition.

Practical

Identification of Ornamental plants. Nursery bed preparation and seed sowing. Training and pruning of Ornamental plants. Planning and layout of garden. Protected structures – care and maintenance. Intercultural operations in flowers. Harvesting and post harvest handling of cut and loose flowers. Visit to commercial flower unit.

Medicinal and Aromatic Plants

Identification of Medicinal and Aromatic Plants- varieties-propagation-special practices - nutrient management, extraction and distillation of essential oil - Periwinkle, Asparagus, Aloe, Costus, Isabgol, Glory lily, Ocimum, Mint, Geranium, Citronella, Lemon grass, ,Palmarosa and Vetiver – visit to commercial medicinal and aromatic plants fields and processing units

Practical schedule

1. Identification, planting, care and maintenance of trees, shrubs and climbers used in garden
2. Identification of varieties in cut flowers under protected conditions.
3. Identification of varieties in flowers under open conditions.
4. Practices of nursery bed preparation, seed sowing in ornamental plants.

5. Training and pruning and intercultural operations in Ornamental plants
6. Planning and layout of garden.
7. Protected structures – care and maintenance.
8. Harvesting and post harvest handling of cut and loose flowers.
9. Identification of medicinal and aromatic plants –economic parts
10. Propagation techniques, planting, cultural operations in Periwinkle, Asparagus and Aloe.
11. Propagation techniques, planting, cultural operations in Costus, Isabgol and poppy.
12. Propagation techniques, planting, cultural operations in Ocimum, Mint, Geranium
13. Propagation techniques, planting, cultural operations in lemon grass, palmarosa, vetiver and citronella
14. Extraction and distillation of medicinal & Aromatic crops.
15. Visit to commercial floriculture and floral oil extraction units
16. Visit to commercial medicinal and aromatic crops field and extraction unit.

References

1. Bhattacharjee, S.K and De L.C (2003) Advanced Commercial Floriculture Vol. (1) Aavishkar publishers, Distributors, Jaipur.
2. Bhattacharjee, S.K and De L.C (2005) Medicinal Herbs & Flowers, Aarishkar, Jaipur.
3. Bhattacharjee, S.K., 2004. Hand book of medicinal plants, Pointer publications, Jaipur.
4. Bose, T.K., Yadav, L.P., Pal. P., Parthasarathy, V.A., Das. P., 2003. Commercial flowers. Vol. I and II. Naya udyog, Kolkata-6.
5. Ravindrasharma (2004) Agro techniques of Medicinal plants. Daya publishing, New Delhi.
6. Trivedi, P.C. (2004) Medicinal Plants: Utilization and Conservation, Aavishkar Publisher, Distributors, Jaipur.
7. Allan M. Armitage and Judy M. Laushman “Speciality Cut Flowers” , Second Edition, Published by Timber press 2003, ISBN – 0881925799
8. Atal. C. K. and B. M. Kapur. 1992. Cultivation and utilisation of medicinal plants RRL. CSIR, Jammu – Tawi.
9. Bose, T.K., Yadav, L.P., Pal. P., Das. P. and Parthasarathy, V.A., (2002) Commercial Flowers. Vol.1, Naya Prakash, Calcutta.
10. Chadha, K.L.1994. Advances in Horticulture, Vol.10. Malhotra Publishing house, New Delhi.
11. Chadha, K.L.1994. Advances in Horticulture, Vol.11. Malhotra Publishing house, New Delhi.
12. Farooqi, M., M. M. Khan and M. Vasundhara. 2004. Production technology of medicinal and aromatic crops. Natural Remedies Pvt. Ltd., Bangalore – 561229.
13. Surendraprasad and Updesh Kumar (1998), Commercial floriculture, Agrobotanica, Bikaner.
14. Kumar, N. Introduction to Horticulture. 2010. Oxford and IBH Publications, New Delhi.

15. Kumar, N. Introduction to Spices, Plantation, Medicinal and Aromatic crops. 1995. Oxford and IBH Publications, New Delhi.

E- References

1. http://www.theflowerexport.com
2. http:// www.intuxford.tripod.com
3. http://www.webct.uark.edu
4. http://www.pubmed.com
5. http://www.bestgarden.net/
6. http://www.indiaagronet.com/
7. http://www.intuxford.tripod.com/
8. http://www.lawngrasses.com/
9. http://www.frlht.org
10. www.herbs.org

AEC 202	AGRICULTURAL MARKETING, TRADE AND PRICES	T	P	C
		2	1	3

THEORY

Unit 1: Agricultural Marketing – Nature and Scope

Agricultural Marketing: Concepts and definitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation, classification and characteristics of agricultural markets**;** nature and determinants of demand and supply of farm products. Producer's surplus – meaning and its types, marketable and marketed surplus, factors affecting marketable surplus of agri-commodities. Approaches to the study of marketing - Market functionaries and Market forces. Marketing of agricultural versus manufactured goods.

Unit 2: Marketing Functions, Pricing and Promotion strategies

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); Standardization, Finance, Storage and Warehousing, Processing, Value Addition and Risk Taking - Market Structure, Conduct and Performance paradigm (SCP) – Market Structure: Meaning, Components, Dynamics of Conduct and Performance – Market structure and Price determination under perfect and imperfect competition.

Product Life Cycle (PLC) and competitive strategies: Meaning and stages in PLC; characteristics of PLC; strategies in different stages of PLC; pricing and promotion strategies: pricing considerations and approaches – cost based and competition based pricing; market promotion – advertising, personal selling, sales promotion and publicity – their meaning and merits and demerits.

Unit 3: Marketing Efficiency and Marketing Institutions

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 over space, time and form: 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; Modern marketing systems versus traditional agricultural marketing systems; Role of Government in agricultural marketing - Public sector institutions - CWC, SWC, FCI and DMI – their objectives and functions; cooperative marketing in India; Market Intelligence -Legal measures for improving agricultural marketing: APMC Act. New EXIM policy of India – Advantages of AEZs, ITPO, Export Promotion Councils, APEDA, MPEDA, and Commodity Boards.

Unit 4: Trade in Agricultural Products

International Trade: Concept of International Trade and its need - Free trade, Autarky and it needs - Theories of Trade: Absolute and comparative advantage; Present status and prospects of Agricultural exports / imports from India and their share - Barriers to Trade: Tariff and non tariff barriers - Trade policy instruments – Terms of Trade - Role of institutions like UNCTAD and GATT - WTO in promoting trade in agricultural products - Free Trade

Agreements – AoA and its implications on Indian agriculture: Sanitary and Phyto-sanitary issues, Market Access, Domestic Support and Export Subsidies - IPR.

Unit 5: Agricultural Prices and Risk Analysis

Agricultural Prices and Policy: Meaning and functions of price; administered prices; need for agricultural price policy; Objectives of Price Policy and Price Stabilization – Role of CACP – Concept of MSP, FRP (SMP) and SAP – Price Parity - Procurement of food grains and buffer stock - Risk in marketing: Meaning and Importance - Types of risk in marketing: Speculation and Hedging and Forward and Futures trading; an overview of futures trading; – Role of Contract Farming in risk mitigation.

Practical Schedule

1. Preparation of farm survey schedule
2. Visit to a farm to collect information on marketing practices of agricultural commodities and marketing problems.
3. Plotting and study of demand and supply curves and calculation of elasticities.
4. Computation of marketable and marketed surplus of important commodities.
5. Visit to a local market / weekly *shandy* / farmers' market to study various marketing functions performed by different agencies.
6. Study of relationship between market arrivals and prices of some selected commodities.
7. Identification of marketing channels for selected commodity, collection of data regarding marketing costs, margins; price spread estimation for major agricultural and allied agricultural products to assess their marketing efficiency; and presentation of report in the class.
8. Visit to market committee and regulated market to study their organization and functioning.
9. Visit to co-operative marketing society to study its organization and functioning.
10. Visit to market institutions – SWC / CWC to study their organization and functioning.
11. Visit to AGMARK Laboratory / Grading institutions.
12. Farm input marketing: Visit to Farm input dealer to study marketing of farm inputs.
13. Visit to Commodity Boards / AEZ / Export oriented units.
14. Time Series Analysis of prices–TCSI Study of price behaviour over time for some selected commodities.
15. Construction of Index Numbers and their uses.
16. Application of principles of comparative advantage of international trade.
17. **Practical Examination.**

References

- Acharya S. S. and N. L. Agarwal. 2002. Agricultural Marketing in India. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
- Acharya S. S. and N. L. Agarwal. 1994. Agricultural Prices - Analysis and Policy. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
- Kahlon A. S. and S. D. Tyagi, 2000. Agricultural Price Policy in India - Allied Publishers Pvt. Ltd. Bombay.

- SakOnkvisit. John J. Shaw. 1999. International Marketing Analysis and Strategy. Prentice Hall of India. New Delhi.
- Sivarama Prasad A. 1999. Agricultural Marketing in India. Mittal Publications, New Delhi.
- Kohls R. L. and N. Uhl. Joseph. 1980. Marketing of Agricultural Products. Collier Macmillan. New York.

AEX201	COMMUNICATION SKILLS AND PERSONALITY DEVELOPMENT	T	P	C
		1	1	2

THEORY

Unit I Communication Concepts

Communication Skills: meaning and process of communication, verbal and nonverbal communication

Unit II Communication Skills

Listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures.

Unit III Writing Skills

Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting

Unit IV Oral Communication skills

Individual and group presentations, impromptu presentation, public speaking

Unit V Oral Communication skills

Group discussion. Organizing seminars and conferences.

Practical

Listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting; individual and group presentations

Practical Schedule

1. Practicing active listening
2. Exercise on note taking methods
3. Exercise on technical writing and practicing proof correction
4. Practicing oral presentation
5. Exercise on writing field diary and Lab record
6. Visit to library and learn indexing
7. Exercise on preparing foot notes and citations
8. Practice on effective reading skills
9. Comprehension of technical article
10. Comprehension of general article
11. Exercise on precise writing
12. Practice on summarizing articles
13. Practice on preparing abstracts

14&15 Developing skill on individual presentation

16. Developing skill on group presentation
17. **Practical Examination**

Referecnce

1. G.L. Ray and Sagar mondal. 2010. Journalism –Farm journalism and communication skills. Kalyani publishers.
2. Sagar Mondal. 2016. Agricultural extension , Kalyani publishers
3. G. L. Ray 2007 Extension Communication and Management , Kalyani publishers
4. Communication and Instructional Technology, By: Indu Grover, Shusma Kaushik, Lali Yadav, Deepak Grover & Shashikanta Verma Indu Grover, Lali Yadav & Deepak Grover Extension Management, Agrotech
5. Everett Rogers, and Floyd Shoemaker, Communication of Innovation – a Cross Cultural Approach, New York Free Press.
6. Knapp, Mark L., & Hall, Judith A . (2007) Nonverbal Communication in Human Interaction. (8th ed.) Wadsworth: Thomas Learning.
7. Kathleen M. German, Bruce E Gronbeck Principles of Public Speaking

e- Referecnce

1. www.managementstudyguide.com
2. www.ajms.co.in
3. www.mindtools.com

		T	P	C
STA 201	**STATISTICAL METHODS AND DESIGNS**	**1**	**1**	**2**

THEORY

Unit I: Descriptive Statistics

Basic concepts – statistics – variable – types and sources of data – classification and tabulation of data. Diagrammatic and graphical representation of data – simple, multiple, component and percentage bar diagrams, pie diagram – frequency polygon, frequency curve and histogram. Construction of frequency distribution tables. Measures of central tendency: arithmetic mean, geometric mean, harmonic mean, median and mode – merits and demerits. Measures of dispersion: range, quartile deviation, mean deviation, standard deviation, and coefficient of variation – skewness and kurtosis – merits and demerits.

Unit II: Probability Distributions and Sampling Theory

Probability – basic concepts – additive and multiplicative laws (without proof). Probability distributions – Discrete distributions: Binomial and Poisson. Continuous distribution: Normal distribution – definitions and properties. Sampling theory – population – sample – parameter and statistic – sampling distribution – sampling vs complete enumeration – Types of sampling – simple random sampling – selection of simple random sample using random number tables.

Unit III: Testing of hypotheses

Null and alternative hypothesis – types of errors – critical region and level of significance – degrees of freedom. Large sample test – single proportion and difference between two proportions – single mean and difference between two means. Small sample tests – F-test – t-test for testing the significance of single mean – independent t test and paired t test – chi square test for goodness of fit – chi square test for testing the association of attributes by m x n contingency table – 2 x 2 contingency table – Yates' correction for continuity.

Unit IV: Correlation and Regression

Correlation – Scatter diagram – Karl Pearson's correlation coefficient definition – computation – types of correlation and properties. Regression – simple linear regression – fitting of simple linear regression equation – properties of regression coefficient.

Unit V: Analysis of Variance and Experimental Designs

Analysis of Variance (ANOVA) – assumptions – one way and two way classifications. Basic principles of experimental designs – Completely Randomized Design (CRD) – Randomized Block Design (RBD) – Latin Square Design (LSD) – lay out, analysis, merits and demerits of the above mentioned designs.

