Course Curriculum of First Semester

as per the ICAR-Sixth Deans' Committee Report for the Academic Programmes in

HORTICULTURE

- UG-Certificate in Horticulture
- UG-Diploma in Horticulture
- UG-Degree: B.Sc. (Hons.) Horticulture

Mahatma Phule Krishi Vidyapeeth, Rahuri

Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola

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with

UG Degree Syllabus Discipline Coordinators &

DICC - UG Degree Syllabus Core Committee

Submitted to the

Directors of Instruction and Deans (F/A) Coordination Committee

~ w.e.f. AY, 2024-25 ~

Course Curriculum of First Semester as per the
ICAR-Sixth Deans' Committee Report for Academic Programmes in
HORTICULTURE

Course Layout

B.Sc. (Hons.) Horticulture

Semester: I (New) ***w.e.f.*** **Academic Year: 2024-25**

Sr. No.	Course No.	Course Title	Credit Hrs.	Remark
1.	**CAC-111**	*Deeksharambh* (Induction-cum-Foundation Course)	2(0+2)	NG (2 Weeks)
2.	**AEC-111**	National Service Scheme (NSS-I) / National Cadet Corps (NCC-I)	1(0+1)	
3.	**AEC-112**	Communication Skills	2(1+1)	
4.	**MDC-111**	Farming-based Livelihood Systems	3(2+1)	
5.	**MATH-111*/ BIO-111****	Introductory Mathematics*/ Basic Biology**	1(1+0)	NG & Need-based
6.	**HORT-111**	Fundamentals of Horticulture	3(2+1)	
7.	**FS-111**	Plant Propagation and Nursery Management of Fruit and Plantation Crops	3(1+2)	
8.	**FLA-111**	Commercial Production of Flower Crops	3(1+2)	
9.	**IDE-111**	Sprinkler and Micro Irrigation Systems	2(1+1)	
10.	**SEC-111**	Skill Enhancement Course-I *(To be offered from the bouquet of SEC Courses)*	2(0+2)	
11.	**SEC-112**	Skill Enhancement Course-II *(To be offered from the bouquet of SEC Courses)*	2(0+2)	
		Total Credits Hrs.	**21(8+13) G 3(1+2) NG**	

CAC: Common Academic Course, **AEC**: Ability Enhancement Course,
MDC: Multidisciplinary Course, **SEC**: Skill Enhancement Course,
G: Gradial, **NG**: Non-Gradial

Note: *MATH-111 for **PCB** student/ **BIO-111 for **PCM** student/ **PCMB** student is NOT required to take any of these Need-based/Deficiency Courses.

B.Sc. (Hons.) Horticulture : First Semester

Course-wise Syllabus with Teaching Schedules

Semester	**:**	**I**	
Course No.	**:**	**CAC-111**	**Credit Hrs. : 2 (0+2) NG / 2 Weeks**
Course Title	**:**	***Deeksharambh* (Induction-cum-Foundation Course)**	
Non-Gradial Common Academic Course for the respective UG degree with the activities to be conducted during initial two weeks.			

Objectives:

(i) To create a platform for students to help for cultural Integration of students from different backgrounds,

(ii) To know about the operational framework of academic process in university, instilling life and social skills,

(iii) To create Social awareness, Ethics and Values, Team work, Leadership, Creativity,

(iv) To identify the traditional values and indigenous cultures along with diverse potentialities both in indigenous and developed scenario.

ACTIVITIES

- Introduction/Orientation and Discussions on operational framework of academic process in University/ College, as well as interactions with Academic and Research Managers of the University.
- Interaction with Alumni, Business Leaders, Perspective Employers, Outstanding Achievers in related fields and people with inspiring life experiences.
- Group activities to identify the strength and weakness of students and to learn from each others' life experiences.
- Activities to enhance Cultural Integration of students from different backgrounds.
- Field visits to the relevant fields/ establishments.
- Sessions on Personally Development (Instilling Life and Social skills, Social awareness, Ethics and Values, Team work, Leadership etc.) and imbibing the Communication skills.

Note: *The details of the relevant activities will be decided by the parent University in line with the above-mentioned broad activities.*

Semester	**:**	**I**	
Course No.	**:**	**AEC-111**	**Credit Hrs. : 1(0+1)**
Course Title	**:**	**National Service Scheme (NSS-I) / National Cadet Corps (NCC-I)**	
Gradial Common Course across all UG degrees			

Course No.: AEC-111	**Course Title: National Service Scheme-I (NSS-I)**	**Credit Hrs: 1(0+1)**

SYLLABUS

PRACTICAL

Introduction and Basic Components of NSS

- Orientation: History, Objectives, Principles, Symbol, Badge; Regular Programs under NSS.
- Organizational structure of NSS, Code of conduct for NSS volunteers, Points to be considered by NSS Volunteers' awareness about Health.
- NSS program activities. Concept of regular activities, Special camping, Day camps, Basis of adoption of village/slums, Conducting survey, Analysing Guiding financial patterns of scheme, Youth program/schemes of GOI, Coordination with different agencies and maintenance of diary. Understanding youth. Definition, Profile, Categories, Issues and Challenges of youth; and Opportunities for youth who is agent of the social change.
- Community mobilization. Mapping of community stakeholders, Designing the message as per problems and their culture; Identifying methods of mobilization involving youth-adult partnership. Social harmony and National integration.
- Indian history and culture, role of youth in nation building, Conflict resolution and peace building. Volunteerism and Shramdaan. Indian tradition of volunteerism, its need, importance, motivation and constraints; Shaman as part of volunteerism.
- Citizenship, Constitution, and Human rights. Basic features of constitution of India, Fundamental rights and duties, Human rights, Consumer awareness and rights and Right to information. Family and Society. Concept of family, Community (PRIs and other community-based organizations) and Society.

TEACHING SCHEDULE

PRACTICAL [NSS-I]

Exercise No.	Exercise Topic	Weightage (%)
1	Orientation, History, Objectives, Principles, Symbols, Badge	10
2	Regular Programmes under NSS	10
3	Organisational Structure of NSS	10
4	Code of Conduct of NSS Volunteer	10
5	Points to be considered about NSS Volunteers awareness about Health	5
6	NSS Programme Activities- Concept of Regular Activities	5
7	NSS Programme Activities- Special Campaign	5
8	NSS Programme Activities- Day Camps	5
9	NSS Programme Activities- Adoption of village, Conducting survey, Analysing Guiding financial patterns of scheme	5
10	NSS Programme Activities- Youth programs/schemes of GOI, Coordination with different agencies and maintenance of diary. Understanding youth. Definition, Profile, Categories, Issues and Challenges of youth and Opportunities for youth who is agent of the social change.	5
11	Community Mobilization- Mapping of community stakeholders, Designing the message as per problems and their culture; Identifying methods of mobilization involving youth-adult partnership.	5
12	Community Mobilization-Culture, Social harmony and National integration.	5
13	Indian History and Culture- Role of youth in Nation Building	5
14	Volunteerism and Shramdaan: Indian tradition of volunteerism, its need, importance, motivation and constraints; Shaman as part of volunteerism.	5
15	Citizenship, Constitution and Human Rights: Basic features of constitution of India, Fundamental rights and duties, Human rights, Consumer awareness and rights and Right to information.	5
16	Family and Society: Concept of family, Community (PRIs and other community-based organizations) and Society.	5
	Total=	**100**

Course No.: AEC-111	Course Title: National Cadet Corps-I (NCC-I)	Credit Hrs.: 1(0+1)

SYLLABUS

Objective: To integrate and develop qualities of leadership, discipline, character and patriotism and foster the NCC Motto: **"Unity and Discipline"** among the youth.

PRACTICAL

- Aims, Objectives, Organization of NCC and NCC Song. DG's Cardinals of Discipline.
- Drill- Aim, General words of command, Attention, Stands-at-ease, Stand-easy and Turning.
- Sizing, Numbering, Forming in three ranks, Open and Close order march and Dressing.
- Saluting at the halt, Getting on parade, Dismissing and Falling-out.
- Marching, Length of pace and time of marching in quick/slow time and halt. Side pace, Pace forward and to the rear. Turning on the march and wheeling. Saluting on the march.
- Marking time, Forward march and halt. Changing step, Formation of squad and squad drill.
- Command and control, Organization, Badges of rank, Honours and Awards.
- Nation Building- Cultural heritage, Religions, Traditions and Customs of India. National integration. Values and ethics, Perception, Communication, Motivation, Decision making, Discipline and duties of good citizens. Leadership traits, Types of leadership. Character/ Personality development. Civil defence organization, Types of emergencies, Fire fighting, Protection. Maintenance of essential services, Disaster management, Aid during development projects.
- Basics of Social Service, Weaker sections of society and their needs, NGO's and their contribution, Contribution of youth towards Social welfare and Family planning.
- Structure and Function of human body, Diet and Exercise, Hygiene and Sanitation. Preventable diseases including AIDS, Safe blood donation, First aid, Physical and mental health. Adventure activities. Basic principles of Ecology, Environmental conservation, Pollution and its control.