Practical

Formation of frequency distribution tables – Diagrammatic and graphical representation. Computation of different measures of central tendency and computation of various measures of dispersion for raw and grouped data – calculation of coefficient of variation (CV) – measures of skewness and kurtosis. Simple problems in Binomial distribution, Poisson and Normal distribution – Selection of simple random sampling. Large sample test for single proportion and difference between two proportions and Large sample test for single mean and difference between two means. t-test for single

mean – t-test for testing the significance of two means for independent and paired samples – chi square test for goodness of fit and test for independence of two attributes in a contingency table – Yates correction for continuity – calculation of the correlation coefficient – fitting of simple linear regression equation – One way and two way ANOVA – completely randomized design (CRD) – randomized block design (RBD) – Latin square design (LSD).

Practical schedule

1. Construction of frequency distribution tables.
2. Diagrammatic representation – simple, multiple, component and percentage bar diagrams, pie diagram. Graphical representation – frequency polygon, frequency curve and histogram.
3. Computation of arithmetic mean, geometric mean, harmonic mean, median and mode for ungrouped and grouped data.
4. Computation of range, standard deviation, variance, coefficient of variation for ungrouped and grouped data. Computation skewness and kurtosis for ungrouped and grouped data.
5. Simple problems in Binomial distribution and Poisson distribution.
6. Simple problems in Normal distribution.
7. Selection of simple random sample using simple random sampling method.
8. Large sample test – test for single proportion and difference between two proportions.
9. Large sample test – test for single mean and difference between two means.
10. Small samples test – t-test for single mean – independent t test for difference between two sample means (equal variances only) – Paired t-test.
11. Chi square test for goodness of fit – Chi square test for testing the association of attributes.
12. Computation of Karl Pearson's correlation coefficient.
13. Fitting of simple linear regression equation y on x.
14. One way ANOVA – analysis of experimental data using Completely Randomised Design (CRD) (for equal replications only).
15. Two way ANOVA – analysis of experimental data using Randomised Block Design (RBD).
16. Analysis of experimental data using Latin Square Design (LSD).
17. **Final Practical Examination**

References

- Rangaswamy, R. 2000, A Text book of Agricultural Statistics, Wiley Eastern Limited, New Delhi.
- K.P. Dhamu and K. Ramamoorthy, 2007, Statistical Methods, Agrobios (India), Jodhpur.
- R. Gangai Selvi and C. Kailasam, 2017, Applied Statistics, Kalyani Publishers, New Delhi.

- K. M. Palaniswamy and Usha Palaniswamy, 2006, Handbook of Statistics for Teaching and Research in Plant and Crop Science, , IBDC Publishers, , Lucknow.

E- References

1. http://www.statistics.com/resources/glossary/
2. www.statsoft.com
3. http://www.iasri.res.in/ebook/EB_SMAR/index.htm
4. http://www.iasri.res.in/design/analysis of data/analysis of data.html
5. www.stats.gla.ac.uk/steps/glossary/index.html
6. http://davidmlane.com/hyperstat/
7. http://www.stattrek.com/
8. http://www.businessbookmall.com/Statistics Internet Library.htm
9. http://www.stat-help.com/
10. www.statsci.org/jourlist.html

AGR224	SHORT TOUR	T	P	C
		0	1	1

The students will undertake the short tour during fourth semester for seven days covering KVK's, Research stations and ICAR institutes in the southern part of Tamil Nadu. The study tour will provide an exposure to the students to know about the soil, climatic conditions and cropping patterns in the respective agro-climatic zones. The students will also have first-hand information on latest technologies on various crops and allied activities.

AGR 301	RAINFED AGRICULTURE AND WATERSHED MANAGEMENT	T	P	C
		1	1	2

THEORY

Unit I – Dryland scope and importance

Dryland farming - India and Tamil Nadu - Major crops of Dryland in India and Tamil Nadu - rainfed farming - Significance, Characteristics and constraints of dry farming in India - Distribution of Arid and semiarid regions in World, India and Tamil Nadu.

Unit II – Drought – Types and Mitigation

Rainfall climatology - Length of growing period - Drought - Definition - Types and effects of Drought on crop production - Mechanism of drought tolerance in plants - Drought management - Contingent crop planning - Mid season correction - Mulching - anti transpirants.

Unit III – Soil Moisture conservation approaches

Soil moisture conservation approaches: agronomical, engineering and agrostological measures - In-situ water harvesting, storage and recycling - water harvesting - farm pond, percolation pond.

Unit IV – Resource management in dryland

Integrated dry land technologies - Mechanization - Resource management under constraint situation - Cost reduction strategies in crop production

Unit V – Watershed and Agroforestry

Watershed management - alternate land use system - Agro forestry systems - Role of institutions - government policies for promotion of dryland farming.

Practical Schedule

1. Studies on climate classification – Koppens, Troll, Modified Troll, Thornthwaite.
2. Studies on rainfall pattern in rainfed areas of the country – ACZs & AEZs.
3. Mapping on onset and withdrawal of Indian monsoons.
4. Studies on cropping pattern of different rainfed areas in the country and demarcation of rainfed area on map of India.
5. Interpretation of meteorological data and scheduling of supplemental irrigation on the basis of evapo-transpiration demand of crops.
6. Indices in dry farming - working out LGP and planning for cropping system
7. Skill development in Seed hardening technique.
8. Study of tools, implements, and machineries for tillage, sowing and after cultivation and assessing their efficiencies.
9. Studies on cultural practices for mitigating moisture stress.
10. Preparation of contingency crop plan for aberrant rainfall situations.
11. Characterization and delineation of model watershed.
12. Field demonstration on soil & moisture conservation measures.
13. Field demonstration on construction of water harvesting structures.
14. Field demonstration contour bund and rubble pitched contour bund and intermittent terraces.
15. Visit to rainfed research station/watershed.
16. Delineation and mapping of watersheds.

AGR322	PRACTICAL CROP PRODUCTION-I *(KHARIF CROPS)*	T	P	C
		0	2	2

Practical Schedule

Rice *(Transplanted rice or Direct sown rice)*

Transplanted rice

1. Rice ecosystems - Climate and weather - Seasons and varieties of Tamil Nadu.
2. Preparation of nursery - Application of manures to nursery - seed treatment - Forming nursery beds and sowing seeds - Weed management and plant protection to nursery.
3. Preparation of main field - Application of organic manures - Green manuring - Bio-fertilizers - Pulling out seedlings and transplanting - Rajarajan 1000 (SRI) - Application of herbicides - Water management - Nutrient management - Plant protection measures - Mechanization in rice cultivation - Recording growth, yield attributes and yield.
4. Harvesting, threshing, drying and cleaning the produce - Working out cost of cultivation and economics.

Practical Schedule

Transplanted rice:

1&2. Study of rice ecosystems, climate, weather, seasons and varieties of Tamil Nadu.
3&4. Selection of nursery area, preparation of nursery, application of manures and fertilizer to nursery.
5&6. Acquiring skill in seed treatment, seed soaking and incubation, nursery sowing and management.
7 & 8. Study and Practice of main field preparation and puddling operations.
9&10. Practicing of field preparatory operations - sectioning of field bunds and plastering, leveling and basal application of fertilizers.
11 &12. Practicing transplanting techniques in lowland rice.
13 &14. Estimation of plant population and acquiring skill in gap filling and thinning.
15 &16. Study of weeds and weed management in rice.
17 &18. Study and practice of green manuring and bio-fertilizer application in rice.
19 & 20. Acquiring skill in nutrient management and practicing top dressing techniques.
21 & 22. Study of water management practices for lowland rice.
23 & 24. Observation of insect pests and diseases and their management.
25 & 26. Recording growth and other related characters of rice.
27 & 28. Estimation of yield and yield parameters in rice.
29 & 30. Harvesting, threshing and
31 32. Cleaning, drying and calculating the yield of produce
33. Working out cost of cultivation
34. Practical Examination.

References:

- Ahlawat, I. P. S. , Om Prakash and G. S. Saini. 1998. Scientific Crop Production in India. Rama Publishing House, Meerut.
- Chidda Singh. 1997. Modern techniques of raising field crops. Oxford and IBH Publishing Co. Pvt. Ltd. , New Delhi.
- Crop Production Guide. 2012. Directorate of Agriculture, Chennai and Tamil Nadu Agricultural University, Coimbatore.
- Rajendra Prasad. 2004. Text Book on Field Crop Production, Indian Council of Agrl. Research, New Delhi.
- K Annadurai and B Chandrasekaran. 2009. A Text Book Of Rice Science. Scientific Publishers.
- Reddy,S. R. 2012. Agronomy of field crops. Kalyani publishers, New Delhi.
- ICAR 2015. Hand book of Agriculture. Indian Council of Agricuture, New Delhi.

PBG301	CROP IMPROVEMENT	T	P	C
		2	1	3

THEORY

Unit I Cereals

Place of origin – putative parents – related wild species – breeding objectives–breeding methods– conventional and innovative methods-heterosis breeding and important varieties in following cereals: Rice, Wheat, Maize, Sorghum, Pearl millet, Finger millet

Unit II Pulses and Oilseeds

Place of origin – putative parents – related wild species – breeding objectives–breeding methods– conventional and innovative methods-heterosis breeding and important varieties in following crops Pulses: Redgram , Bengal gram, Greengram, Blackgram, Cowpea, Soybean. Oilseeds: Groundnut, Sunflower, Gingelly, Castor, Rape and Mustard.

Unit III Cash crops, Fodder and Horticultural crops

Place of origin – putative parents – related wild species – breeding objectives–breeding methods– conventional and innovative methods-heterosis breeding and important varieties in following crops

Fibres: Cotton; Sugars: Sugarcane; Starch: Potato; Fumitories: Tobacco, Fodder: Guinea grass, Napier, Cumbu – Napier, Lucerne, *Stylosanthes*; Horticultural crops: Bhendi, Tomato, Brinjal, Papaya, Banana

Unit IV Breeding for Biotic and Abiotic stresses and Quality

Breeding for insect resistance – mechanisms, basis, genetics of insect resistance - suitable breeding methods- merits and demerits of resistance breeding;

Breeding for disease resistance – horizontal and vertical resistance- Gene for gene hypothesis – mechanisms, genetics of disease resistance; Suitable breeding methods for disease resistance- exploitation of vertical resistance in plant breeding- multilines, gene pyramiding, gene deployment.

Breeding for Abiotic stress – drought – mechanisms, basis, genetics of drought resistance - suitable breeding methods -limitations of drought resistance breeding; Breeding for Abiotic stress – salinity and alkalinity;

Breeding for quality traits- Important quality traits in different crops- nutritional quality of cereals and pulses- Genetics of nutritional traits-breeding methods- Breeding for low toxic substances- limitations of breeding for enhanced nutritional quality

Unit V: Hybrid seed production techniques and ideotype breeding

Hybrid seed production techniques in rice, maize and redgram. Ideotype breeding-main features-difference between traditional and ideotype breeding- - crop ideotypes in rice, wheat, cotton- steps in ideotype breeding- merits and demerits of ideotype breeding

Practical schedule

Observation on floral biology – anthesis and pollination – selfing – crossing techniques – observation on cultivated germplasm, wild species – Experimental design – handling segregating generations- Yield trials in following crops.

1. Rice

2. Maize and Sorghum
3. Pearl millet and Finger millet
4. Redgram, Bengal gramand Soybean
5. Green gram, Black gram and Cowpea
6. Groundnut and Sunflower.
7. Sesame and Castor
8. Cotton
9. Sugarcane
10. Guinea grass, Cumbu – Napier hybrids Lucerne and *Stylosanthes*
11. Bhendi, Brinjal, Tomato
12. Papaya and Banana
13. Study of quality characters in rice
14. Study of donor parents for different characters
15. General seed production techniques in field crops
16. Visit to AICRP and seed production plots of different field crops.

Reference Book

1. Singh, B.D. 2005. Plant breeding - Principles and methods. Kalyani Publishers, New Delhi.
2. Phundhan Singh. 2001. Essentials of plant breeding, Kalyani publishers, New Delhi.
3. Grierson D. 2012. *Plant Genetic Engineering*. Springer Netherlands.Lal R & Lal S. 1990. *Crop Improvement Utilizing Biotechnology*. CRC Press.

Text book

1. Chopra, V. L. 1994. Plant breeding theory and practice. Oxford and IBH Publishing Co. Pvt. Ltd.
2. Sharma, J. R. 1994. Principles and practice of plant breeding Tata McGraw-Hill publishing Co., New Delhi.
3. John Joel, A., C. Vanniarajan, T.S. Raveendran, and A. Gopalan 2006. Fundamentals of Crop Botany, Directorate of ODL, Tamil Nadu Agricultural University, Coimbatore–641 003.Sons, New Delhi.

AEN 301	PESTS OF FIELD CROPS, STORED PRODUCES AND THEIR MANAGEMENT	T	P	C
		1	1	2

THEORY

Unit I: Pests of Cereals and Millets

Distribution, bionomics, symptoms of damage and management strategies for insects and non-insect pests of rice, wheat, maize, sorghum, cumbu, ragi, tenai. Integrated Pest Management - case studies in rice.

Unit II: Pests of Pulses and Oilseeds

Distribution, bionomics, symptoms of damage and management strategies of insects and non-insect pests of pulses (redgram, green gram, black gram, bengal gram, cowpea.), groundnut, castor, gingelly, sunflower, safflower, jatropa, soybean and mustard. Integrated Pest Management - case studies in groundnut.

Unit III. Pests of Cotton and Sugarcane

Distribution, bionomics, symptoms of damage and management strategies of insects and non-insect pests of cotton and sugarcane. Integrated Pest Management - case studies in cotton.

Unit IV: Pests of Green Manures, Forage Crops

Distribution, bionomics, symptoms of damage and management strategies of pests of green manures (Sunnhemp, Sesbania, Daicha. Glyricidia), forage crops (Lucere and Subabul).

UNIT V: Stored Products and Non-Insect Pests

Distribution, bionomics, symptoms of damage and management strategies of pests of stored products and Rodents and birds of agricultural importance and their management. Locusts and their management.

Practical schedule

Identification of symptoms of damage and life stages of pests of

1. Pests of rice (sucking pests)
2. Pests of rice (borers and defoliators)
3. Pests of maize, sorghum and cumbu
4. Pests of wheat, ragi and tenai
5. Pests of redgram and bengalgram
6. Pests blackgram, greengram and cowpea
7. Pests of groundnut, gingelly and sunflower
8. Pests of castor, soybean, safflower, jatropha and mustard
9. Pests of cotton (sucking pests)
10. Pests of cotton (bollworms and defoliators)
11. Pests of sugarcane
12. Pests of green manures-sunnhemp, sesbania, daincha, lucerne, subabul and gliricidia
13. Pests of stored products
14. Gadgets for management of stored product insects
15. Rodents and Birds pests in field and storage
16. Visit to FCI godown and farmer’s fields

17. Final practical examination

A. Text Books:

- Manisegaran, S. and R.P.Soundararajan. 2010. *Pest Management in Field Crops-Principlesand Practices.* Agrobios, Jodhpur, India. 316p. {ISBN (10): 81-7754-321-0}
- David, B.V. and V.V. Ramamurthy. 2011. *Elements of Economic Entomology*, NamruthaPublications, Chennai. 386 p. {ISBN: 978-81-921477-0-3}

E- RESOURCES:

1. http://www.ncipm.org.in
2. http://agritech.tnau.ac.in/
3. http://www.nbaii.res.in/
4. http://www.nrcg.res.in/

PAT301	DISEASES OF FIELD AND HORTICULTURAL CROPS AND THEIR MANAGEMENT-I	T	P	C
		2	1	3

THEORY

Unit-I Diseases of cereals and Millets

Cereals: rice and maize; **Millets:** sorghum, bajra, finger millet and small millets

Unit- II Diseases of Pulses and Oilseeds

Pulses : pigeon pea, urd bean, mung bean, soyabean, cowpea; **Oilseeds:** ground nut, castor and Sesame

Unit- III Diseases of Cash crops

Tobacco, jute and mulberry

Unit- IV Diseases of Fruits and vegetables crops

Fruits: banana, guava, papaya, pomegranate;

Vegetables: tomato, brinjal, okra,cruciferous vegetables, beans, colacasia and sweet potato

Unit- V Diseases of Plantation crops

Plantation: coconut, arecanut, tea, coffee, rubber and cocoa

PRACTICAL SCHEDULE

Study of symptoms and host-parasite relationship of:

1 Diseases of rice
2 Diseases of maize and sorghum
3 Diseases of pearl millet, finger millet and small millets,
4 Diseases of pigeonpea, urdbean, mungbean, soybean and cowpea
5 Diseases of groundnut , sesame and castor
6 Diseases of tobacco, jute and mulberry
7 Diseases of banana
8 Diseases of guava, papaya and pomegranate
9 Diseases of crucifers
10 Field visit/ exposure visit to hilly fruits , vegetables and plantation crops
11 Diseases of tomato, brinjal and okra
12 Diseases of sweet potato and beans
13 Diseases of coconut and arecanut
14 Diseases of tea
15 Diseases of coffee
16 Diseases of rubber and cocoa
17 Final practical examination

Reference Books

- Arjunan. G. Karthikeyan, G, Dinakaran ,D. Raguchander,T. 1999 Diseases of Horticultural Crops, AE Publications, Coimbatore.
- Rangasawmi ,G and Mahadevan, A. 1998. Diseases of crop Plants in India, Prentice Hall of India Pvt. Ltd. , New Delhi

- Prakasam, V. , Valluvaparidasan, V. , Raguchander, T. and K. Prabakar. 1997. Field crop diseases, AE Publication, Coimbatore.

SAC301	MANURES, FERTILIZERS AND SOIL FERTILITY MANAGEMENT	T	P	C
		2	1	3

THEORY

UNIT I Introduction to Manures and INM

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 Inorganic Fertilizers & Fertilizer control orders

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 Essential Plant Nutrients

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 Nutrients in Soil

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.

UNIT V Fertilizer recommendation to crops & NUE

Indicator plants. Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions.

PRACTICAL SCHEDULE

1. Introduction of analytical instruments and their principles, calibration and applications.
2. Colorimetry and flame photometry.
3. Estimation of soil organic carbon.
4. Estimation of alkaline hydrolysable N in soils.
5. Estimation of soil extractable P in soils.
6. Estimation of exchangeable K in soils.
7. Estimation of exchangeable Ca in soils.
8. Estimation of exchangeable Mg in soils.
9. Estimation of soil extractable S in soils.
10. Estimation of DTPA extractable Zn in soils.
11. Estimation of N in plants.
12. Estimation of P in plants.
13. Estimation of K in plants.
14. Estimation of S in plants.
15. Visit to STL and FTL Colloquium on soil testing laboratories - Soil test based fertilizer prescription.
16. Visit to fertilizer manufacturing/mixing unit.

REFERENCE BOOKS

1. John Havlin, James Beaten, Samuel Tisdale, Werner Nelson. 2005. Soil Fertility and Fertilizers - An Introduction to Nutrient Management. 7th Edition, Prentice Hall. Upper Saddle River, NJ.
2. Kanwar. J.S. 1976. Soil fertility – Theory and Practice. ICAR- New Delhi.
3. Mengel, K. and E.A. Kirkby. 1987. Principles of Plant Nutrition, 4th ed. International Potash Institute, Worblaufen-Bern, Switzerland.
4. Horst. 1995. Mineral Nutrition of Higher Plants, 2nd edition. Marschner, Academic Press Inc. San Diego, CA.
5. Yawalkar, K.S., J.P. Agarwal and S.Bokde. 1972. Manures and Fertilizers Third revised edition, Agri Horticultural Publishing House, Nagpur.
6. Cooke G.W. 1972. Fertilizers for maximizing yield. Grenada Publishing Ltd, London.
7. Russell. E.J. 1973. Soil conditions and plant growth. Tenth edition English Language Book Society, London.
8. Westerman, R.L. (ed.) 1990. Soil Testing and Plant Analysis. 3rd. edition. Soil Science Society of America, Inc., Madison, WI.
9. Tandon, H.L.S. 1994. Fertilizer, Organic Manures, Recyclable Wastes and Biofertilizers Fertilizer Development and Consultation Organization, New Delhi.

WEB RESOURCES

1. www.fspublishers.org/ijab/past-issues/IJABVOL_5_NO_3/47.pdf
2. www.springerlink.com/index/l011256h8t325054.pdf
3. www.ipni.net/ppiweb/bcrops.nsf/$webindex/.../Better_Crops_2009-4_L.pdf
4. onlinelibrary.wiley.com/doi/10.1002/9780470431771.index/pdf
5. agtr.ilri.cgiar.org/agtrweb/Documents/Library/docs/.../Module4.htm
6. www.uoa.edu.er/academics/graduate/.../courses.html
7. www.fao.org/wairdocs/ilri/x5546e/x5546e08.htm
8. www.fao.org/wairdocs/ilri/x5546e/x5546e08.htm
9. www.uoa.edu.er/academics/graduate/.../courses.html
10. www.ncpahindia.com/articles/article17.pdf
11. www.energy.ca.gov/process/agriculture/ag_pubs/fertigation.pdf

www.soilandhealth.org/.../010117attrasoilmanual/010117attra.html

HOR 301	POSTHARVEST MANAGEMENT AND VALUE ADDITION OF FRUITS AND VEGETABLES	T	P	C
		1	1	2

THEORY

Unit I Sope and Importance of Post Harvest Handling

Scope and Importance of postharvest technology of fruits and vegetables- factors responsible for postharvest losses – constraints –preharvest factors affecting postharvest quality - postharvest operation – precooling, grading, cleaning, waxing on shelf life of fruits and vegetables.

Unit II Maturity and Ripening

Physiological and biochemical changes occurring during maturity and ripening- Respiration and factors affecting respiration rate - role of ethylene in regulation of ripening.

Unit III Packaging and Storage

Packaging and storage of fruits and vegetables - heat, chilling and freezing injury - storage (ZECC, cold storage, CA, MA and hypobaric) - cold chain management for fruits and vegetables

Unit IV Value Addition

Value addition concepts, principles and methods of preservation, intermediate moisture food –Jam, jelly, marmalade, preserve, candy- concepts and standards of fermented and non-fermented beverages. Tomato products – Concepts and Standards

Unit V Canning & Quality Standards

Drying and dehydration of fruits and vegetables, concepts and methods, osmotic drying. Canning-concepts-processing of canned products-spoilage and prevention. Packaging of products –quality standards - GMP, HACCP, FSSAI, Codex alimentrarius and ISO certification.

Practical

Pre harvest operations to improve postharvest shelf life - assessment of maturity indices and harvest criteria of fruits and vegetables-different types of packaging for shelf life extension- of chilling and freezing injury in vegetables and fruits- estimation of ethylene evolution in fruit crops- Identification of postharvest diseases and disorders- Postharvest machineries -extraction and preservation of pulps and juices. Preparation of jam, jelly, RTS, nectar, squash, osmotically dried products, fruit bar and candy and tomato products, canned products. Quality evaluation of products –physio-chemical and sensory evaluation. Visit to cold storage / packaging unit -visit to processing unit/ industry.

Practical Schedule

1. Preharvest operations to improve post harvest shelf life of fruits and vegetable crops
2. Assessment of maturity indices and harvest criteria for fruits and vegetable crops
3. Methods of packaging in fruits and vegetables
4. Identification and causes of chilling and freezing injury in vegetables and fruits
5. Estimations of ethylene evolution in fruit crops
6. Identification of postharvest diseases and disorders of fruits and vegetable crops

7. Postharvest machineries for fruits and vegetables crops

8. Postharvest handling of the produce (washing, fungicide treatment, grading, sorting, precooling, waxing and nano coating).
9. Preparation of jam/Jelly and quality evaluation of products
10. Preparation of RTS, nectar, squash and quality evaluation of products
11. Processing of dried and dehydrated fruits and vegetables
12. Preparation of fruit bar and candy and quality evaluation of products
13. Preparation of tomato products
14. Processing of canned fruits and vegetables - Quality evaluation of products –physio-chemical and sensory evaluation. .
15. Visit to processing unit/ industry and cold storage / packaging unit
16. **Practical examination**

Reference

1. Adel A. Kader. 2002. Post Harvest Technology of Horticultural Crops. University of California Agrl. And Natural Resources Publication.
2. Ashwani. S. and Goel. 2007. Post harvest management and value addition. Daya publishing house, New Delhi.
3. Swati Barche and K. S. Kirad. 2010. Post harvest handling of fruits, vegetables and flowers. Jain Brothers, New Delhi.
4. Sudheer,K. P. and V. Indira. 2007. Post harvest technology of horticultural crops, New India publishing agency, New Delhi.
5. Bhutani, R. C. 2003 Fruit and Vegetable Preservation. Biotech Books, Delhi. 89
6. Pruthi, J. S. 2000. Major Spices and condiments. Productions and post harvest technologies. ICAR publications, New Delhi.
7. Verma, L. R and V. K. Joshi. 2000. Post harvest technology of fruits and vegetables – Handling, Processing, Fermentation and Waste Management. Indus publishing House.

AEX 301	ENTREPRENEURSHIP DEVELOPMENT AND BUSINESS COMMUNICATION	T	P	C
		1	1	3

THEORY

Unit I – Entrepreneur and Entrepreneurial Process

Concept and Types of Entrepreneurship - Characteristics of Entrepreneurs and Entrepreneurial Skills - Entrepreneurial process – Importance of Entrepreneurship.

Unit II – Entrepreneurship Opportunities

Innovation - principles of innovation - Sources of innovative opportunities - Business environment – Micro and Macro environment - MSME Classification and Opportunities for rural enterpreneurship - KVIC classification, Startup and Business incubators. Agribusiness – Importance, Opportunities and Challenges.

Unit III – Managerial Functions – Planning and Organizing

Management Functions – Planning – Types of Plans and Steps in Planning, Organizing – Principles and Departmentation.

Unit IV – Managerial Functions – Staffing, Directing and Control

Staffing – Job Analysis, Human Resource Planning Process, Recruitment and Selection, Directing-Principles, Techniques and Supervision, Controlling – Process and Types.

Unit V – Functional Areas of Management

Operations Management – Meaning and Scope, Supply Chain Management – Drivers and flows and Total Quality Management – Meaning and Principles, Marketing Management – Market Segmentation and Marketing Mix Financial Management – Meaning, Objectives and Scope.