TEACHING SCHEDULE

PRACTICAL [NCC-I]

Exercise No.	Exercise Topic	Exercise Sub-topics	Weightage (%)
1-2	Introduction to NCC	Aims, Objectives, NCC Organizational structure, NCC Song, DG's Cardinals of Discipline.	4
3-5	Drill Basics	Aim of drill, General words of command, Positions of attention, Stand-at-ease and Stand-easy, Turning.	8
6-8	Formation Drills	Sizing, Numbering, Forming in three ranks, Open and Close order march and Dressing.	8
9-11	Saluting Drills and Parade Movements	Saluting at halt, Getting on parade, Dismissing and Falling-out.	8
12-14	Marching Techniques	Length of pace and time of marching in Quick/slow march, Side pace, Forward/rear pace, Turning on the march, Wheeling and Saluting on the march	10
15-17	Squad Formation and Control	Marking time, Forward march, Halt, Changing step, Formation of squad and Squad drill.	10
18-19	Command and Control in NCC	Organization, Badges of rank, Honours and Awards.	4
20-22	Nation Building and Citizenship; Leadership	Cultural heritage, Religions, Traditions, Customs of India, National integration, Values and Ethics, Communication, Leadership traits, Discipline and Motivation, Character/ Personality Development.	12
23-24	Civil Defence and Emergency Management	Types of emergencies, Fire fighting techniques, Maintenance of essential services, Disaster management and Aid during development projects, Civil Defence Organizations.	10
25-26	Social Service and Youth Welfare	Weaker sections of society, Role of NGOs, Youth participation in Social welfare and Family planning	8
27-29	Health, Hygiene and First Aid	Human body structure, Diet, Hygiene, Preventable diseases (including AIDS), Safe blood donation, First aid practices, Mental and Physical health.	10
30-32	Environment and Ecology	Basic Principles of Ecology, Environmental conservation, Pollution and its control, Adventure activities.	8
		Total=	**100**

Semester : I		
Course No. : AEC-112	**Credit Hrs. : 2(1+1)**	
Course Title : Communication Skills		
Gradial Common Course across all UG degrees		

SYLLABUS

Objectives: (i) To acquire competence in oral, written and non-verbal communication,

(ii) To develop strong personal and professional communication and

(iii) To demonstrate positive group communication.

THEORY

Communication Process: The magic of effective communication; Building self-esteem and overcoming fears; Concept, nature and significance of communication process; Meaning, types and models of communication; Verbal and Non-verbal communication; Linguistic and non-linguistic barriers to communication and reasons behind communication gap/ miscommunication. Basic Communication Skills: Listening, Speaking, Reading and Writing Skills; Precís writing/Abstracting/Summarizing; Style of technical communication, Curriculum vitae/resume writing; Innovative methods to enhance vocabulary, analogy questions; Structural and Functional Grammar: Sentence structure, modifiers, connecting words and verbals; Phrases and clauses; Case: subjective case, possessive case, objective case; Correct usage of nouns, pronouns and antecedents, adjectives, adverbs and articles; Agreement of verb with the subject: tense, mood, voice; Writing effective sentences; Basic sentence faults.

PRACTICAL

Listening and note taking; Writing skills: precis writing, summarizing and abstracting; Reading and comprehension (written and oral) of general and technical articles; Micro-presentations and Impromptu Presentations: Feedback on presentations; Stage manners: grooming, body language, voice modulation, speed; Group discussions; Public speaking exercises; Vocabulary building exercises; Interview techniques; Organization of events.

TEACHING SCHEDULE

THEORY [AEC-112]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1	Communication Process: The Magic of Effective Communication	Elements of Communication process such as Communicator, Message, Channel treatment of message, Audience and Audience response.	5
2	Building Self-esteem and Overcoming Fears	Points to build Self-esteem, Build social connections, Encourage yourself, Focus on solutions and Set realistic goals, Strategies to overcome fears, Practice, Visualize Success, Preparation, Know your audience, Seek feedback and Active listening.	5
3	Communication	Concept, Nature and Significance of Communication process	10
4		Meaning, Types and Models of communication	10
5		Verbal and Non-verbal communication, Linguistic and Non-linguistic communication	10
6		Barriers to communication and Reasons behind communication gap/ miscommunication	5
7	Basic Communication Skills	Listening, Speaking, Reading, Writing Skills	5
8		Precís writing/ Abstracting/ Summarizing- Styles of technical communication, Curriculum Vitae/Resume writing.	10
9		Innovative methods to enhance vocabulary, analogy questions	5
10	Structural and Functional Grammar	Sentence structure, modifiers, connecting words and verbal; Phrases and Clauses	5
11		Case: Subjective case, Possessive case, Objective case	5
12		Correct usage of nouns, Pronouns and Antecedents	5
13		Adjectives, Adverbs and Articles	5
14		Agreement of verbs with the subject: Tense, Mood, Voice	5
15		Writing effective sentences	5
16		Basic sentence faults	5
		Total=	**100**

TEACHING SCHEDULE

PRACTICAL [AEC-112]

Exercise No.	Exercise Topic
1	Listening and Note taking
2	Writing skills- Precís writing
3	Writing skills- Abstracting
4	Writing skills- Summarizing
5	Reading and Comprehension (written and oral) of general and technical articles
6	Micro-presentations
7	Impromptu presentations
8	Feedback on presentations
9	Stage manners- Grooming
10	Stage manners- Body language
11	Stage manners- Voice modulations, speed
12	Group discussions
13	Public speaking exercise
14	Vocabulary building exercises
15	Interview techniques
16	Organization of events

Suggested Readings [AEC-112]:

1. **Allport, G.W. 1937.** Personality: A Psychological Interpretation, Holt, New York.
2. **Brown, M. and Brandreth G. 1994**. How to Interview and be Interviewed. Sheldon Press, London.
3. **Dale, C. 1997.** The Quick and Easy Way to Effective Speaking, Pocket Books, New York.
4. **Francis Peter, S.J. 2012.** Soft Skills and Professional Communication, Tata McGraw Hill, New Delhi.
5. **Kumar, S and Pushpa, L. 2011.** Communication Skills, Oxford University Press.
6. **Neuliep James, W. 2003.** Intercultural Communication-A Contextual Approach, Houghton Mifflin Co Boston.
7. **Pease, A. 1998.** Body Language, Sudha Publications, Delhi.
8. **Raman, M. and Singh, P. 2000.** Business Communication, Oxford University Press.
9. **Ray, G.L. 2008.** Extension, Communication and Management, Kalyani Publishers, Ludhiana
10. **Ray, G.L. and Mondal S. 2012. Textbook on Rural Development Entrepreneurship and** Communication Skills, Kalyani Publishers, Ludhiana.
11. **Seely, J. 2013.** Oxford Guide to Effective Writing and Speaking, Oxford University Press.
12. **Thomson, A. J. and Martinet, A.V. 1977.** A Practical English Grammar, Oxford University.

Semester	**:**	**I**			
Course No.	**:**	**MDC-111**	**Credit Hrs.**	**:**	**3(2+1)**
Course Title	**:**	**Farming-based Livelihood Systems**			
Gradial Common Course across all UG degrees					

SYLLABUS

Objectives: (i) To make the students aware about farming-based livelihood systems in Agriculture,

(ii) To disseminate the knowledge and skills that how farming-based systems can be a source of livelihood**.**

THEORY

Status of Agriculture in India and different States, Income of farmers and rural people in India, Livelihood-Definition, Concept and livelihood pattern in urban and rural areas, Different indicators to study livelihood systems. Agricultural Livelihood Systems (ALS): Meaning, approach, approaches and framework, Definition of farming systems and farming-based livelihood systems, Prevalent Farming systems in India contributing to livelihood. Types of traditional and modern farming systems. Components of farming system/ farming-based livelihood systems: Crops and cropping systems, Livestock, (Dairy, Piggery, Goatry, Poultry, Duckry etc.), Horticultural crops, Agroforestry systems, Aquaculture, Duck/Poultry-cum-Fish, Dairy-cum-Fish, Piggery-cum-Fish etc.; Small, medium and large enterprises including value chains and secondary enterprises as livelihood components for farmers, Factors affecting integration of various enterprises of farming for livelihood. Feasibility of different farming systems for different agro-climatic zones, Commercial farming-based livelihood models by NABARD, ICAR and other organizations across the country; Case studies on different livelihood enterprises associated with the farming. Risk and success factors in farming-based livelihood systems, Schemes and programs by Central and State Governments; Public and Private organizations involved in promotion of farming-based livelihood opportunities. Role of farming-based livelihood enterprises in 21st Century in view of circular economy, green economy, climate change, digitalization and changing life style.

PRACTICAL

Survey of farming systems and agriculture-based livelihood enterprises, Study of components of important farming-based livelihood models/systems in different agro-climatic zones, Study of production and profitability of crop based, livestock based, processing-based and integrated farming-based livelihood models, Field Visit of innovative farming system models. Visit of Agri-based enterprises and their functional aspects for integration of production, processing and distribution sectors and Study of agri-enterprises involved in industry and service sectors (Value Chain Models), Learning about concept of project formulation on farming-based livelihood systems along with cost and profit analysis, Case study of Start-Ups in agri-sectors.

TEACHING SCHEDULE

THEORY [MDC-111]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1	Status of Agriculture in India	Historical background, Current status, Role of Agriculture in Indian Economy	4
2	Status of Agriculture in Different States	State-wise scenario, Major crops, Regional diversity	4
3	Income of Farmers and Rural People in India	Factors affecting income, Rural-urban income gap, Government initiatives	4
4	Livelihood: Definition, Concept, and livelihood Patterns in urban and rural areas	Livelihood- Definition and its Concept, Urban vs Rural livelihood patterns, Sources of income	4
5	Different Indicators to Study Livelihood Systems	Economic, Social and Environmental indicators, Measuring livelihood resilience	4
6	Agricultural Livelihood Systems (ALS): Meaning and Approaches	Definition, Significance of ALS, Integrated farming systems, Approaches	4
7	ALS Framework and Case studies	Framework for ALS, Case studies in India	4
8	Definition of Farming Systems and farming based Livelihood Systems	Definition and Role of farming systems in rural livelihoods, Examples of systems	4
9	Prevalent Farming Systems in India contributing to livelihood	Traditional vs. Modern farming systems, Regional differences	4
10	Types of Traditional and Modern Farming Systems	Types; Differences; Strengths, Limitations, Case studies	4
11	Components of farming system/farming-based livelihood systems - Crops and Cropping Systems	Components, Crop diversification, Cropping pattern, Mixed cropping, Importance for rural livelihoods	4
12	Livestock-based Farming Systems	Importance and Management of dairy, piggery, poultry, goatry, duckry, etc.	4
13	Horticultural Crops and Livelihoods	Role of fruits, vegetables and spices in rural income generation	4
14	Agroforestry Systems	Agroforestry- Definition, Combining trees and crops, Agroforestry models in India	2
15	Aquaculture as a Livelihood System	Importance of Aquaculture, Integrated systems (e.g. Duck/Poultry-cum-Fish, Dairy-cum-Fish, Piggery-cum-Fish etc.)	4
16	Challenges in Aquaculture-based Systems	Feasibility, Government support and Market access	2

Continued….

17	Small Enterprises in Farming	Role of small enterprises, Value addition, Local processing	2
18	Medium and Large Enterprises in Farming	Value chains, Secondary enterprises as livelihood components for farmers, Agri-processing.	2
19	Factors affecting Integration of various enterprises of farming for livelihood	Technology, Market access, Credit and infrastructure challenges etc.	4
20	Strategies for Enterprise Integration	Successful integration, Government policies, Examples.	2
21	Overview of Agro-Climatic Zones in India	Characteristics of different zones and their agricultural potential.	2
22	Feasibility of different Farming Systems for different Agro-Climatic Zones	Suitable farming systems for different zones, Climate adaptation.	2
23	Commercial Farming Based Livelihood Models by NABARD, ICAR and other organizations across the country	Role of NABARD, ICAR and other Organizations in promoting commercial models, Successful cases.	4
24	Case studies on different Livelihood Enterprises associated with farming	Analysis of successful enterprises, Dairy Cooperatives etc.	4
25	Risk Factors in Farming-based Livelihood Systems	Climate, Market fluctuations, Input costs; Mitigation strategies etc.	4
26	Success Factors in Farming-based Livelihood Systems	Innovation, Market access, Government support, Social capital etc.	2
27	Schemes and Programmes by the Central Government	Overview of schemes like, PM-KISAN, National Rural Livelihood Mission.	2
28	Schemes and programmes by State Governments	State-specific programs promoting rural livelihoods, Case examples.	2
29	Role of Private Sector in Livelihood Promotion	Public-Private Partnerships, Role of private agribusiness.	2
30	Public-Private Partnerships in Agriculture	Successful collaborations in rural development and farming systems	2
31	Farming-based Livelihoods in the 21st Century	Circular economy, Green economy, Climate change, Sustainability.	2
32	Impact of Digitalization and Changing Lifestyles	Technology in Agriculture, Future prospects for rural livelihoods.	2
		Total =	**100**

TEACHING SCHEDULE

PRACTICAL [MDC-111]

Exercise No.	Exercise Topic	Exercise Sub-topics/ Title
1	Survey of Farming Systems and Agriculture-based Livelihood Enterprises	Methods of data collection; Field survey techniques; Preparing reports on surveyed farms.
2	Study of Components of Farming-based Livelihood Models in Different Agro-Climatic Zones	Components: Crop, livestock, fishery, agroforestry; Identifying models suited to specific zones.
3	Study of Production and Profitability of Crop-based Models	Analysis of input-output relations; Identifying profitable crops
4	Study of Livestock-based Models	Livestock systems: Dairy, poultry, goat farming; Profitability and market access
5	Study of Processing-based Models	Value addition in agriculture; Studying small-scale food processing units
6	Study of Integrated Farming-based Models	Study of crop-livestock-aquaculture integration; Synergies and challenges
7	Field Visit to Innovative Farming System Models	Visit to farms using modern technologies; Documenting practices
8	Visit to Agri-based Enterprises	Enterprises involved in input supply or value addition
9	Study of Functional Aspects: Integration of Production, Processing and Distribution	Backward and forward linkages; Assessing supply chain models
10	Agri-Enterprises in Industry and Service Sectors (Value Chain Models)	Studying value chain enterprises; Evaluating sustainability models
11	Concept of Project Formulation on Farming-based Livelihood Systems	Identifying project objectives; Structuring budgets and timelines
12	Cost and Profit Analysis of Farming-based Livelihood Projects	Developing Cost-Benefit analysis; Identifying Break-Even points
13	Case Study of Start-ups in Agri-sectors	Analysing real-world Start-ups; Identifying success factors
14	Group Project: Develop a Farming-based Livelihood Model	Formulating a working model; Feasibility and sustainability analysis
15	Preparation of Report on Farming Systems Survey and Livelihood Models	Compiling field data; Preparing reports with recommendations
16	Presentation and Evaluation of Practical Project Reports	Group presentations; Internal assessment of reports and participation

Suggested Readings (MDC-111):

1. **Ashley, C. and Carney, D. 1999**. *Sustainable Livelihoods: Lessons from Early Experience.* Department for International Development, London, UK.
    - **Relevance**: This book explores sustainable livelihood frameworks, which are key to understanding livelihood patterns and rural income systems.
2. **Agarwal, A. and Narain, S. 1989**. *Towards Green Villages: A Strategy for Environmentally Sound and Participatory Rural Development.* Centre for Science and Environment, New Delhi, India.
    - **Relevance**: Provides strategies for participatory rural development, focusing on environmental sustainability—a core concept in farming systems.
3. **Carloni, A. 2001**. *Global Farming Systems Study: Challenges and Priorities to 2030 – Regional Analysis: Sub-Saharan Africa.* FAO, Rome, Italy.
    - **Relevance**: Offers insights into global farming system challenges, with lessons that can be adapted for Indian contexts in agricultural development.
4. **Dixon, J., Gulliver, A. and Gibbon, D. 2001**. *Farming Systems and Poverty: Improving Farmers' Livelihoods in a Changing World.* FAO & World Bank, Rome & Washington, DC.
    - **Relevance**: Focuses on farming systems' role in poverty alleviation and rural livelihood improvement.
5. **Evenson, R.E. 2000**. *Agricultural Productivity and Production in Developing Countries.* In *FAO, The State of Food and Agriculture.* FAO, Rome, Italy.
    - **Relevance**: Discusses agricultural productivity, a critical factor in sustainable farming and improved livelihoods.
6. **Bhatt *et al*. (ICAR Research Complex for Eastern Region)**. *Livelihood Improvement of Underprivileged Farming Community: Experiences from Bihar.* Patna, Bihar.
    - **Relevance**: Case studies on improving livelihoods in rural India, relevant to learning about region-specific agricultural interventions.
7. **Panwar *et al.*, 2020**. *Integrated Farming System Models for Agricultural Diversification, Enhanced Income, and Employment.* Indian Council of Agricultural Research, New Delhi.
    - **Relevance**: Provides models for agricultural diversification and income enhancement, which align with farming system topics.
8. **Reddy, S.R., 2016**. *Farming System and Sustainable Agriculture.* Kalyani Publishers, New Delhi.
    - **Relevance**: Covers sustainable agriculture principles and farming system models, essential for sustainable livelihood systems.
9. **Singh *et al.*, 2015**. *Region Specific Integrated Farming System Models*. ICAR-Indian Institute of Farming Systems Research, Modipuram.
    - **Relevance**: Discusses integrated farming models tailored to different agro-climatic regions of India, essential for practical learning.
10. **Walia, S.S., and Walia, U.S., 2020**. *Farming System and Sustainable Agriculture.* Scientific Publishers, Jodhpur, Rajasthan.
    - **Relevance:** Provides insights into sustainable agricultural practices and integrated farming systems with regional focus.

Semester	**:**	**I**		
Course No.	**:**	**MATH-111***	**Credit Hrs.**	**: 1(1+0) NG; Need-based**
Course Title	**:**	**Introductory Mathematics**		
*Need-based, Non-Gradial Common Course across 5 UG Degrees: **B.Sc. (Hons.) Agri. / B.Sc. (Hons.) Horti. / B.Sc. (Hons.) Forestry / B.F.Sc. (Hons.) / B.Sc. (Hons.) C.S.**				

SYLLABUS

Objective: To impart knowledge on Introductory Mathematics as a need-based/ deficiency course.

THEORY

Algebra: Progressions: Arithmetic Progression: Definition, Sum of n terms, Examples. Geometric Progression: Definition, Sum of n terms, Examples. Harmonic Progression: Definitions, Examples.

Determinants: Definition of Determinant, Expansion of determinant up to 3rd order, Examples

Properties of determinants up to 3rd order (without proof).

Matrices: Definition of Matrices, Order of Matrix, Types of Matrices, Algebra of Matrices: Addition, Subtraction, Multiplication, Examples, Transpose of Matrix and it's properties (without proof).

Differential Calculus: Definition, Differentiation of function using first principle, Examples. Rules of Differentiation: Derivatives of sum, Difference, Product and quotient of two functions (Formulae only) and Derivative of Standard functions: Algebraic Function, Trigonometric, Logarithmic and exponential functions (Formulae only), Examples. Increasing and Decreasing Functions, Growth rate, Average Cost and Marginal cost, Marginal Revenue. Examples.