Practical

Assessment of entrepreneurial traits-Identification of new business opportunities-Exercise on SWOC Analysis of Agribusiness Sector in India -Market survey for understanding customer needs-Starting new business - Visit to firms / discussion with entrepreneurs-Documenting Procedure for Establishing Agribusiness Firms-Government programs and institutions for entrepreneurship development-Financing new agribusiness ventures - Visit to banks / discussion-Exercise on Demand Forecasting for Agricultural Inputs/Products-Preparation of Advertisement and Sales Promotion Measures for Agribusiness-Exercise on Inventory Management – ABC Analysis and EOQ Model-Exercise on discounted measures of Capital Budgeting-Calculation of Break Even Point and its Business Implication-Understanding balance sheet and income statement-Financial Performance Analysis - Ratio Analysis.

Lecture Schedule

1. Concept of Entrepreneurship and Types of Entrepreneurship
2. Characteristics of Entrepreneurs and Entrepreneurial Skills
3. Entrepreneurial process -– Importance of Entrepreneurship
4. Innovation - principles of innovation - Sources of innovative opportunities
5. Business environment – Micro and Macro environment

6. MSME Classification and Opportunities for rural enterpreneurship - KVIC classification, Startup and Business incubators
7. Agribusiness – Importance, Opportunities and Challenges
8. Management Functions – Planning – Types of Plans and Steps in Planning
9. **MID SEMESTER EXAMINATION**
10. Organizing – Principles and Departmentation
11. Staffing – Job Analysis, Human Resource Planning Process, Recruitment and Selection
12. Directing – Principles, Techniques and Supervision
13. Controlling – Process and Types
14. Functional Areas of Management – Operations Management – Meaning and Scope
15. Supply Chain Management – Importance, Drivers and flows and Total Quality Management – Meaning and Principles
16. Marketing Management – Market Segmentation and Marketing Mix
17. Financial Management –Meaning, Objectives and Scope

Practical schedule

1. Assessment of entrepreneurial traits
2. Identification of new business opportunities
3. Exercise on SWOC Analysis of Agribusiness sectorin India
4. Market survey for understanding customer needs
5. Starting new business - Visit to firms / discussion with entrepreneurs
6. Documenting Procedure for Establishing Agribusiness Firms
7. Government programs and institutions for entrepreneurship development
8. Financing new agribusiness ventures - Visit to banks / discussion
9. Exercise on Demand Forecasting for Agricultural Inputs/Products
10. Preparation of Advertisement and Sales Promotion Measures for Agribusiness
11. Exercise on Inventory Management – EOQ Model and ABC Analysis
12. Exercise on discounted measures of capital budgeting
13. Calculation of Break Even Point and its Business Implication
14. Business Plan Preparation
15. Understanding balance sheet and income statement
16. Financial Performance Analysis - Ratio Analysis
17. **PRACTICAL EXAMINATION**

References

1. Chandrasekaran N. and G. Raghuram. Agribusiness Supply Chain Management. 2014. CRC Press, Taylor & Francis Group, Brooklyn.
2. Joseph, L. Massie. 1995. Essentials of Management. Prentice Hall of India Pvt. Ltd. , New Delhi.
3. Mark J Dollinger. 1999. Entrepreneurship Strategies and Resources. Prentice-Hall, Upper Saddal Rover, New Jersey.
4. Mohanty S K. 2007. Fundamentals of Entrepreneurship. Prentice Hall India Ltd. , New Delhi.

5. Peter F. Drucker, 2006. Innovation and Entrepreneurship. HarperBusiness; Reprint edition, New York.
6. Poornima M. Charantimath 2005. Entrepreneurship Development and Small Business Enterprise, Pearson Education India, New Delhi.
7. Prasanna Chandra, 2007. Financial Management: Theory and Practice, McGraw-Hill Education, New Delhi.
8. Thomas W Zimmer and Norman M Scarborough. 1996. Entrepreneurship. Prentice-Hall, New Jersey.

E- References

1. www. ediindia. org/
2. iie. nic. in/
3. msme. gov. in/
4. niesbudtraining. org
5. www. nimsme. org/
6. www. nsic. co. in/
7. https://www. nabard. org/

AGR 304	PRINCIPLES OF ORGANIC FARMING	T	P	C
		1	1	2

THEORY

Unit - I: Components and Principles of Organic Cotton

Organic farming: Definition - Scope - principles and concepts - history of organic farming – global scenario - biodiversity: importance and measure to preserve biodiversity - pre requisites for Organic farming:- Soil organic carbon: status and improvement strategies.

Unit - II: Organic sources of Nutrients

Organic sources of nutrients - manures and other inputs - on farm and off farm sources - organic waste recycling - methods - Soil and crop management - inter cropping, crop rotation, green manures, cover crops, mulching - bio fertilizers.

Unit - III: Non - Chemical weed and Pest disease management

Non-chemical weed management methods: preventive, physical, cultural, mechanical and biological measures - Bio-intensive pest and disease management.

Unit - IV: Indigenous Technical Knowledge (ITK)

Indigenous Technical Knowledge (ITK) in organic agriculture - scientific rationale - soil, nutrient, weed, water, management - prospects and problems in organic farming.

Unit - V: Certification of label

Organic certification - NPOP guidelines - Certification agencies in India - crop production standards - Quality considerations - labeling and accreditation process - marketing and export opportunities.

Practical Schedule

Resource inventory of organic farm- Soil sampling and analysis for organic carbon and pesticide residues / contaminants.

1. Raising of green manures (Sunnhemp / Daincha / Fodder cowpea).
2. Incorporation of green manure - seed treatment and raising of field crop (Rice / Maize / Cowpea / Cotton / Gingelly).
3. Hands on practice on preparatory cultivation; soil and water conservation methods.
4. Hands on experience on recycling techniques; bio-composting and vermicomposting.
5. Quantification of nutrients from organic sources and application of manures and bio-fertilizers.
6. Exposure visit to an organic farm to learn ITK based preparations.
7. Organic crop production and weed management.
8. Skill development in composting farm residues.
9. Organic crop production and pest management.
10. Exposure visit to bio-control agent (*Pseudomonas*, *Trichoderma* etc.,) production units.
11. Skill development in Organic pest and diseases management practices.
12. Skill development in vermicompost preparation.
13. Hands on training on grading, packaging and post-harvest management.
14. Exposure visit to organic market out lets.
15. Exposure visit to organic certification agencies / Directorate of Organic Certification, Tamil Nadu.

AGR 325	PRACTICAL CROP PRODUCTION – II (RABI CROP)	T	P	C
		0	2	2

1. Each student will be allotted a minimum land area of 100/200 m^2 and he / she will do all field operations in the allotted land from field preparation to harvest and processing.
2. 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.
3. Any irrigated dry crop (maize / sorghum / pearl millet / finger millet / cotton / groundnut / sunflower / sesame)

Practical Schedule for Irrigated dry crop (Eg. Maize):

4. Ecosystem - Climate and weather - Seasons and varieties of Tamil Nadu
5. Selection of field - Main field preparation - seed treatment - Application of manures and fertilizers - Sowing - Weed management and practicing pre- emergence application of herbicides - Thinning and gap filling - Estimation of plant population - Top dressing - Weed management - Water management - Pest management - Observation on nutrient and weeds - Recording growth, yield attributes and yield
6. Harvesting, threshing and cleaning the produce - Cost of cultivation and economics

1 & 2 .Study of ecosystems, climate, weather, seasons and varieties of Tamil Nadu
3 & 4. Selection of field for maize cultivation
5 & 6. Acquiring skill in seed treatment practices
7 & 8. Study and Practice of main field preparation for maize
9 & 10. Practicing of application of manures and fertilizers for maize
11 & 12. Practicing sowing of maize
13 &14. Acquiring skill in pre-emergence application of herbicides
15 &16. Estimation of plant population and acquiring skill in gap filling and thinning
17 & 18. Observation on nutritional deficiency symptoms and corrective measures
19 & 20. Study of weeds and weed management in maize
20 & 21. Recording growth parameters and assessing dry matter production
22 & 23 Study of water management practices for maize
24 & 25. Observation of insect pests and diseases and their management
26 & 27. Estimation of yield and yield parameters in maize
28 & 29. Harvesting, threshing and cleaning of the produce
30 & 31. Harvesting, threshing and cleaning of the produce
32 & 33. Working out cost of cultivation and economics

References:

1. Ahlawat, I.P.S., Om Prakash and G.S.Saini.2010. Scientific Crop Production in India. Rama Publishing House, Meerut.
2. Crop Production Guide. 2012. Directorate of Agriculture, Chennai and Tamil Nadu Agricultural University, Coimbatore.

3. Rajendra Prasad. 2012. Text Book on Field Crop Production, Indian Council of Agrl. Research, New Delhi. Reddy,S.R. 2012. Agronomy of field crops. Kalyani publishers, New Delhi.
4. Chidda Singh.1997. Modern techniques of raising field crops. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi. Crop Production Guide. 2012. Directorate of Agriculture, Chennai and Tamil Nadu Agricultural University, Coimbatore.

E-References:

www.cimmyt.org

AGE301	Post-harvest Management of Field Crops	L	P	C
		1	1	2

UNIT I

Cleaning and grading, aspiration, size separators, screens, sieve analysis, capacity and effectiveness of screens. Various Separators: Specific gravity, spiral, colour sorters, cyclone seperator. Size reduction: principles of Bond's law, Kick's law, Rittinger's law.

UNIT II

Material handling equipment: Conveyors- Belt, roller, chain and screw. Elevators: bucket. Drying: moisture content and water activity; Free, bound and equilibrium moisture content, EMC determination.

UNIT III

Psychrometric chart and its use in drying. Drying principles and theory, Thin layer and deep bed drying. Different methods of drying, batch-continuous; mixing-non-mixing. Different types of grain dryers: bin, flat bed, LSU, columnar, RPEC, fluidized, rotary and tray

UNIT IV

Milling of rice: Conditioning and parboiling, advantages and disadvantages, traditional methods, CFTRI and Jadavpur methods, Pressure parboiling method, Types of rice mills, Modern rice milling. Milling of wheat: unit operations.

UNIT V

Milling of pulses: traditional milling methods, commercial methods, pre-conditioning, dry milling and wet milling methods. Milling of corn and its products. Dry and wet milling. Milling of oilseeds: mechanical expression, screw press, hydraulic press, solvent extraction methods, preconditioning of oilseeds, refining of oil, stabilization of rice bran.By-products utilization.

PRACTICAL SCHEDULE:

1. Performance evaluation of different types of cleaners and separators.
2. Determination of separation efficiency.
3. Study of different size reduction machines and performance evaluation.
4. Determination of fineness modulus and uniformity index.
5. Study of different types of conveying and elevating equipment.
6. Measurement of moisture content: dry basis and wet basis.
7. Study on drying characteristics of grains and determination of drying constant.
8. Determination of EMC (Static and dynamic method).
9. Study of various types of dryers.
10. Study of different types of equipment in rice mills.
11. Study of different types of equipment in pulse mills.
12. Study of different types of equipment in oil mills.
13. Type of process flow charts with examples relating to the processing of cereals pulses and oilseeds.
14. Visit grain processing industries.

TEXTBOOKS:

1. Chakraverty, A. Post Harvest Technology of cereals, pulses, and oilseeds. Oxford & IBH Publishing Co. Ltd., New Delhi.
2. Dash, S.K., Bebartta, J.P. and Kar, A. Rice Processing and Allied Operations. Kalyani Publishers, New Delhi.
3. Sahay, K.M. and Singh, K.K. 1994. Unit operations of Agricultural Processing. Vikas Publishing house Pvt. Ltd. New Delhi.
4. Geankoplis C. J. Transport processes and unit operations, Prentice Hall of India Pvt Ltd, New Delhi
5. Earle, R.L. 2003. Unit Operations in Food Processing. Pergamon Press. Oxford. U.K.
6. Henderson, S.M., and Perry, R. L. Agricultural Process Engineering, Chapman, and Hall, London
7. McCabe, W.L., Smith J.C. and Harriott, P. Unit Operations of Chemical Engineering. McGraw Hill.
8. Singh, R. Paul. and Heldman, R.Dennis. 2004. Introduction to Food Engineering. 3rd Edition. Academic Press, London.

HOR 302	PRECISION FARMING AND PROTECTED CULTIVATION	T	P	C
		1	1	2

Theory

Unit I: Basics of protected cultivation

Protected cultivation: Introduction, History, origin, development, National and International Scenario, components of green house, perspective, Types of green houses, polyhouses /shed nets, Cladding materials,

Unit II: Factors of protected cultivation & its maintenance

Plant environment interactions – principles of limiting factors, solar radiation and transpiration, greenhouse effect, light, temperature, relative humidity, carbon dioxide enrichment, Design and construction of greenhouses – site selection, orientation, design, construction, design for ventilation requirement using exhaust fan system, selection of equipment, Greenhouse cooling system – necessity, methods – ventilation with roof and side ventilators, evaporative cooling, different shading material fogging, combined fogging and fan and pad cooling system, design of cooling system, maintenance of cooling and ventilation systems, pad care etc. Greenhouse heating – necessity, components, methods, design of heating system. Root media – types – soil and soil less media, composition, estimation, preparation and disinfection, bed preparation.

Unit III: Irrigation management in green houses

Planting techniques in green house cultivation. Irrigation in greenhouse and net house – Water quality, types of irrigation system, components, design, installation and material requirement. Fogging system for greenhouses and net houses – introduction, benefits, design, installation and material requirement. Maintenance of irrigation and fogging systems.