Partial Differentiation: Definition, Homogeneous function, Euler's Theorem, Examples.

Maxima and Minima of the functions of the form y = f (x) Examples.

Integral Calculus: Definition of Indefinite and Definite Integrals, Integrals of elementary functions (Formulae only), Theorems of integration (without proof), Integration by substitution, Examples.

Integration by parts, Examples, Application of Integration: to find Area under simple well-known curves (Simple problems based on it).

Mensuration: Statement of Simpson's 1/3rd Rule (Without Proof). Examples on Simpson's Rule.

Suggested Readings:

1. NCERT, 2012, Mathematics of Class XII, NCERT, India.
2. A Textbook of Mathematics XI and XII (Part I and II), Maharashtra State Board of Secondary and Higher Secondary Education, Pune.
3. Sharma RD, 2014, Mathematics of Class XII, Dhanpat Rai Publisher.
4. Mensuration-I by Pierpoint.

TEACHING SCHEDULE

THEORY

Lecture No.	Topic	Subtopics/ Key Points	Weightage (%)
1-2	Algebra: Progressions	Arithmetic Progression: Definition, Sum of n terms, Examples.	10
		Geometric Progression: Definition, Sum of n terms, Examples. Harmonic Progression: Definitions, Examples.	
3-4	Determinants	Definition of Determinant, Expansion of determinant up to 3rd order, Examples	10
		Properties of determinants up to 3rd order (without proof)	
5-7	Matrices	Definition of Matrices, Order of Matrix, Types of Matrices	20
		Algebra of Matrices: Addition, Subtraction, Multiplication, Examples	
		Transpose of Matrix and it's Properties (without proof)	
8-10	Differential Calculus	Definition, Differentiation of function using First principle, Examples.	20
		Rules of Differentiation: Derivatives of sum, Difference, Product and quotient of two functions (Formulae only) and Derivative of Standard functions: Algebraic Function, Trigonometric, Logarithmic and Exponential functions (Formulae only), Examples.	
		Increasing and Decreasing Functions,	
		Growth rate, Average Cost and Marginal cost, Marginal Revenue. Examples.	
11-12	Partial differentiation	Definition, Homogeneous function, Euler's theorem, Examples.	10
		Maxima and Minima of the functions of the form y = f (x) Examples.	
13-15	Integral Calculus	Definitions of Indefinite and Definite Integrals	20
		Integrals of elementary functions (Formulae only)	
		Theorems of integration (without proof)	
		Integration by substitution, Examples	
		Integration by parts, Examples	
		Application of Integration: to find Area under simple well-known curves, (Simple problems based on it).	
16	Mensuration	Statement of Simpson's 1/3rd Rule (without Proof). Examples on Simpson's Rule.	10
		Total =	**100**

Semester	**:**	**I**				
Course No.	**:**	**BIO-111****	**Credit Hrs.**	**:**	**1(1+0)**	**Need-based; NG**
Course Title	**:**	**Basic Biology**				
Need-based, Non-Gradial Common Course across 5 UG Degrees: **B.Sc. (Hons.) Agri. / B.Sc. (Hons.) Horti. / B.Sc. (Hons.) Forestry / B.F.Sc. (Hons.) / B.Sc. (Hons.) C.S.						

SYLLABUS

Objectives:

(i) To impart foundational knowledge of biological principles including diversity, genetics, evolution of living organisms,

(ii) To impart basic knowledge about flowering plants and animals with a focus on their application in Agriculture.

THEORY

Introduction to the living world, Diversity and characteristics of life. Origin of life, Evolution and Eugenics. Genetics and Basics concepts. Binomial nomenclature and Classification. Cell and cell division. Morphology of flowing plants. Seed and Seed germination. Plant systematics- *viz*., Brassicaceae, Fabaceae and Poaceae. Role of animals in agriculture.

TEACHING SCHEDULE

THEORY

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1	Introduction to Living World	Definition of Biology; Composition and Biological Classification of living world.	5
2	Diversity and Characteristics of Life	Definitions: Diversity, Biodiversity; Characteristics of life; Building blocks of life and relationship between different organisms.	5
3	Origin of Life	Theories of Origin of Life; Oparin - Haldane Theory of Chemical origin.	5
4	Evolution and Eugenics	Evidences of Organic Evolution, Theories of Evolution; Eugenics: Definition.	5

Continued…

5	Genetics and Basics Concepts	Genetics and Mendel's Experiments (Basic Concepts)	5
6	Binomial Nomenclature	Binomial nomenclature and classification; Overview of taxonomic hierarchy/ ranks.	10
7	Cell: Structure and Function	Cell structure, Composition and Cell organelles and their functions.	5
8-9	Cell Division	Definition, Types: Mitosis and Meiosis, their Significance, Stages.	10
10-12	Morphology of Flowering plants	Morphology, Structure and Functions: Roots, Stems, Leaves, Flowers and Fruits.	25
13	Seed and Seed Germination	Definitions, Types of seed (Monocot and Dicot seed), Types of seed germination and factors affecting it.	5
14-15	Plant Systematics – Study of Families	Key features, Economic importance and Examples of - A) Brassicaceae B) Fabaceae C) Poaceae	15
16	Role of Animals in Agriculture	Livestock in farming systems: Nutritional and economic contributions; Role of pollinators in crop production; Biological pest control (Predatory use); Sustainable integration of animals in agroecosystems.	5
		Total =	**100**

Suggested Readings [BIO-111]:

1. Cell Biology, Genetics, Molecular Biology and Evolution by P.S. Verma, V.K. Agrwal. Publisher- S. Chand and Company Ltd., Ram Nagar, New Delhi. India.
2. Evolution of Vertebrates by Edwin H. Colbert, Publisher- A Wiley, Inter Science Publication, John Wiley and Sons, New York. US.
3. A Class-book of Botany by A.C. Dutta, Publisher- Oxford University Press, YMCA Library Building. Jai Singh Road, New Delhi - 110001, India.
4. Fundamentals of Genetics by B.D. Singh, Publisher- Kalyani Publ. B-I/1292, Rajinder Nagar, Ludhiana.
5. A Textbook of Practical Botany-2 by Ashok M. Bendre, Ashok Kumar, Publisher- Rastogi Publications, Shivaji Road, Meerut, India.
6. Botany-An Introduction to Plant Biology by Jamesh D. Mauseth, Publisher- Continental Prakashan, 1962, Pune.
7. Anatomy of Seed Plants by A.C. Datta, Sigh V., Pande P.G., Publisher- Sai Print Opack, New Delhi, Rastogi Publication, Meerut, India.
8. Handbook of Animal Husbandry by ICAR, New Delhi Publication, Publisher- Directorate of Knowledge Management in Agriculture, Krishi Anusandhan Bhavan, Pusa, New Delhi - 110012, India.

Semester	**:**	**I**		
Course No.	**:**	**HORT-111**	**Credit Hrs.**	**: 3(2+1)**
Course Title	**:**	**Fundamentals of Horticulture**		

SYLLABUS

Objectives:

(i) To provide basic knowledge of Horticulture in a brief and prescribed manner,

(ii) To familiarize students with principles and practices of management for Horticultural crops.

THEORY

Scope and Importance, Classification of horticultural crops and nutritive value, Area and Production, Exports and imports, Fruit and vegetable zones of India and of different states, Nursery techniques and their management, Soil and climate, Vegetable gardens, Nutrition and kitchen garden and other types of gardens-principles, planning and layout, management of orchards, planting systems and planting densities. Principles, objectives, types and methods of pruning and training of fruit crops. Types and use of growth regulators in Horticulture, Water management: irrigation methods, merits and demerits. Weed management. Fertility management in horticultural crops, manures and fertilizers, different methods of application, Cropping systems, intercropping, multi-tier cropping, mulching – objectives, types, merits and demerits. Classification of bearing habits of fruit trees, Factors influencing the fruitfulness and unfruitfulness. Rejuvenation of old orchards, top working, frame working. Principles of Organic and Natural farming, Market chain management.

PRACTICAL

Features of orchard, Planning and layout of orchard, tools and implements, Identification of various horticultural crops, Layout of nutrition garden, Preparation of nursery beds for sowing of vegetable/ flower seeds, digging of pits for fruit plants, planting systems, training and pruning of orchard trees, Calculation of fertilizer doses, Preparation of fertilizer mixtures and field application, Preparation and application of growth regulators, Layout of different irrigation systems, Identification and management of nutritional disorder in fruits and vegetable crops, Assessment of bearing habits, maturity standards, harvesting, grading, packaging and storage.

TEACHING SCHEDULE

THEORY [HORT-111]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1	Scope and Importance of Horticulture	Definition, Income/Employment generation, Industrial/religious value, Export value, Nutritional value, Aesthetic value etc.	10
2-3	Classification of Horticultural crops	Classification based on life cycle, Nature of stem, Season, Ripening behaviour, Light requirement, Fruit type, Edible portion, Botanical, Growth habit, etc. with examples of fruit, vegetable, flower, spice and plantation crops	
4	Nutritive value of Horticultural crops	Role and Deficiency of vitamins and minerals, and their sources.	05
5	Area and Production, Exports and Imports of fruit and vegetable	Global, Indian and State Scenario in major fruit and vegetable crops	05
6	Fruit and Vegetable zones of India and of different states	Fruit and Vegetable zones of India and Maharashtra	05
7	Nursery techniques and their management	Definition, Component, Bed preparation, Growing media, Method of propagation Sexual, Asexual	10
8	Soil and Climate requirement of Horticultural crops	Optimum condition, Effect of various parameters	
9-10	Vegetable gardens, Nutrition and Kitchen garden and other types of gardens	Kitchen garden, Market garden, Truck garden, Vegetable garden for processing, Vegetable garden for seed production, Vegetable forcing and Floating vegetable garden	05
11-12	Principles, Planning, Layout and Management of Orchards	Points to be considered, Features of orchard	10
13	Planting systems and Planting densities	Square, Rectangle, Diagonal, Hexagonal, Contour etc.	