Unit IV: Nutrient management in green houses

Fertilization – nutrient deficiency symptoms and functions of essential nutrient elements, principles of selection of proper application of fertilizers, fertilizer scheduling, rate of application of fertilizers, methods, automated fertilizer application. Greenhouse climate measurement, control and management. Insect and disease management in greenhouse and net houses.

Unit V: Crop production under protected cultivation

Selection of crops for greenhouse cultivation, major crops in greenhouse – irrigation requirement, fertilizer management, cultivation, harvesting and post-harvest techniques; Economic analysis.

Practical

1. Estimation of material requirement for construction of greenhouse
2. Determination of fertilization schedule and rate of application for various crops
3. Estimation of material requirement for preparation of root media
4. Root media preparation, bed preparation and disinfections
5. Study of different planting techniques

6. Design and installation of irrigation system
7. Design and installation of fogging system
8. Greenhouse heating
9. Study of different greenhouse environment control instruments
10. Study of operation maintenance and fault detection in irrigation system
11. Study of operation maintenance and fault detection in fogging system
12. Economic analysis of greenhouses and net houses
13. Visit to greenhouses.

Suggested Readings

1. Singh Brahma and Balraj Singh. 2014. Advances in protected cultivation, New India Publishing Company.
2. Sharma P. 2007. Precision Farming. Daya Publishing House New Delhi.

AEN 303	PESTS OF HORTICULTURAL CROPS, STORED PRODUCTS AND THEIR MANAGEMENT	T	P	C
		2	1	3

THEORY

Unit I: Pests of Vegetable Crops

Distribution, bionomics, symptoms of damage and management strategies of insect and non-insect pests of Brinjal, Bhendi, Tomato, Chillies, Onion, Garlic, Moringa, Amaranthus Crucifers, Cucurbits.

Unit II: Pests of Fruit Crops

Distribution, bionomics, symptoms of damage and management strategies of insect and non-insect pests of Mango, Citrus, Banana, Guava, Grapevine, Sapota, Pomegranate, Papaya, Aonla, Apple, Pine apple, Custard apple and Jack

Unit III: Pests of Tuber Crops|

Distribution, bionomics, symptoms of damage and management strategies of insect and non-insect pests of Potato, Sweet potato, Tapioca, Yam and Colocasia

Unit IV: Pests of Spices and Plantation Crops

Distribution, bionomics, symptoms of damage and management strategies of insect and non- insect pests of Coconut, Arecanut, Tea, Coffee, Cashew, Cocoa, Betelvine, Ginger, Turmeric, Coriander, Cardamom, Pepper, Curry leaf and Tamarind

Unit V: Pests of Flower Crops, Medicinal Plants, Lawn and Stored products

Distribution, bionomics, symptoms of damage and management strategies of insect and non-insect pests of Rose, Jasmine, Crossandra, Chrysanthemum, Tuberose, Cut flowers, Gloriosa, Coleus, Phyllanthus, Aswagantha, Senna, Periwinkle, Lawn and Stored products.

Practical

Identification of symptoms of damage and life stages of important pests of different horticultural crops: vegetables, fruits, spices, tubers, plantation crops, flower crops, medicinal plants, lawn and stored products.

Practical schedule

1. Identification of symptoms of damage & life stages of important pests
2. Pests of Brinjal, Bhendi and Tomato
3. Pests of Chillies, Onion, Garlic, Moringa and Amaranthus
4. Pests of Crucifers and Cucurbits
5. Pests of Mango, Citrus and Sapota
6. Pests of Banana, Grapevine and Guava
7. Pests of Pomegranate, Aonla, Papaya
8. Pests of Jack, Pine apple, Custard apple, Ber and Apple
9. Pests of Potato, Sweet potato, Tapioca, Yam and Colocasia
10. Pests of Coconut and Arecanut
11. Pests of Coffee and Tea
12. Pests of Cashew, Cocoa and Betelvine
13. Pests of Turmeric, Ginger and Coriander
14. Pests of Cardamom, Pepper, Curry leaf and Tamarind

15. Pests of Rose, Jasmine, Crossandra, Chrysanthemum, Tuberose and Cut flowers
16. Pests of Gloriosa, Coleus, Phyllanthus, Aswagantha, Senna and Periwinkle
17. Pests of Lawn and stored products
18. Final Practical Examination

References:

Text Book:

1. Muthukrishnan, N., N. Ganapathy, R.Nalini and R.Rajendran.2005. **Pest Management in Horticultural Crops**. New Madura Publishers, Madurai. 325p. {ISBN: 81-902832-0-0.

2.Nair, M.R.G.K.1986. **Insects and mites of crops in India**. Publications and Information Division, ICAR, NewDelhi. 408p.

3.ParvathaReddy.2010. **Insect, Mite and Vertebrate Pests and their Management in Horticultural Crops**. Scientific Publishers, Jodhpur. 384p.

4.David, B.V. and V. V. Ramamurthy.2011. **Elements of Economic Entomology**. Namrutha Publications, Chennai. 386 p

5.Butani, D.K. and M.G. Jotwani.2013. **Insects in Vegetables.** Daya Publishing House, NewDelhi. 356p.

6.Regupathy,A. and R.Ayyasamy.2013. **A Guide on Crop Pests**. Namrutha Publications, Chennai.368p**C. Supplementary references:**

7.Srivastava, K.P. and D.K.Butani. 2009. **Pest Management in Vegetables** (Vol. I & II). Studium Press (India) Pvt. Ltd., New Delhi. 777p.

8.Ayyar, T.V.R. 1963. **Hand Book of Economics Entomology for South India.** Govt. Press Madras.

9.Sathe,T.V. 2012. **Pests of Ornamental Plants**. Daya Publishing House, New Delhi.199p.

Web resources:

- http://agritech.tna u.ac.in/horticulture/horti_plantprotection_pest.html
- http://www.nbaii.res.in/insectpests/pestsearch.php?cropname=Mango
- http:www.ncipm.org.in/data bases.html
- ipm.illinois.edu

PAT 303	DISEASES OF FIELD AND HORTICULTURAL CROPS AND THEIR MANAGEMENT-II	T	P	C
		2	1	3

THEORY

Unit-I Diseases of cereals Wheat

Unit- II Diseases of Pulses, Oilseeds and Cash crops

Pulses: chick pea and lentil; **Oilseeds:** sunflower and mustard; **Cash crops:** sugarcane and cotton

Unit- III Diseases of Fruits and vegetables crops

Fruits: mango, citrus, grapevine, sapota, jackfruit, pineapple, ber, apple, peach plum and strawberry;

Vegetables: cucurbits, peas, potato, beet root, radish, cassava, colacasia and yam

Unit- IV Diseases of Spices, Plantation and Flower crops

Spices: chillies, turmeric, ginger, onion, garlic, coriander, cardamom; **Plantation crops:** black pepper and vanilla; **Flower crops:** rose, Jasmine, marigold,crossandra, chrysanthemum, tube rose , carnation, lillium and orchids

Unit- V Diseases of medicinal crops and mushroom cultivation

Medicinal crops: gloriosa, coleus, stevia and aloe; **Mushroom cultivation:** Importance of mushroom and cultivation of button mushroom, oyster mushroom, milky mushroom and paddy straw mushroom- pest and diseases of mushroom

PRACTICAL

Study of symptoms and host parasite relationship of the important diseases of wheat, chick pea, lentil, sunflower , mustard , cotton, sugarcane, mango , citrus, grapevine, sapota , jackfruit , pineapple, ber, apple , peach, plum , strawberry, cucurbits , potato , peas , beet root , radish , cassava, colacasia, yam , chillies, turmeric, ginger, onion, garlic, coriander, cardamom, black pepper, vanilla, rose, Jasmine, marigold, crossandra, chrysanthemum, tube rose , carnation, lillium , orchids, gloriosa, coleus, stevia and aloe and cultivation of button mushroom, oyster mushroom, milky mushroom and paddy straw mushroom.

PRACTICAL

Study of symptoms and host-parasite relationship of:

1. Diseases of wheat
2. Diseases of chick pea, lentil, sunflower and mustard
3. Diseases of cotton and sugarcane
4. Diseases of mango and sapota
5. Diseases of citrus and grapevine
6. Diseases of jackfruit , pineapple, ber, apple , peach, plum , strawberry
7. Diseases of cucurbits
8. Diseases of potato , peas , beet root and radish
9. Diseases of cassava, colacasia and yam
10. Field visit/ exposure visit to hilly fruits , vegetables and plantation crops / mushroom unit
11. Diseases of chillies, turmeric and ginger
12. Diseases of coriander, cardamom, black pepper and vanilla,

13. Diseases of rose, Jasmine, marigold and crossandra
14. Diseases of tube rose , carnation, lillium and orchids,
15. Diseases of gloriosa, coleus, stevia and aloe
16. Cultivation of oyster , milky and paddy straw mushroom cultivation
17. **Final practical examination**

Reference:

1. Arjunan.G. Karthikeyan, G, Dinakaran ,D. Raguchander,T. 1999 Diseases of Horticultural Crops, AE Publications, Coimbatore.
2. Rangasawmi ,G and Mahadevan, A. 1998. Diseases of crop Plants in India, Prentice Hall of India Pvt. Ltd., New Delhi
3. Prakasam, V., Valluvaparidasan, V., Raguchander, T. and K.Prabakar. 1997. Field crop diseases, AE Publication, Coimbatore.
4. Agrios, G.N. 2008. Plant Pathology, Academic Press, New York
5. Rangaswami, G. 2005. Diseases of Crop plants in India. Prentice Hall of India Pvt. Ltd., New Delh
6. Thakur, B.R. 2006. Diseases of field crops and their management

COM301	AGRI-INFORMATICS	T	P	C
		1	1	2

THEORY

UNIT I Computer and Operating Systems

Introduction to Computers, Operating Systems, definition and types, Applications of MSOffice for document creation & Editing, Data presentation, interpretation and graph creation, statistical analysis, mathematical expressions.

UNIT II ICT in Agriculture

Database, concepts and types, uses of DBMS in Agriculture, World Wide Web (WWW): Concepts and components. Introduction to computer programming languages, concepts and standard input/output operations. e-Agriculture, concepts and applications, Use of ICT in Agriculture.

UNIT III IT applications in Agriculture

Computer Models for understanding plant processes. IT application for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management.

UNIT IV Apps in Agriculture

Smartphone Apps in Agriculture for farm advises, market price, postharvest management etc; Geospatial technology for generating valuable agri-information. Decision support systems, concepts, components and applications in Agriculture.

UNIT IV Expert Systems

Agriculture Expert System, Soil Information Systems etc for supporting Farm decisions. Preparation of contingent crop-planning using IT tools.

PRACTICAL SCHEDULE

1. MS-EXCEL - Creating a spreadsheet, use of statistical tools, writing expressions, creating graphs, analysis of scientific data.
2. MS-ACCESS: Creating Database, preparing queries and reports, demonstration of Agri-information system.
3. Introduction to World Wide Web (WWW). Introduction of programming languages.
4. Database Management Systems (DBMS), its components in generating agricultural information.
5. Hands on Crop Simulation Models (CSM) such as DSSAT/Crop- Info/CropSyst/ Wofost.
6. Computation of water and nutrient requirements of crop using CSM and IT tools.
7. Applications - Geographic Information Systems (GIS) - Remote Sensing – Geographic data and maps.
8. Geospatial Technology for generating valuable information for Agriculture. Hands on Decision Support System. Preparation of contingent crop planning.
9. Relational Database Management System (RDBMS) – Client Server computing – Overview of Codd’s rules.
10. Structured Query Language (SQL) Commands.

11. Building a Visual Basic Application – Writing codes – Working with controls – Managing Visual Basic data.
12. Database Management System (DBMS) and its components - Data modeling and its components.
13. VB Functions – Creating Visual Basic Function for MS Excel.
14. Commands – Join types – self JOIN – Database Security Commands using GRANT, REVOKE options.
15. Bio-informatics in Agriculture – Analysing protein sequences – DNA and RNA sequences.
16. Usage of SWISSPROT, EMBL, BLAST software for similarities searches – Bio-informatics software programmes.

REFERENCE BOOKS

1. Krishna, K.K. 2013. Precision Farming: Soil Fertility and Productivity Aspects. Apple Academic Press.
2. Srivastava, G.S. 2014. An Introduction to Geo-informatics. McGrew Hill Education (India) Pvt. Ltd., New Delhi.
3. Gupta, R.K. and Subhash Chander. 2008. Principles of Geo-informatics. Jain Brothers, New Delhi.
4. Introduction of Bioinformatics: Parrysmith and Attwood.
5. Internet of Molecular Biologist: Swindell.
6. A Textbook of Bioinformatics: Sharma, Munjal and Shanker, Rastogi publication.

AEC301	FARM MANAGEMENT, PRODUCTION AND RESOURCE ECONOMICS	T	P	C
		1	1	2

THEORY

Unit 1: Production Economics and Farm Management - Nature and Scope

Meaning and concept of farm management, objectives and relationship with other sciences. Meaning and definition of farms, its types and characteristics, factors determining types and size of farms. Types of farming: Specialized, Diversified, and Mixed farming – Systems of farming: Peasant Farming, State Farming, Capitalistic, Collective and Co – operative Farming.