Continued….

14-15	Pruning and Training of fruit crops	Principles, Objectives, Types and Methods	05
16-17	Types and use of growth regulators in Horticulture	Auxins, Gibberellins, Cytokinins, Ethylene, Growth Retardants/ Inhibitors.	05
18	Water management in Horticultural crops	Role of water, Methods of irrigation, Merits and Demerits.	03
19-20	Weed management in Horticultural crops	Definition, Methods of weed control in Horticultural crops.	03
21-22	Fertility management in Horticultural crops	Soil management practices, Sources of nutrient, Manures and Fertilizers, Methods of application of fertilizers	05
23	Cropping systems in Horticultural crops	Types, Advantages, Cropping systems, Intercropping, Multi-tier cropping	05
24	Mulching	Objectives, Types, Merits and Demerits	03
25	Classification of bearing habits of fruit trees	Shoot bearing: Terminal, Lateral/Axillary bearing, SPUR bearing and Stem /Branch bearing with examples.	05
26-27	Fruitfulness and Unfruitfulness	Influencing factors: External and Internal.	05
28	Rejuvenation of old orchards	Top working and Frame working.	04
29-30	Principles of Organic and Natural farming	Concepts, Advantages.	05
31-32	Market chain management	Meaning, Components and Importance of market chain management in Horticulture	02
		Total=	**100**

TEACHING SCHEDULE

PRACTICAL [HORT-111]

Exercise No.	Exercise Title
1	Identification of various Horticultural crops
2	Tools and implements
3	Features of orchard; Planning and layout of orchard
4	Layout of nutrition garden
5	Preparation of nursery beds for sowing of vegetable/ flower seeds
6	Digging of pits for fruit plants
7	Planting systems for orchard trees
8	Training and pruning of orchard trees
9	Calculation of fertilizer doses, preparation of fertilizer mixtures and field application
10	Preparation and application of growth regulators in horticultural crops
11	Layout of different irrigation systems in horticultural crops
12	Identification and management of nutritional disorder in fruits and vegetable crops
13	Assessment of bearing habits of horticultural crops
14	Maturity standards & harvesting of horticultural crops
15	Grading, packaging and storage of horticultural crops

Suggested Readings [HORT-111]:

1. **Singh, J. 2011.** Basic Horticulture, Kalyani Publications, New Delhi.
2. **Salunkhe, D. K. and Kadam, S. S. 2013.** A Handbook of Fruit Science and Technology, CRC Press.
3. **Chattopadhyay, T. K. 2013.** A Textbook on Pomology Vol. I-IV. Kalyani Publications, New Delhi.
4. **Peter, K.V. 2009.** Basics Horticulture, New India Publishing Agency.
5. **Misra, K.K. and Kumar, R. 2014.** Fundamentals of Horticulture, Biotech Books.
6. **Singh, N.P. 2005.** Basic Concepts of Fruit Science, 1st Edn. IBDC Publishers.
7. **Kumar, P. 2014.** Principles of Horticulture, 2nd Edn. Agrobios India.
8. **Kunte, Y.N., Kavthalkar, M.P. and Yawalkar, K.S. 2013.** Principles of Horticulture and Fruit Growing, 11th Edn. Agri-Hort Publishers.

Semester	**:**	**I**		
Course No.	**:**	**FS-111**	**Credit Hrs.** **:**	**3(1+2)**
Course Title	**:**	**Plant Propagation and Nursery Management of Fruit and Plantation Crops**		

SYLLABUS

Objectives: (i) To know different methods of propagation techniques,

(ii) To learn the horticultural significance of specialized vegetative structures,

(iii) To study the different types of plant propagation methods and structures.

THEORY

Status and Importance of plant propagation and nursery production in fruits and plantation crops. Sexual and Asexual methods of propagation, their advantages and disadvantages. Apomixis, Seed dormancy, Types of dormancy and Methods to overcome seed dormancy. Use of vegetative propagation methods viz., division, cutting, layering, budding and grafting. Propagation structures in nursery production: Mist chamber, Humidifiers, Greenhouses, Glasshouses, Cold frames, Hot beds and Polyhouses. Use of growth regulators in nursery production. Components of a Nursery, maintenance of mother trees and seed gardens, collection of scion-wood and bud wood certification. Growing medium and containers used for nursery production. Role of tissue culture techniques viz., Micropropagation, Micrografting and Meristem culture. Nursery Registration Act. Management of insect-pests and diseases in nursery. Cost of establishment of a modern nursery.

PRACTICAL

Selection of site, soil sterilization and preparation of beds for nursery raising. Preparation of growing media and use of different nursery containers for containerized nursery production in fruits and plantation crops. Seed treatments for breaking dormancy and prevention of nursery diseases. Sowing of seed, raising and maintenance of rootstock/seedlings. Practicing different vegetative propagation methods viz., cutting, layering, grafting and budding. Preparation of plant growth regulators for seed germination and vegetative propagation. Digging, labelling and packing of field grown nursery plants. Familiarisation with propagation structures mist chamber, greenhouse, glasshouse, polyhouse and net house, and their maintenance. Micropropagation and hardening of plants. Tissue culture media preparation, explant preparation, *in vitro* culturing and shoot tip culture, primary and secondary hardening of tissue culture plants. Maintenance of nursery records. Identification and management of insect-pests and diseases in nursery. Project formulation for small and high-tech nurseries. Nursery accreditation.

TEACHING SCHEDULE

THEORY [FS-111]

Lecture No.	Topic	Sub-topics/ Key points	Weightage (%)
1	Status and Importance of Plant propagation and Nursery production in Fruits and Plantation crops	Scope and Importance of plant propagation and Nursery production of fruit and plantation crops: Creating diversity, Production of genetically pure nurseries stock, Export of nursery stock, Employment generation, Create the new cultivar, Cloning desirable specimens, Development of disease and pest resistant	10
2	Sexual and Asexual methods of plant propagation and their advantages and disadvantages	Definition of propagation, Objectives of propagation, Methods of propagation-Sexual and Asexual, Advantages and Disadvantage of Sexual and Asexual propagation.	10
3	Seed dormancy, Types of dormancy, Internal and External factors affecting seed dormancy and Seed treatment	Definition of Seed dormancy, Types of Seed dormancy: Exogenous- Physical (Seed coat dormancy), Mechanical, Chemical and Endogenous- Morphological, Physiological (Non deep, Photo, Thermo), Double dormancy, Secondary dormancy. Factors affecting seed dormancy; Different Seed treatments (in brief).	10
4	Methods to overcome Seed dormancy	Methods of breaking seed dormancy: Definition of Scarification and Stratification, Scarification methods: Mechanical, Acid scarification, Hot water scarification and Warm moist scarification, Stratification methods- Outdoor stratification.	
5	Apomixis	Definition of Apomixis, Types of Apomixis, Definitions, Monoembrony, Polyembrony, Chimera etc.	4

Continued…

6	Use of vegetative propagation methods viz., division, cutting, layering,	Definition of Cutting, Types of cutting: Stem cuttings (Herbaceous, Softwood, Semi-hard wood, Hardwood), Root cutting, Leaf cutting, Leaf bud cutting. Definition of Layering, Types of Layering: Simple or Tongue layering, Serpentine or Compound layering, Trench or Continuous layering, Mount or Stool layering, Air or Gootee or Marcottage, Definition of Division, Types of specialized plant organs: Bulbs, Corns, Tuber, Runner, Suckers, Offset, Rhizomes etc.	15
7	Budding and Grafting	Methods of budding: T-budding (Shield budding), Patch budding, Chip budding, Flute budding, I-budding, Forkert budding. Definition of Grafting, Types of grafting: Splice or Whip grafting, Whip and Tongue grafting, Cleft or Wedge grafting, Side grafting, Veneer grafting, Approach grafting, Root grafting, *In-situ* grafting, Double grafting, Top working, Stone grafting. Scion-stock relationship (compatibility, closeness of fit, cambial contact etc.)	
8	Propagation structures in nursery production:	Detail information of propagation structures in nursery production: Mist chamber, Humidifiers, Greenhouses, Glasshouses, Cold frames, Hot bed sand Polyhouses.	8
9	Use of Plant Growth Regulators in Nursery propagation	Definition of Plant growth regulators, Use of plant growth regulators: Plant propagation- Seed germination, Rooting of cuttings, Rootings of layers, Hastening the growth of rootstocks in nursery, Other roles; Methods of application: Application of powder mixture, Lanolin paste methods, Soaking method, Quick deep methods, Aerosol method, Vapour method.	8

Continued…

10	Component of nursery, Maintenance of mother trees and Seed garden and Budwood certification	Components of Nursery: (Nursey bed, production areas, nursery stock, nutrient, water tank or well/pond, potting shed, seed and fertilizer store room, propagation structure, office room, etc.) Selection of mother trees, Maintenance of mother trees and Budwood certification.	10
11	Selection/collection of scion-wood, and Bud wood Certification	Selection/Collection of scion-wood and Budwood Certification, Importance of scion mother tress.	
12	Growing medium and Containers used for nursery production	Ideal quality/Characteristics of growing media, Different media: Soil, sand, peat, sphagnum moss, vermiculite, perlite, pumice, leaf mold, cocopeat, sawdust and wood shavings etc. Features of ideal containers, Types of plant containers: Clay pots, wooden boxes, hanging baskets, plant tubes and urns, polythene bags etc.	8
13	Role of tissue culture techniques:	Role of tissue culture techniques viz., Micropropagation, Micrografting and Meristem culture.	4
14	Management of Insect-Pest and Diseases in Nursery	Important pest and diseases in nursery and their control measures.	4
15	Nursery Registration Act	Nursery Registration Act: Rules and regulations and Features of Nursery Act.	5
16	Cost of establishment of a modern nursery.	Cost of establishment of Greenhouse/ Glasshouses, Plastic houses, Shadenet houses, Lathhouse.	4
		Total=	**100**

TEACHING SCHEDULE

PRACTICAL [FS-111]

Exercise No.	Exercise Title
1	Selection of site for plant propagation and nursery management of fruits and Plantation crops.
2-3	Preparation of Nursery beds and sowing of seeds
4-5	Study of different media for plant propagation
6	Study of different containers for containerized nursery production
7-8	Seed treatment for breaking seed dormancy including germination and growth of seedlings
9	Sowing of seeds, raising and maintenance of rootstock/seedlings
10-11	Potting, repotting, and preparation of plant material for potting
12	Practicing different types of cutting
13-14	Practicing different types of layering
15-16	Practicing different types of runners, offsets and other specialized plant parts for propagation
17-18	Practicing different methods of budding
19-20	Practicing different grafting methods
21-22	Preparation of growth regulators for seed germination and vegetative propagation
23	Digging/uprooting, labelling and packaging of field grown nursery plants
24	Use of mist chambers in plant propagation and hardening of plants
25	Study of propagation structures, greenhouse, polyhouse and net house and their maintenance.
26-27	Tissue culture media preparation, *Ex-plant* preparation, *in vitro* culturing and shoot tip culture
28	Primary and Secondary hardening of Tissue culture plants
29	Maintenance of nursery records
30	Identification and management of insect-pests and diseases in nursery
31	Project formulation for small and High-tech nurseries
32	Nursery accreditation

Suggested Readings [FS-111]:

1. **Davies, F.T., Geneve, R.L. and Wilson, S.B. 2018.** *Hartmann and Kester's Plant Propagation: Principles and Practices* (9th ed.), Pearson, USA.
    - **Relevance**: Covers principles and techniques of plant propagation, an essential topic for nursery management and crop establishment.
2. **ICAR. 2019**. *Handbook of Horticulture* (2nd ed., Vol 1 & 2), ICAR, New Delhi.
    - **Relevance**: A comprehensive reference on horticultural crops, including information on production, management practices, and horticultural zones of India.
3. **Peter, K.V. 2002.** *Plantation Crops.* National Book Trust, New Delhi.
    - **Relevance**: Focuses on key plantation crops in India, with insights into production, management, and marketing, aligning with market chain management concepts.
4. **Sharma, R.R. and Krishna, H. 2017.** *Textbook of Plant Propagation and Nursery Management.* CBS Publishers, New Delhi.
    - **Relevance**: Provides detailed guidance on nursery management and propagation techniques, complementing topics on nursery techniques and management.
5. **Sharma, R.R. and Srivastava, M. 2004.** *Plant Propagation and Nursery Management.* IBDC Publishers, New Delhi.
    - **Relevance**: This book further elaborates on propagation methods and nursery management, useful for developing practical skills in orchard establishment.

Semester	**:**	**I**		
Course No.	**:**	**FLA-111**	**Credit Hrs.**	**: 3(1+2)**
Course Title	**:**	**Commercial Production of Flower Crops**		

SYLLABUS

Objectives: To impart knowledge about climatic and soil requirements, commercial varieties/hybrids, sowing/planting times and methods, nutritional and irrigation requirements, intercultural operations, weed management, physiological disorders, postharvest management, plant protection measures of major flower crops.

THEORY

Scope and Importance of commercial floriculture, Soil climate, varieties, propagation, special intercultural operations, fertilizers requirement, irrigation, use of growth regulators, weed management, plant protection measures, harvesting, grading, packaging and storage of flowering flower crops for following flower crops: Rose, Jasmine, Carnation, Chrysanthemum, Gladiolus, Tuberose, Marigold, Cut foliage under open/ partial shade, Seed production of flowering annuals.

PRACTICAL

Identification of commercially important floricultural crops, Propagation technique in Rose, Jasmine, Carnation, Chrysanthemum, Gladiolus, Tuberose, Marigold, Sowing of seeds and Raising of seedlings of annuals, Propagation of ornamental plants with particular reference to cutting, layering, grafting and budding, bed preparation, soil decontamination. Planting and layout. Staking, Training and Pruning of roses. Growing media and containers for growing flower for exhibition, potting, depoting and repotting. Fertilizer application, Growth regulator measures. Special horticulture practices in cut flower and cut foliage crops. Weed management and plant protection measures, Determination of harvesting indices. Harvesting methods and post-harvest handling. Commercial standards and packaging methods, Project preparation, Visit to commercial flower market and progressive growers having high tech-farms.

TEACHING SCHEDULE

THEORY [FLA-111]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1-2	Scope and Importance of Commercial Floriculture	Scope- Domestic, Export, Urban Horticulture, Industrial, Entrepreneurship, etc. Importance- Economic, Social and Cultural, Aesthetic and Environmental, Health and Therapeutic etc.	10
3-4	Rose	Soil, Climate, Varieties, Propagation, Special intercultural operations, Training and pruning, Fertilizers requirement, Irrigation, Use of growth regulators, Weed management, Plant protection measures, Harvesting, Grading, Packaging and Storage of respective flower crops.	10
5	Jasmine		10
6	Carnation		10
7-8	Chrysanthemum		10
9-10	Gladiolus		10
11-12	Tuberose		10
13-14	Marigold		10
15	Cut foliage under Open/ Partial shade	Definition, Plant names, Factors, Use, Media, Maintenance (water, fertilizers, plant protection) Harvesting, Storage.	10
16	Seed Production of Flowering Annuals	Soil, Climate, Planting, Irrigation, Pest management, Harvesting, Seed storage.	10
		Total =	**100**

TEACHING SCHEDULE

PRACTICAL [FLA-111]

Exercise No.	Exercise Title
1	Introduction of flower crops; their Identification, B.N., Family Origin.
2	Identification of commercial flower crop varieties
3	Study of Propagation techniques: Sexual and Asexual
4	Bed preparation: Ridges and furrows, flat bad, raised bed, broad ridge.
5	Soil Decontamination: Chemical use like, formalin etc.
6	Planting and layout: Seed sowing, Transplanting, Dibbling
7	Training and pruning, staking: Rose, Jasmine, Carnation, Tuberose, Gladiolus.
8	Preparation of growing media and containers for growing flower for exhibition: Identification Characteristics, Advantages and Disadvantages.
9	Experiment of Potting, depotting and repotting.
10	Study of Fertilizer application: Direct application; Fertigation.
11	Study of Growth Regulators Measures, their Use and Application.
12	Special horticultural practices in cut flower and cut foliage crops: Rose, Chrysanthemum, Carnation.
13	Weed management and plant protection measures (*All six crops major pest and diseases control*)
14	Determination for harvesting indices, harvesting methods and post-harvest handling (Harvesting sign, Time Post harvest handling)
15	Commercial standards and packaging methods; Packaging materials
16	Project preparation and Visit to commercial flower market and progressive growers having high-tech farms

Suggested Readings [FLA-111]:

1. **Singh, A.K. 2006.** *Flower Crops, Cultivation and Management*. New India Publishing Agency, Pitampura, New Delhi.
2. **Arora, J.S. 2006.** *Introductory Ornamental Horticulture*. Kalyani Publishers, Ludhiana-141 008.
3. **Bhattacharjee, S.K.** *Advanced Commercial Floriculture*. Aavishkar Publishers Distributors, Jaipur - 320 003.
4. **Choudhary D. and Mehta, A. 2010**. *Flower Crops Cultivation and Management*. Oxford Book Company Jaipur, India.
5. **Randhawa, G.S. and Mukhopadhyay A. 2004.** *Floriculture in India*. Allied Publishers Pvt. Ltd.
6. **Bhattacharjee, S.K. and De, L.C. 2003.** *Advanced Commercial Floriculture*. Aavishkar Publishers, Distributors, Jaipur (Rajasthan) India.
7. **Bose,T.K., Yadav, L.P., Patil, P., Das P. and Partha Sarthy V.A. 2003.** *Commercial Flowers.* Partha Sankar Basu, Nayaudyog,206, Bidhan Sarani, Kolkata-700006.
8. **Sheela, V.L. 2008.** *Flower for Trad*e. New India Publishing Agency, Pitampura, New Delhi.
9. *Relevant e-Readings:* **http://ecourses.iasri.res.in/**

Semester	**:**	**I**			
Course No.	**:**	**IDE-111**	**Credit Hrs.**	**:**	**2(1+1)**
Course Title	**:**	**Sprinkler and Micro Irrigation System**			

SYLLABUS

Objectives: To acquaint the students with the basic knowledge of modern irrigation systems.