Unit 2: Factor – Product, Factor – Factor and Product – Product Relationships

Principles of farm management: concept of production function and its characteristics and its type, use of production function in decision-making on a farm. Factor-Product relationship. Meaning, Definition – Laws of Returns. Meaning and concept of cost, types of costs, cost curves - and their inter-relationship - shut down and break-even points, importance of cost in managing farm business and estimation of gross farm income, net farm income, family labor income and farm business income. Economies of Scale – Economies of Size - Determination of Optimum Input and Output – Physical and Economic Optimum. Factor – Factor relationship: Least Cost Combination of inputs; Product – Product relationship: Optimum Combination of Products – Principle of Equi – Marginal Returns – Principle of Opportunity Cost and Minimum Loss Principle. Law of Comparative Advantage.

Unit 3: Farm Planning and Budgeting

Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises. Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain on farm, farm inventory, balance sheet, profit and loss accounts. 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.

Unit 4: Risk and Uncertainty in Agriculture Production

Concept of risk and uncertainty occurrences in agriculture production, nature and sources of risks and their management strategies**,** Crop / livestock / machinery insurance. Weather based crop insurance - Features and determinants of compensations.

Unit 5: Resource Economics

Resource Economics: Concepts, Classification, differences between Natural Resource Economics (NRE) and agricultural economics, unique properties of natural resources. Natural Resources - Issues – Scarcity of resources – Factors mitigating scarcity – Property Rights: Common Property Resources (CPRs): meaning and characteristics of CPRs – Externalities: meaning and types - positive and negative externalities in agriculture, Inefficiency and welfare loss, solutions; Important issues in economics and management of common property resources of land, water, pasture and forest resources.

Practical Schedule

16. Preparation of farm layout. Determination of cost of fencing of a farm.

17. Computation of depreciation and cost of farm assets: Valuation of assets by different methods.
18. Application of equi - marginal returns / opportunity cost principle in allocation of farm resources.
19. Determination of most profitable level of inputs use in a farm production process.
20. Determination of least cost combination of inputs.
21. Selection of most profitable enterprise combination.
22. Application of cost principles including CACP concepts in the estimation of cost of cultivation and cost of production of agricultural crops.
23. Estimation of cost of cultivation and cost of production of perennial crops / horticultural crops.
24. Estimation of cost of returns of livestock products.
25. Preparation of farm plan and budget.
26. Farm records and accounts: Usefulness, types of farm records: farm production records and farm financial records.
27. Preparation of Cash flow statement
28. Preparation and Analysis of Net worth Statement and Profit and Loss statement
29. Estimation of Break – even analysis.
30. Graphical solution to Linear Programming problem.
31. Collection and analysis of data on various resources in India.
32. **Final Practical Examination.**

References

- Sankayan, P.L. 1983. Introduction to Farm Management. Tata McGraw Hill Publishing Company Ltd. New Delhi.
- Johl, S.S & Kapoor, T.R. 1973. Fundamentals of Farm Business Management. Kalyani Publishers. Ludhiana.
- Kahlon, A.S and Singh K. 1992. Economics of Farm Management in India. Allied Publishers. New Delhi.
- Doll, J.P. and F. Orazem. 1983. Theory of Production Economics with Applications to Agriculture. John Wiley, New York.
- Debertin, D.L. 1986. Agricultural Production Economics. Macmillan. New York.
- Heady, E.O. and H.R. Jensen. 1954. Farm Management Economics. Prentice – Hall. Englewood Cliffs.
- Kay, Ronald D., and William M. Edwards, and Patricia Duffy. 2004. Farm Management. Fifth Edition. McGraw–Hill Inc. New York.
- Panda, S.C. 2007. Farm Management and Agricultural Marketing. Kalyani Publishers. Ludhiana. India.

AEC312	INTELLECTUAL PROPERTY RIGHTS	T	P	C
		1	0	1

THEORY

UNIT I Introduction to IPR

Introduction and meaning of intellectual property, brief introduction to GATT, WTO, TRIPs and WIPO, Treaties for IPR protection: Madrid protocol, Berne Convention, Budapest treaty, etc.

UNIT II Types of IPR

Types of Intellectual Property and legislations covering IPR in India:-Patents, Copyrights, Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets.

UNIT III Patent System in India

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 IV IPR Act for Plant Protection

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

UNIT V IPR Acts

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.

REFERENCE BOOKS

1. Acharya, N. K. 2014. *Text Book of Intellectual Property Rights*. Asia Law House, Hyderabad.
2. Adukia, R.S. 2013. *Handbook on Intellectual Property Rights in India*. Jain Book Depot. New Delhi.
3. Catherine, J. 2007**.** *Intellectual property: patents, trademarks, copyrights, trade secrets.*Entrepreneur Press, Holland.
4. Elsy, C. R., Thomas, J. K. and Mohandas, H. 2006. *Primer on IPR in Agriculture*. Kerala Agricultural University, Vellanikkara.
5. Elsy, C. R., Joseph, J. and Thomas, J. K. 2014. *Protection and Management of IPR in Agriculture.* Kerala Agricultural University, Vellanikkara.
6. GOI. 2001 *The Protection of Plant varieties and Farmers Rights*. The Gazette of India 2(1) Ministry of Law, Justice and Company Affairs, GOI, New Delhi.
7. GOI. 2003. *The Biological Diversity Act, 2002*. The Gazette of India II (1) Ministry of Law, GOI, New Delhi.
8. Karki, M. M. S. 2009. *Intellectual Property Rights: Basic Concepts*. Atlantic Publishers, Mumbai.
9. Rosedar S.R.A. 2014. *Intellectual Property Rights*(1stEd.) LexisNexis.

IMPORTANT WEBSITES

1. www.ipindia.nic.in – CGPDT, India.
2. www.patentoffice.nic.in – Patent office, India.
3. http://copyright.gov.in/ - Copyright Office, India.
4. www.plantauthority.gov.in – Plant Varieties and Farmers' Rights Authority, India.
5. http://nbaindia.org/ - National Biodiversity Authority.
6. www.nipo.in – The Indian IPR Foundation.

ERG301	RENEWABLE ENERGY AND GREEN TECHNOLOGY	T	P	C
		1	1	2

THEORY

UNIT I Sources of Energy

Energy sources, Introduction, Classification, Energy from Biomass, Types of biogas plants, constructional details, Biogas production and its utilization, Agricultural wastes, Principles of combustion, pyrolysis and gasification. Types of gasifiers, Producer gas and its utilization. Briquettes, Types of Briquetting machines, uses of Briquettes, Shredders.

UNIT II Solar Energy

Solar energy, Solar flat plate and focusing plate collectors, Solar air heaters, Solar space heating and cooling, Solar energy applications/Solar energy gadgets, Solar cookers, Solar water heating systems, solar grain dryers, Solar Refrigeration system, Solar ponds, Solar photo voltaic systems, solar lantern, Solar street lights, solar fencing, Solar pumping systems.

UNIT III Wind Energy

Wind energy, Types of wind mills, Constructional details and application of wind mills. Liquid Bio fuels, Bio diesel and Ethanol from agricultural produce, its production and uses.

UNIT IV Biogas

Biogas technology - Science of production - feed stocks - factors affecting biogas production - types and capacity of biogas plants - KVIC, Janata and Deenbandhu model biogas plants - construction and working principles - comparison features of biogas plants. Applications of biogas – biogas requirements - biogas appliances - environmental considerations – enrichment and uses of biodigested slurry (BDS).

UNIT V Green Energy

Green technology – Introduction, Definition**,** Need of Alternative materials, Green Materials, Biomaterials, Natural and synthetic Polymers. Photovoltaic (PV) thin films for solar cells; Organic Solar Cells; dye sensitized solar cells; Thermo photovoltaic (TPV) devices Fuel cells. The role of the fuel in the operation, performance and degradation of fuel cells.

PRACTICAL SCHEDULE

1. Study of fixed dom and floating drum type biogas plants.
2. Study of cross draft, updraft and down draft gasifiers.
3. Constructional details of KYIC and Janatha type biogas plants.
4. To study briquetting machine.
5. Study of box type solar cooker.
6. Study of solar water heating system.
7. Study of solar distillation system.
8. Study of solar dryer.
9. Study of solar animal concentrate cooker.
10. Study of solar photovoltaic water pumping system.
11. and visit to nearby solar photovoltaic water pumping system.
12. Study of solar photovoltaic sprayer.
13. Study of wind mill and Field visit to wind mills.
14. Study of improved cook stove.
15. To study the processing of Bio-diesel production from Jatropha.

16. Field visit to biogas plants.

REFERENCE BOOKS

1. G.D. Rai. Non-Conventional Energy Sources, Kh Publishers, New Delhi.
2. N. S. Rathore. A.K. Kurchania, N.L. Panwar. 2007. Non Conventional Energy Sources, Himanshu Publications.
3. N.S. Rathore. A. K. Kurchania, N.L. Panwar. 2007. Renewable Energy, Theory and Practice, Himanshu Publications.
4. K.C. Khandelwal. & S.S. Mandi. 1990. Biogas Technology.
5. Renewable Energy, Godfrey Boyle (Editor) ISBN: 0199261784 / ISBN-13: 9780199261789.
6. Solar Energy Utilization, Rai G.D 1984. Khanna Publishers, New Delhi.
7. Solar Energy, Sukhatme SP. 1985. Tata McGraw Hill publishing Co. Ltd., New Delhi.
8. Energy technology - Non conventional, renewable and conventional, Rao, S. and B.B. Parulekar, 2002. Khanna Publishers, New Delhi, India.
9. Renewable Energy Resources, John Twidell and Tony Weir - (Paperback - 24 Nov 2005).
10. Biotechnology and other Alternate Technology, Chakravarthy A. 1989. Oxford and IBH Publishing Co. Ltd. New Delhi.

FURTHER READING

1. Renewable Energy Sources and Conversion Technology, Bansal N.K. *et al*., 1990. Tata McGraw Hill publishing Co. Ltd., New Delhi.
2. Non Conventional Energy Sources, Rai GD. 1996. Khanna publishers, New Delhi.
3. Biomass Briquetting and utilization, Srivastava *et al*., 1995. Jain Brothers. New Delhi.

WEB RESOURCES

1. Journal of Renewable and Sustainable Energy - http://jrse.aip.org/
2. Bio-resource Technology - International Journal - http://www.sciencedirect.com/
3. *Ministry of New and Renewable Energy* - http://www.mnre.gov.in/

SEMESTER VII

AEX 421	RURAL AGRICULTURAL WORK EXPERIENCE AND AGRO-INDUSTRIAL ATTACHMENT (RAWE & AIA)	T	P	C
		0	20	20

UNIT I Village Resource Inventory and Planning

(using PRA tools, Rich pictures, GIS maps, secondary data, interview, etc.)

- Describe the Natural Resources - Village boundaries, topography, historical background, water resources (river, canal, tank, etc.), soil resources, vegetation (trees, crops, etc.), fodder, animal husbandry (milch cattle, poultry, goatery, fishery, etc.), wild animals, climate, land utilization pattern, etc.
- Describe the Agricultural scenario - Cropping pattern, cropping systems, farming systems, area, production and productivity of crops, adoption pattern of recommended varieties / hybrids, technologies and machinery / implements, organic farming, contract farming, etc.
- Explain the Demographic details – population, literacy, land holdings, farmers, farm women, youth, caste, labour, etc.
- Analyze the Social factors – social structure, social stratification, social change, social groups, culture, social control, leadership, social processes, migration, social customs, social issues, etc.
- Study the Socio-psychological factors – group processes / dynamics, attitude towards innovations, etc.
- Assess the Village Infrastructure - Educational institutions, Government institutes / offices, private firms / offices, NGOs, Societies, Banks, Panchayat Union / Grama Panchayat, Clubs, SHGs, FPOs,
- Associations, Communication facilities, transport facilities, railway station, police station, hospitals, clinics, veterinary hospital, post office, markets, community centers, religious places of worship, etc.
- Analyze the Problems / Constraints – Problem / Constraints related to farming, marketing, processing, transport, communication, access to extension and other services, etc.
- Prepare village development plans in consultation with different stakeholders.

Unit II Farm Resource Inventory and Planning

(using maps, Rich pictures, farm system modeling, family tree charts, flow diagrams, interview, etc.)

- Describe the Farm boundaries, topography, water resources, soil resources, vegetation, animal enterprises, etc.
- Describe the cropping pattern, cropping system, farming system, agri-business, etc.
- Explore Farmers Practices – Indigenous Technical Knowledge (ITK).Identify the constraints of the system environment (natural, economic, social, political, legal).
- Assess the linkages with Extension agencies, Markets, Input agencies, Media, Development departments, etc.
- Identify and describe all the people involved in the farm, their work, roles, visions, needs, values, interests and relationships.

- Analyze the system in terms of satisfying current needs. What are the critical factors that need to be managed to sustain the system? Are there opportunities for growth and development to satisfy the future needs of the system? Are there threats that also need to be managed?
- Describe the different sub-systems viz., production sub-system, management sub-system, marketing sub-system, human activity sub-system, landscape and natural sub-system, etc., and their relationships.
- Identify the linkages with the Supra System viz., economic, political, legal and social.
- Find out the adoption pattern of recommended varieties / hybrids, technologies, machinery / implements, etc.
- Analyze the financial status and performance of the system - Economics of production (area, production, productivity, yield gaps, net returns, cost benefit ratio, etc).
- Prepare farm development plans for different types of farmers, by involving them so as to improve their systems.