THEORY

Sprinkler irrigation: Adaptability, types, problems and prospects. Sprinkler/Micro sprinkler irrigation system design: steps, layout, selection, design of lateral, sub-main and main pipeline, selection of pump and power unit. Performance evaluation of sprinkler irrigation system: Uniformity coefficient and pattern efficiency. Microirrigation system: types, merits and demerits, components. Design of drip irrigation system: general considerations, wetting patterns, irrigation requirement, emitter selection, hydraulics and design steps. Steps for proper operation of a drip irrigation system. Maintenance of microirrigation system: clogging, filter cleaning, flushing and chemical treatment. Fertigation: advantages, limitations, methods, fertilizers solubility and their compatibility, precautions, frequency, duration and injection rate. Economics: Cost estimation of sprinkler and micro irrigation systems.

PRACTICAL

Study of different components, design and installation of sprinkler irrigation system. Determination of precipitation pattern, discharge and uniformity coefficient. Study of different components, design and installation of drip irrigation system. Determination of pressure discharge relationship and emission uniformity for emitter. Study of different types of filters and determination of filtration efficiency. Determination of rate of injection and calibration for chemigation/ fertigation. Design of irrigation and fertigation schedule for crops. Field visit to microirrigation system and evaluation of drip system. Cost economics of sprinkler and drip irrigation systems.

TEACHING SCHEDULE

THEORY [IDE-111]

Lecture No.	Topic	Sub-topics/ Key points	Weightage (%)
1	Sprinkler irrigation: Adaptability, Types, Problems and Prospects.	Introduction, Advantages, Limitations, Basic concepts	10
2- 4	Sprinkler/Micro sprinkler irrigation system design: Steps, layout, selection, design of lateral, sub-main and main pipeline, selection of pump and power unit.	Hydraulic design of Sprinkler system, Sprinkler selection, Spacing, Design of main line, Sub main line and Sprinkler laterals	15
5-6	Performance evaluation of sprinkler irrigation system: Uniformity coefficient and Pattern efficiency.	Moisture distribution pattern, Testing of uniformity, Distribution uniformity, Uniformity coefficient (Uc), Determination of Uc	05
7	Microirrigation system: Types, Merits and demerits, Components.	Types, Merits and Demerits, Components	10
8-10	Design of drip irrigation system: General considerations, Wetting patterns, Irrigation requirement, Emitter selection, Hydraulics and Design steps.	Basic hydraulics of drip lines, Steps in design of drip system, Selection of drippers, Selection and design of laterals, sub main, mainline, Selection of pump, Calculation of irrigation time	20
11	Steps for proper operation of a drip irrigation system:	Steps for proper operation of a drip irrigation system in detail.	10
12	Maintenance of microirrigation system:	General maintenance, Clogging, Filter cleaning, Sub main and lateral flushing, Chemical treatment in detail	10
13-14	Fertigation:	Advantages, Limitations, Methods of fertilizer injection, Fertilizer solubility and their compatibility, Precautions; Frequency, Duration and Injection rate.	10
15-16	Economics of sprinkler and drip irrigation system:	Calculation of quantities of material required and Cost estimation of sprinkler and drip irrigation system	10
		Total=	**100**

TEACHING SCHEDULE

PRACTICAL [IDE-111]

Exercise No.	Exercise Title
1-2	Study of different components, design and installation of sprinkler irrigation system.
3-4	Determination of precipitation pattern, discharge and uniformity coefficient.
5-6	Study of different components, design and installation of drip irrigation system.
6-7	Determination of pressure discharge relationship and emission uniformity for emitter.
8	Study of different types of filters and determination of filtration efficiency.
9-10	Determination of rate of injection and Calibration for chemigation / fertigation.
11-12	Design of irrigation and fertigation schedule for crops.
13-14	Field Visit(s) to micro irrigation system and evaluation of drip system.
15-16	Study of Cost Economics of sprinkler and drip irrigation systems.

Suggested Readings [IDE-111]:

1. **Mane, M.S. and Ayare, B.L. 2019.** Principles of Sprinkler Irrigation. Publ.-Jain Brothers, New Delhi, 4th Edn.

2. **Mane, M.S. and Ayare, B.L. 2019**. Principles of Drip Irrigation. Publ.- Jain Brothers, New Delhi, 4th Edn.

List/ Bouquet of Skill Enhancement Courses (SECs)

Sr. No.	Course No.	Course Title	Credit Hrs.
1.	**SEC-xxx**	Mushroom Cultivation	2(0+2)
2.	**SEC-xxx**	Orchard Floor Management	2(0+2)
3.	**SEC-xxx**	Apiculture	2(0+2)
4.	**SEC-xxx**	Landscape Gardening	2(0+2)
5.	**SEC-xxx**	Packing and Packaging of Horticultural Crops	2(0+2)
6.	**SEC-xxx**	Farm Machinery	2(0+2)
7.	**SEC-xxx**	Introduction to Forestry	2(0+2)
8.	**SEC-xxx**	Installation, Operation and Maintenance of Microirrigation System	2(0+2)
9.	**SEC-xxx**	Computer Programming and Data Structures	2(0+2)
10.	**SEC-xxx**	Turf and Turf Management	2(0+2)
11.	**SEC-xxx**	Post-harvest Management of Horticulture Crops	2(0+2)
12.	**SEC-xxx**	Nursery Production in Horticulture Crops	2(0+2)
13.	**SEC-xxx**	Seed production Techniques in Vegetables Crops	2(0+2)
14.	**SEC-xxx**	Sericulture	2(0+2)
15.	**SEC-xxx**	Dairy Management	2(0+2)
16.	**SEC-xxx**	Ornamental Fishery	2(0+2)
17.	**SEC-xxx**	Poultry Management	2(0+2)
18.	**SEC-xxx**	Biofertilizers and Biopesticides	2(0+2)

Note : Skill Enhancement Courses can be added/offered as per the facilities and resources available at the respective universities/colleges based on the relevance to the region and the UG degree subject.

In case of unavailability of said detailed course-wise syllabus of above SEC courses, the same can be primarily developed and followed at College/ University level in the academic year, 2024-25; However, the same will be obtained from the respective UG Degree Coordinator/ Discipline Coordinators and can be followed w.e.f. AY, 2025-26.

[Above list is an indicative list/bouquet of SEC courses and subject to modification as applicable therein]

Skill Enhancement Courses (SECs): Detailed Syllabi

Course No. : SEC-xxx	**Credit Hrs. : 2(0+2)**
Course Title : Mushroom Cultivation	

TEACHING SCHEDULE

PRACTICAL

Exercise No.	Exercise Title (with Sub-topics)
1	Study of Current status and Scope in India and Maharashtra, Potential for entrepreneurship.
2	Study of Important features of edible fungi: Nutritional composition, Medicinal benefits, Therapeutic applications.
3	Study of Nutritional and Medicinal value of mushrooms: Types of media, Sterilization techniques, Preparation for tissue culture.
4-5	Preparation of media: Types of media, Sterilization techniques, Preparation for tissue culture
6-7	Tissue Culture Preparation, Sub-culturing, Culture maintenance and Preservation
8	Sub-culturing for culture maintenance and its preservation
9-10	Spawn preparation techniques: Types of spawn (grain, sawdust, liquid), Methods of spawn preparation, Quality control
11-12	Collection of wild mushroom flora: Identification of wild mushrooms, Ecological significance and Safety measures
13	Raw material formulations for *Agaricus bisporus* (Button mushroom): Sourcing and Preparation.
14-15	Composting: Long and Short methods - Long method vs. Short method of composting, Environmental factors and Common challenges.
16	Casing preparation: Importance of casing, Types of casing materials, Methods and Maintenance.
17	Study of Crop Management Practices: Environmental controls, Watering, Ventilation and Humidity management.
18-19	Mushroom farm design and Infrastructure required for commercial unit: (Farm layout, Design requirements, Essential infrastructure for commercial units)

Continued…

20	Cultivation techniques of *Pleurotus florida* (Dhingri) mushroom
21	Cultivation techniques of *Volvoriella volvacea* (Paddy straw) mushroom
22	Cultivation techniques of *Calocybe indica* (Milky) mushroom
23	Cultivation techniques of *Lentunus edodes* (Shiitake) mushroom
24	Study of Marketing of mushrooms: Market analysis, Distribution channels, Pricing strategies and Customer engagement
25-26	Mushroom diseases and their control: Common diseases, Symptoms, Prevention and Control measures
27-28	Preparation of value-added products from mushrooms: (Types of value-added products, Processing techniques, Product development ideas)
29	Working-out the Economics of Mushroom Production: Input requirement and its cost for mushroom production.
30-32	Exposure visit(s) to Commercial Unit(s): Practical learning through visits to established commercial mushroom farms

Suggested Readings:

1. **Mishra, S.R. 2014.** Techniques of Mushroom Cultivation, Discovery Publishing House.
2. **Kumaresan, V. 2023.** Fundamentals of Mushroom Cultivation, Saras Publication.
3. **Suman, B.C. and Sharma, V.P. 2007.** Mushroom Cultivation in India, Daya Publishing House.
4. **Gupta R. and Singh, A. 2023.** Textbook of Mushroom Cultivation, Daya Publishing House.
5. **Tripathi, D.P. 2014.** Mushroom Cultivation, Oxford and IBH.
6. **Cotter, T. 2014.** Organic Mushroom Farming and Mycoremediation: Simple to Advanced and Experimental Techniques for Indoor and Outdoor Cultivation. White River Junction.
7. **Oss, O.T. 1991.** Psilocybin: Magic Mushroom Grower's Guide: A Handbook for *Psilocybin enthusiasts*. San Francisco, Calif: Quick American Pub.
8. **Stamets, P. 2000.** Growing Gourmet and Medicinal Mushrooms: Shokuyō Oyobi Yakuyō Kinoko No Saibai.
9. **Money, N.P. 2004.** Mr. Bloomfield's Orchard: The Mysterious World of Mushrooms, Molds, and Mycologists. Oxford: Oxford University Press**.**