Unit III Studying activities of State Department of Agriculture

Visit to Office of Assistant Director of Agriculture to study the organizational structure, functions, duties and responsibilities of extension personnel, ATMA, schemes implemented, extension activities conducted, etc. Involve in different extension activities such as village meetings, demonstrations, campaigns, exhibition, radio / TV programmes and record observations and lessons learnt.

Unit IV Studying activities of an NGO

Visit to an NGO to study the organizational pattern, functions, projects, duties and responsibilities of staff, extension activities, schemes implemented, funding sources, etc.

Unit V Studying activities of an Agri Business Firm

Visit to an Agri-business firm to study the business activities, projects, managerial functions viz., planning, supervision, delegation, communication, budgeting, and related aspects.

AEX423	EDUCATIONAL TOUR	T	P	C
		0	1	1

Objective

The course will provide an opportunity to the students to study the functioning of important national and international institutes related to agriculture and allied fields.

Syllabus

Visit to important National and International institutes related to agriculture, horticulture, forestry and allied fields in various regions of the country. Exposure to varied agro-climatic zones, crops grown, cultivation practices, socio-economic and cultural features of the farming community in different parts of the country.

SEMESTER VIII

S. No.	SUB. CODE	SUBJECT NAME	T	P	C
1.	ABM421	Modules for Skill Development and Entrepreneurship -I	0	10	10
2.	ABM422	Modules for Skill Development and Entrepreneurship -II	0	10	10
	Total		0	20	20

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.

S. No.	Title of the module	T	P	C
1.	Production Technology for Bioagents and Biofertilizers	0	10	10
2.	Seed Production and Technology	0	10	10
3.	Mushroom Cultivation Technology	0	10	10
4.	Soil, Plant, Water and Seed Testing	0	10	10
5.	Poultry Production Technology	0	10	10
6.	Commercial Horticulture	0	10	10
7.	Floriculture and Landscaping	0	10	10
8.	Food Processing	0	10	10
9.	Agricultural Waste Management	0	10	10
10.	Organic Production Technology	0	10	10
11.	Commercial Sericulture	0	10	10
12.	Commercial Bee Keeping	0	10	10

Evaluation of Experiential Learning Programme/HOT

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

ARM201	AGRI-BUSINESS MANAGEMENT	T	P	C
		2	1	3

THEORY

UNIT I Importance of Agribusiness

Transformation of agriculture into agribusiness, various stakeholders and components of agribusiness systems. Importance of agribusiness in the Indian economy and New Agricultural Policy.

UNIT II Agro based Industries

Distinctive features of Agribusiness Management: Importance and needs of agro-based industries, Classification of industries and types of agro based industries. Institutional arrangement, procedures to set up agro based industries. Constraints in establishing agro-based industries.

UNIT III Management functions

Agri-value chain: Understanding primary and support activities and their linkages. Business environment: PEST & SWOT analysis. Management functions: Roles & activities, Organization culture. Planning, meaning, definition, types of plans.

UNIT IV Management functions

Purpose or mission, goals or objectives, Strategies, polices procedures, rules, programs and budget. Components of a business plan, Steps in planning and implementation. Organization staffing, directing and motivation. Ordering, leading, supervision, communications, control. Capital Management and Financial management of Agribusiness.

UNIT V Marketing & Project Management

Financial statements and their importance. Marketing Management: Segmentation, targeting & positioning. Marketing mix and marketing strategies. Consumer behaviour analysis, Product Life Cycle (PLC). Sales & Distribution Management. Pricing policy, various pricing methods. Project Management definition, project cycle, identification, formulation, appraisal, implementation, monitoring and evaluation. Project Appraisal and evaluation techniques.

PRACTICAL SCHEDULE

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

REFERENCE BOOKS

1. Prasad, L.M, 2005, 'Principles and Practices of Management', Sultan Chand and Sons Educational Publishers, New Delhi.
2. Richard, B Chase, Nicholas J., Acquilano and F.Robert Jacobs, 2007, `Production and Operations Management - Manufacturing and service, Tata Mc Graw Hill Publishing Company Limited, New Delhi.
3. Aswathappa, K, Human Resource Management: Text and Cases, Tata McGraw-Hill Pub. Co. Ltd. New Delhi, 5th Edition, 2008.
4. Philip Kotler, Marketing Management, Pearson Education, India, 2003.
5. Chandra Prasanna. 2000. Financial Management - Theory and Practice. Tata Mc Graw Hill Publishing Company Ltd., New Delhi.
6. R.K.Sapru, Project Management, Excel Books, New Delhi, 1997.

HOR203	LANDSCAPING	T	P	C
		2	1	3

THEORY

UNIT I: IMPORTANCE AND SCOPE

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

UNIT II: ORNAMNETAL TREES

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

UNIT III: ORNAMNETAL CLIMBER AND CREEPERS

Climber and creepers: importance, selection, propagation, planting, Annuals: selection, propagation, planting scheme, other garden plants: palms, ferns, grasses and cacti succulents.

UNIT IV: BIO-AESTHETIC PLANNING

Pot plants: selection, arrangement, management. Bio-aesthetic planning: definition, need, planning; landscaping of urban and rural areas, Peri-urban landscaping.

UNIT V: LANDSCAPING FOR VARIOUS LOCATIONS

Landscaping of schools, public places like bus station, railway station, townships, river banks, hospitals, play grounds, airports, industries, institutions. Bonsai: principles and management, lawn: establishment and maintenance. CAD application.

PRACTICAL SCHEDULE

1. Identification of trees, shrubs, annuals, pot plants.
2. Propagation of trees, shrubs and annuals.
3. Care and maintenance of plants, potting and repotting.
4. Identification of tools and implements used in landscape design, training and pruning of plants for special effects.
5. Lawn establishment and maintenance.
6. Layout of formal gardens, informal gardens, special type of gardens (sunken garden, terrace garden, rock garden).
7. Designing of conservatory and lathe house.
8. Use of computer software.
9. Visit to important gardens/ parks/ institutes.

REFERENCE BOOKS

1. Randhawa, G.S. and A. Mukhopadyay. 1998. Floriculture in India. Allied publishers Limited, New Delhi.
2. K.M.P. Nambisan 1992 – Design elements of landscape gardening – Oxford and IBH publishing Co, New Delhi.
3. Lancaster, P. 1991. Gardening in India. Oxford and IBH publishers Pvt. Ltd., Calcutta.
4. Gopalasamy lyengar. 1990. Complete gardening in India. IBH. Bangalore.

TEXT BOOKS

1. McCarty, L.B. 2005. Best Golf Course Management Practices. 2nd Edition. Pearson Prentice Hall, Upper Saddle River, NJ.
2. S.K. Bhattacharjee, 2004. Landscape Gardening and Design with plants. Aavishkar Publishers and Distributers, Jaipur.

AEX203	AGRICULTURAL JOURNALISM	T	P	C
		2	1	3

THEORY

UNIT I Introduction and scope of journalism in Agriculture

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

UNIT II Communication Media

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

UNIT III Agricultural Story

Style and language of newspapers and magazines, parts of newspapers and magazines. The agricultural story: Types of agricultural stories, subject matter of the agricultural story, structure of the agricultural story.

UNIT IV Agricultural Information

Gathering agricultural information: Sources of agricultural information, interviews, coverage of events, abstracting from research and scientific materials, wire services, other agricultural news sources. Writing the story: Organizing the material, treatment of the story, writing the news lead and the body, readability measures.

UNIT V Editorial Mechanics

Illustrating agricultural stories: Use of photographs, use of artwork (graphs, charts, maps, etc.) writing the captions. Editorial mechanics: Copy reading, headline and title writing, proofreading, lay outing.

PRACTICAL SCHEDULE

1. Practice in interviewing.
2. Covering agricultural events.
3. Abstracting stories from research and scientific materials and from wire services.
4. Writing different types of agricultural stories.
5. Selecting pictures and artwork for the agricultural story.
6. Practice in editing, copy reading, headline and title writing, proofreading, layouting.
7. Testing copy with a readability formula.
8. Visit to a publishing office.

SAC202	AGROCHEMICALS	T	P	C
		2	1	3

THEORY

UNIT I

An introduction to agrochemicals, their type and role in agriculture, effect on environment, soil, human and animal health, merits and demerits of their uses in agriculture, management of agrochemicals for sustainable agriculture.

UNIT II

Herbicides-Major classes, properties and important herbicides. Fate of herbicides. Fungicides - Classification – Inorganic fungicides - characteristics, preparation and use of sulfur and copper, Mode of action-Bordeaux mixture and copper oxychloride. Organic fungicides- Mode of action- Dithiocarbamates-characteristics, preparation and use of Zineb and maneb.

UNIT III

Systemic fungicides- Benomyl, carboxin, oxycarboxin, Metalaxyl, Carbendazim, characteristics and use. Introduction and classification of insecticides: inorganic and organic insecticides Organochlorine, Organophosphates, Carbamates, Synthetic pyrethroids. Neonicotinoids, Biorationals, Insecticide Act and rules, Insecticides banned, withdrawn and restricted use, Fate of insecticides in soil & plant. IGRs Biopesticides, Reduced risk insecticides, Botanicals, plant and animal systemic insecticides their characteristics and uses.

UNIT IV

Fertilizers and their importance. Nitrogenous fertilizers: Feedstocks and Manufacturing of ammonium sulphate, ammonium nitrate, ammonium chloride, urea. Slow release N-fertilizers. Phosphatic fertilizers: feedstock and manufacturing of single superphosphate. Preparation of bone meal and basic slag. Potassic fertilizers: Natural sources of potash, manufacturing of potassiumchloride, potassium sulphate and potassium nitrate.

UNIT V

Mixed and complex fertilizers: Sources and compatibility–preparation of major, secondary and micronutrient mixtures. Complex fertilizers: Manufacturing of ammonium phosphates, nitrophosphates and NPK complexes. Fertilizer control order. Fertilizer logistics and marketing. Plant bio-pesticides for ecological agriculture, Bio-insect repellent.

PRACTICAL SCHEDULE

1. Sampling of fertilizers and pesticides.
2. Pesticides application technology to study about various pesticides appliances.
3. Quick tests for identification of common fertilizers.
4. Identification of anion and cation in fertilizer.
5. Calculation of doses of insecticides to be used.
6. To study and identify various formulations of insecticide available kin market.
7. Estimation of nitrogen in Urea.
8. Estimation of water soluble P2O5 and citrate soluble P2O5 in single super phosphate.
9. Estimation of potassium in Muraite of Potash/ Sulphate of Potash by flame photometer. Determination of copper content in copper oxychloride.

10. Determination of sulphur content in sulphur fungicide.
11. Determination of thiram.
12. Determination of ziram content.

REFERENCE BOOKS

1. Handa.S.K.2004.Principles of Pesticide Chemistry.Agrobios.
2. Cremlyn, R.J. 1991. Agrochemicals – Preparation and mode of action. John Wiley and sons, New york.
3. Dutcher R.A., Jensen C.O. and Alttiouse P.M. 1951. Introduction to Agricultural Biochemistry – John Wiley & Sons Inc., New York.
4. Friend J.And Rhodes M.J.C., 1981. Recent Advances in the Biochemistry of Fruits and Vegetables – Academic Press, London.
5. George W.Ware, 1986. Fundamentals of Pesticides – A Self Instruction Guide – Thomas Publications, PO Box.9335, Freno, California 93791.
6. Hulme A.C., 1970. The Biochemistry of Fruits and their Products Vol.I & II – Academic Press, London.
7. Hulse J.H., Laing E.M. and Peasson C.E., 1980. Sorghum and Millets, their Composition and Nutritive Value – Academic Press, London.
8. Rameshwar A., 1993. Outlines of Plant Biochemistry – Noya Prakash, Calcutta.
9. Robert White, Stevens, 1971. Pesticides in the Environment Vol.I and Part I – Marcel Dekker Inc., New York.

PBG302	COMMERCIAL PLANT BREEDING	T	P	C
		1	1	2

THEORY

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

IPR issues in commercial plant breeding: DUS testing and registration of varieties under PPV & FR Act. Variety testing, release and notification systems in India.

UNIT V

Principles and techniques of seed production, types of seeds, quality testing in self and cross pollinated crops.

PRACTICAL SCHEDULE

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

REFERENCE BOOKS

1. Agarwal, R.L. 1991. Seed Technology. Oxford & IBH Publishing Co. New Delhi.
2. Chaddha, K.L. and Rajendra Gupta. 1995. Advances in Horticulture Vol. II Medicinal and Aromatic Plant. Malhotra Publishing House, New Delhi.

3. Chopra, V.L. 2000. Breeding of Field Crops (Edt.). Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Hallauer A.R. and Miranda, J.B. 1989. Quantitative Genetics in Maize. Iowa State Univ. Press Amesterdum.
5. Poehlman, J.M. 1987. Breeding of Field Crops. Third Edition, AVI Publication, USA.
6. Ram, H.H. 2005. Vegetable Breeding – Principles and Practices. Kalyani Publishers, New Delhi.

HOR303	PROTECTED CULTIVATION	T	P	C
		1	1	2

THEORY

UNIT I: IMPORTANCE AND SCOPE

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

UNIT II: FACTORS OF GREEN HOUSE PRODUCTION AND ITS MAINTENANCE

Cladding material involved in greenhouse/ poly house. Greenhouse design, environment control, artificial lights, Automation.

UNIT III: NUTRIENT AND FERTILIZER MANAGEMENT

Soil preparation and management, Substrate management. Types of benches and containers. Irrigation and fertigation management. Propagation and production of quality planting material of horticultural crops.

UNIT IV: PRODUCTION OF GREEN HOUSE CROPS - I

Greenhouse cultivation of important horticultural crops – rose, carnation, chrysanthemum, gerbera, orchid, anthurium, lilium, tulip, tomato, bell pepper, cucumber, strawberry, pot plants, etc.

UNIT V: PRODUCTION OF GREEN HOUSE CROPS - II

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

PRACTICAL SCHEDULE

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

REFERENCE BOOKS

1. Post Harvest Technology of Cereals, Pulses and Oil Seeds.1999.
2. Chakravarty, A. Oxford and IBH Pub. New Delhi.
3. Agricultural Process Engineering. 1955. Henderson, S.M. and R.L. Perry. John Willy and Sons, New York.
4. Principles of Agricultural Engineering, Vol. I. 1993. Michael, A.M. and T. P. Ojha . Jain Brothers, New Delhi.

AEN303	BIOPESTICIDES & BIOFERTILIZERS	T	P	C
		1	1	2

THEORY

UNIT I Introduction to Biopesticides

History and concept of biopesticides. Importance, scope and potential of biopesticide. Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides and biorationals. Botanicals and their uses. Mass production technology of bio-pesticides.

UNIT II Application and quality control of Biopesticides

Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes. Methods of application of biopesticides. Methods of quality control and Techniques of biopesticides.

UNIT III Biofertilizers

Impediments and limitation in production and use of biopesticide. Biofertilizers - Introduction, status and scope. Structure and characteristic features of bacterial biofertilizers- Azospirillum, Azotobacter, Bacillus, Pseudomonas, Rhizobium and Frankia.

UNIT IV Biofertilizers

Cynobacterial biofertilizers- Anabaena, Nostoc, Hapalosiphon and fungal biofertilizers- AM mycorrhiza and ectomycorhiza. Nitrogen fixation -Free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilization and phosphate mobilization, K solubilization.

UNIT V Production technology & Storage of Biofertilizers

Production technology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertiizers. FCO specifications and quality control of biofertilizers. Application technology for seeds, seedlings, tubers, sets etc. Biofertilizers - Storage, shelf life, quality control and marketing. Factors influencing the efficacy of biofertilizers.

PRACTICAL SCHEDULE

1. Isolation and purification of important biopesticides: Trichoderma Pseudomonas, Bacillus, Metarhyzium etc. and its production.
2. Isolation and purification of important biopesticides: Trichoderma Pseudomonas, Bacillus, Metarhyzium etc. and its production.
3. Identification of important botanicals.
4. Visit to biopesticide laboratory in nearby area.
5. Field visit to explore naturally infected cadavers.
6. Identification of entomopathogenic entities in field condition.
7. Quality control of biopesticides.
8. Isolation and purification of Azospirillum, Azotobacter, Rhizobium, P-solubilizers and cyanobacteria.
9. Mass multiplication and inoculums production of biofertilizers.
10. Isolation of AM fungi -Wet sieving method and sucrose gradient method.
11. Mass production of AM inoculants.

REFERENCE BOOKS

1. DeBach,P. 1974. Biological control by Natural enemies. Cambridge University Press.
2. Manfred Mackaur, Laster E.Ehler and Jens Roland. 1990. Critical Issues in Biological control- Intercept Ltd.
3. Project Directorate of Biological control. 1994. Technology for mass production of Natural enemies. Technical Bulletin.
4. Rabindra, R.J., Kennedy, J.S., Sathaiah, N., Rajasekharan, B. and Srinivasan, M.R. 2001. Microbial control of crop pests. TNAU.
5. Dhaliwal GS & Arora R. 2001. Integrated Pest Management: Concepts and Approaches. KalyaniPubl., New Delhi.
6. Dhaliwal, GS & Koul O. 2007. Biopesticides and Pest Management. Kalyani Publ., New Delhi.
7. Gautam, R.D. Biological Pest Suppression, Westvill Publising Co., New Delhi.

ABT301	MICRO PROPAGATION TECHNOLOGIES	T	P	C
		1	1	2

THEORY

UNIT I

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

UNIT II

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

UNIT III

Organogenesis (callus and direct organ formation).

UNIT IV

Somatic embryogenesis, cell suspension cultures, Production of secondary metabolites.

UNIT V

Somaclonal variation, Cryopreservation.

PRACTICAL SCHEDULE

1. Identification and use of equipments in tissue culture Laboratory.
2. Nutrition media composition.
3. Sterilization techniques for media.
4. Containers and small instruments.
5. Sterilization techniques for explants: Seeds, shoot tip and single node.
6. Callus induction.
7. Induction of somatic embryos regeneration of whole plants from different explants.
8. Hardening procedures.

REFERENCE BOOKS

1. Rao, M.M. 1990. Recent Developments in Multiplication of Planting Materials by Greenhouse and Tissue Culture Technologies. Short Course Manual of UAS, Dharward.
2. Sadhu, M.K.1989. Plant Propagation. Wiley Eastern Ltd., 4835/24, Ansari Road, Daryaganj, New Delhi 110 002.
3. Kumar, U. 2002. Methods in Plant Tissue culture, Second Edition, Agro Bios, Jodhpur.
4. Parthasarathy, V. A. 2001. Biotechnology of Horticultural Crops Vol. I, II & III, Nayoprakash, Calcutta.

AGR306	WEED AND WATER MANAGEMENT	T	P	C
		1	1	2

THEORY

UNIT I – Weed characteristics

Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem. Classification, reproduction and dissemination of weeds. Weed biology and ecology, crop weed competition and allelopathy.

UNIT II – Principles of Weed control

Concepts of weed prevention, eradication and control. Methods of weed control; physical, cultural, chemical and biological methods. Integrated weed management.

UNIT III – Herbicide – Formulation, Mode of action

Herbicide classification, concept of adjuvant, surfactant, herbicide formulation and their use. Introduction to mode of action of herbicides and selectivity. Concept of herbicide mixture and utility in agriculture.

UNIT IV -

Introduction of selectivity of herbicides. Herbicides absorption and translocation. Mode and mechanism of action of herbicides. Herbicide compatibility with agro-chemicals and their application. Resistance and its management.

UNIT V -

Weed management in major field and horticultural crops, shift of weed flora in cropping system, aquatic and problematic weeds and their control.

PRACTICAL SCHEDULE

1. Techniques of weed preservation.
2. Identification, characterization and classification of terrestrial weeds.
3. Identification, characterization and classification of aquatic weeds.
4. Assessment of weed seed bank and seed production of weeds.
5. Calculation of weed control index and weed control efficiency.
6. Study of information about herbicids, labels and herbicides dose.
7. Study of herbicides formulation and mixture of herbicides
8. Study of herbicides application techniques and equipments
9. Working out herbicides spray fluid requirements
10. Shift of weed flora study in long term experiments.
11. Study of physical method of weed control.
12. Study of cultural method of weed control.
13. Study of bio – herbicieds in agriculuture.
14. Study of phytotoxicity symptoms of herbicides in different crops.
15. Economic analysis of different method of weed control.
16. Visit to farm and identification of weeds.

REFERENCE BOOKS

1.Hance, R.J. and K. Holly. 1990. Weed Control Handbook: Principles. Blackwell Scientific Publications, Oxford, London.

2.Krieg, A. and J. M. Franj. 1989. Textbook of Biological Pest Control. Verlag Paul Pary, Humberg.
3.Musselman, L. J. 1987. Parasitic Weeds in Agriculture. Vol. I. Striga. CRO Press Inc. Florida, US.
4.Pierterse, A. H. and K.J. Murphy. 1990. Aquatic Weeds: The Ecology and Management of Nuisance Aquatic Vegetation. Oxford Univ. Press. Oxford. U.K.
5.Rao, V. S. 1983. Principles of Weed Science. Oxford and IBH Publishing Co. New Delhi.

TEXT BOOKS

1. Gupta, O. P. 1998. Modern Weed Management. Agro Botanica Bikaner, India.
2. Jaganathan R., and R.Jayakumar, Weed Management, Kalyani Publisher, New Delhi.
3. Subramanian, S. A. Mohammed Ali and R. Jayakumar. 1991. All about Weed Control. Kalyani Publishers, New Delhi.
4. Sankara Reddi, G.H. and T.Yellamanda Reddy, 1995. Efficient use of Irrigation Water, Kalyani Publishers, New Delhi.
5. Michael, A.M. 1986. Irrigation Theory and Practices, Vikas, New Delhi.

AGR307	SYSTEM SIMULATION AND AGROADVISORY	T	P	C
		1	1	2

THEORY

UNIT I

System Approach for representing soil-plant-atmospheric continuum, system boundaries, Crop models, concepts & techniques, types of crop models, data requirements, relational diagrams.

UNIT II

Evaluation of crop responses to weather elements; Elementary crop growth models; calibration, validation, verification and sensitivity analysis. Potential and achievable crop production - concept and modelling techniques for their estimation.

UNIT III

Crop production in moisture and nutrients limited conditions; components of soil water and nutrients balance. Weather forecasting, types, methods, tools & techniques, forecast verification.

UNIT IV

Value added weather forecast, ITK for weather forecast and its validity.

UNIT V

Crop-Weather Calendars; Preparation of agro-advisory bulletin based on weather forecast. Use of crop simulation model for preparation of Agro-advisory and its effective dissemination.

PRACTICAL SCHEDULE

1. Preparation of crop weather calendars.
2. Preparation of agro-advisories based on weather forecast using various approaches and synoptic charts.
3. Working with statistical and simulation models for crop growth.
4. Potential & achievable production.
5. Yield forecasting, insect & disease forecasting models.
6. Simulation with limitations of water and nutrient management options.
7. Sensitivity analysis of varying weather and crop management practices.
8. Use of statistical approaches in data analysis and preparation of historical, past and present meteorological data for medium range weather forecast.
9. Feedback from farmers about the agroadvisory.

REFERENCE BOOKS

1. Adhikary, M.M., Sarkar, A., Acharia,S.K. and Basu, D. 2006. Participatory Planning and Project Management in Extension Sciences Agrotech Publishing Company, Udhaipur.
2. De, Dipak, 2011 A handbook of Extension education, JV Publishing House, Jodhpur.
3. Samanta,R.K and Chandra Gowda 2002 KVK- The Capacity Builder of Farmers, New Delhi, B.R. Publishing Corporation.
4. Samanta,R.K. 1991, Agricultural Extension in Changing World Perspective, New Delhi, Uppal Publishing House.

FSN301	FOOD SAFETY AND STANDARDS	T	P	C
		1	1	2

THEORY

UNIT I

Food Safety – Definition, Importance, Scope and Factors affecting Food Safety. Hazards and Risks, Types of hazards - Biological, Chemical, Physical hazards. Management of hazards - Need. Control of parameters.

UNIT II

Temperature control. Food storage. Product design. Hygiene and Sanitation in Food Service Establishments- Introduction. Sources of contamination and their control. Waste Disposal. Pest and Rodent Control. Personnel Hygiene. Food Safety Measures.

UNIT III

Food Safety Management Tools- Basic concepts. PRPs, GHPs, GMPs, SSOPs etc. HACCP. ISO series. TQM - concept and need for quality, components of TQM, Kaizen. Risk Analysis. Accreditation and Auditing, Water Analysis, Surface Sanitation and Personal Hygiene. Food laws and Standards- Indian Food Regulatory Regime, FSSA.

UNIT IV

Global Scenario CAC. Other laws and standards related to food. Recent concerns- New and Emerging Pathogens. Packaging, Product labeling and Nutritional labeling.

UNIT V

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

PRACTICAL SCHEDULE

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

REFERENCE BOOKS

1. Inteaz Alli.2004. Food Quality Italics Assurance: Principles and Practices. CRC Press, Boca.
2. Raton, Ronald, H. Schmidt and Gary E. Rodrick. 2003. Food Safety Handbook. John Wiley & Sons, Inc., Hoboken. New Jersey, USA.
3. Hester, R.E. and Harrison R.M. 2001. Food Safety and Food Quality. Royal Society of Chemistry, Cambridge, UK.
4. Michael, M. Cramer. 2013. Food Plant Sanitation: Design, Maintenance, and Good Manufacturing Practices. CRC Press, Boca Raton, FL, USA.

5. Norman, G. Marriott, and Robert, B. Gravani. 2006. Principles of Food Sanitation, 5th Ed. Springer Science + Business Media, Inc., NY, USA.
6. Hui, Y.H. Bernard L. Bruinsma, J. Richard Gorham, Wai-Kit Nip, Phillip S. Tong and Phil Ventresca. 2003. Food Plant Sanitation. Marcel Dekker, Inc., NY, USA.
7. Singh, B.D. 2014. Biotechnology - Expanding Horizons. Kalyani Publishers, New Delhi.
8. Pepper I.L. and Gerba C.P. 2005. Environmental Microbiology. Laboratory Manual, 2nd Ed. Elsevier Academic Press, Amsterdam.