Course No. : SEC-xxx	Credit Hrs. : 2(0+2)
Course Title : Orchard Floor Management	

TEACHING SCHEDULE

PRACTICAL

Exercise No.	Exercise Title (with Sub-topics)	*Skills to be developed*
1	Introduction to Orchard floor Management: Overview, Objectives, and Significance of floor management	Conceptual understanding of orchard management
2-3	Study of Fruit Crop Nutrition Garden: Importance and Scope, Layout and Layout management practices for availability of fruits	Skill for planning and layout management
4-5	Planning and Design of Orchard layouts, Floor designs and Calculation of plant population.	Skills in planning Orchard floor systems
6-9	Soil Management Practices- Clean Cultivation, Sod Culture, Sod Mulch: Demonstration of clean cultivation techniques, Practical exposure to sod-based orchard management.	Techniques of: Weed-free cultivation, Identifying benefits of Sod culture & mulch
10-11	Practical exposure to intercropping systems, cover crop selection and Maintenance, Mixed crop selection.	Practical skill of selection & maintenance
12	Mulching with Organic materials using Straw, Leaves & Compost	Hands-on mulching skills; Application and Evaluation of mulch
13	Mulching with Inorganic materials using Plastic, Gravel and Fabric	
14	Soil sampling Techniques: Collection and preparation of soil samples for testing	Precision in soil sampling
15	Demonstration of moisture conservation techniques	Skills in irrigation and mulching
16	Weed identification and classification of common orchard weeds	Weed recognition and classification
17	Mechanical Weed Control: Use of manual and mechanical tools for weeding	Use of mechanical weeding tools
18	Chemical weed control: Herbicide application techniques	Safe handling of chemicals
19-20	Irrigation techniques: Use of drip and sprinkler irrigation systems	Skills in water management
21-22	Organic fertilizers application of organic manures and biofertilizers	Practical organic fertilizer application
23-24	Inorganic fertilizers application of chemical and liquid fertilizers	Precision in inorganic fertilizer use
25	Study of Biofertilizers: Types of biofertilizers, Advantages and Application of beneficial microbes	Application, Techniques and Procedure for preparation of different biofertilizers

26	Study of Green Manuring and Bioagents: Advantages of green manuring; Green manuring crops; Different sources of bioagents and their role.	Identification of green manuring crops and bio-agents; Practice of incorporation of green manuring
27-30	Visit to Orchards of Progressive Fruit Growers: Observing orchard floor management practices in a commercial setting.	Observation & Exposure to real-world practices

Suggested Readings:

1. **Hartmann, H.T., Kester, D.E., Davies, F.T. and Geneve, R.L. 2018.** *Plant Propagation : Principles and Practices (9th ed.).* Pearson, USA.
    - **Relevance**: Covers essential principles of plant propagation and orchard management techniques, including floor preparation.
2. **Sharma, R.R. and Pal, R. K. 2016.** *Horticulture for Sustainable Development.* New India Publishing Agency, New Delhi.
    - **Relevance**: Focuses on sustainable horticultural practices, including organic orchard management and mulching.
3. **Fageria, N. K., Baligar, V. C. and Jones, C. A. 2011.** *Growth and Mineral Nutrition of Field Crops.* CRC Press.
    - **Relevance**: Provides detailed insights on soil fertility management, nutrient cycling and integrated nutrient management practices.
4. **Atkinson, D. 2018.** *The Biology of Horticultural Crops.* Elsevier Science.
    - **Relevance**: Explores soil management, root systems and orchard floor practices in the context of horticultural crop production.
5. **Bhattacharyya, P. and Chakraborty, G. 2017.** *Handbook of Organic Farming and Bio-fertilizers.* Astral International, New Delhi.
    - **Relevance**: Offers in-depth knowledge of organic practices for floor management, such as composting, cover cropping and mulching.
6. **Singh *et al*. 2015.** *Region-Specific Integrated Farming System Models.* ICAR-IIFSR, Modipuram.
    - **Relevance**: Provides practical models for integrating orchard systems with other components like livestock and cover crops.
7. **Weinbaum, S.A., Johnson, R.S. and DeJong, T.M. 2019.** *Orchard Systems Management: Ecology and Agronomy.* CABI Publishing.
    - **Relevance**: Covers orchard design, weed management, inter cropping and ecological aspects of orchard systems.
8. **Panwar *et al.* 2020.** *Integrated Farming Systems for Agricultural Diversification.* ICAR, New Delhi.
    - **Relevance**: Discusses orchard integration with other farming components and sustainable floor management strategies.
9. **Yadav, A. K. and Chauhan, S. 2016.** *Orchard and Plantation Management Practices.* Scientific Publishers, Jodhpur.
    - **Relevance**: Offers insights on orchard layout, weed management, water conservation and post-harvest management.
10. **Brady, N.C. and Weil, R.R. 2017.** *The Nature and Properties of Soils (15th ed.).* Pearson.
    - **Relevance:** Essential reference for soil health management and the impact of orchard floor practices on soil properties.

Course Curriculum of Second Semester as per the ICAR-Sixth Deans' Committee Report for the Academic Programmes in HORTICULTURE

- UG-Certificate in Horticulture
- UG-Diploma in Horticulture
- UG-Degree: B.Sc. (Hons.) Horticulture

Mahatma Phule Krishi Vidyapeeth, Rahuri

Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola

Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani

Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli

Maharashtra Agricultural Universities Examination Board, Pune

Compiled & Submitted by

Dr. P.C. Mali

Associate Dean, College of Horticulture, Mulde (Dr.BSKKV)

UG Degree Syllabus State Coordinator

with

UG Degree Syllabus Discipline Coordinators &

DICC - UG Degree Syllabus Core Committee

Submitted to the

Directors of Instruction Coordination Committee

~ w.e.f. AY, 2024-25 ~

Course Curriculum of Second Semester as per the

ICAR-Sixth Deans' Committee Report for Academic Programme in HORTICULTURE

Course Layout

B.Sc. (Hons.) Horticulture

Semester: II (New) ***w.e.f.* Academic Year: 2024-25**

Sr. No.	Course No.	Course Title	Credits Hrs.	Remark (if any)
1.	**AEC-123**	National Services Scheme (NSS-II)/ National Cadet Corps (NCC-II)	1(0+1)	--
2.	**AEC-124**	Personality Development	2(1+1)	--
3.	**MDC-122**	Entrepreneurship Development and Business Management	3(2+1)	--
4.	**VAC-121**	Environmental Studies and Disaster Management	3(2+1)	--
5.	**AGRO-121**	Introduction to Major Field Crops	3(2+1)	--
6.	**PSMA-121**	Commercial Production of Spices and Plantation Crops	3(2+1)	--
7.	**VS-121**	Plant Propagation and Nursery Management in Vegetables, Flowers and Medicinal crops	3(1+2)	--
8.	**SEC-123**	Skill Enhancement Course-III (*To be offered from the list of SEC Courses*)	2(0+2)	--
9.	**SEC-124**	Skill Enhancement Course-IV (*To be offered from the list of SEC Courses*)	2(0+2)	--
		Total Credits Hrs.	**22(10+12)**	**G**
AEC: Ability Enhancement Course, **MDC**: Multidisciplinary Course, **SEC**: Skill Enhancement Course, **VAC**- Value-Added Course, **G**: Gradial				
Post II Semester (Only for Exit option for award of UG-Certificate)				
10.	**INT-121**	Internship (10 Weeks)	10(0+10)	--

B.Sc. (Hons.) Horticulture : Second Semester

Course-wise Syllabus with Teaching Schedules

Semester	**:**	**II**		
Course No.	**:**	**AEC-123**	**Credit Hrs.**	**: 1(0+1)**
Course Title	**:**	**National Service Scheme-II (NSS-II)/ National Cadet Corps-II (NCC-II)**		
Gradial Common Course across all UG Degrees				

Course No. : AEC-123	**Course Title : National Service Scheme-II (NSS-II)**	**Credit Hrs.:1(0+1)**

SYLLABUS

Objectives :

(i) To evoke social consciousness among students through various activities viz., working together, constructive and creative social work,

(ii) To be skilful in executing democratic leadership and developing skill in program,

(iii) To be able to seek self-employment, reducing gap between educated and uneducated, increasing awareness and desire to help sections of society.

PRACTICAL

Importance and role of youth leadership. Meaning, types and traits of leadership, qualities of good leaders; Importance and roles of youth leadership, Life competencies. Definition and importance of life competencies, Problem-solving and Decision-making, Interpersonal communication. Youth development programs Development of youth programs and policy at the national level, state level and voluntary sector; Youth-focused and youth-led organizations Health, hygiene and sanitation. Definition Needs and Scope of health education; Role of food, nutrition, safe drinking water, water borne diseases and sanitation (Swachh Bharat Abhiyan) for health; National health programs and reproductive health. Youth health, lifestyle, HIV-AIDS and first aid. Healthy lifestyles, HIV-AIDS, drugs and substance abuse, home nursing and first aid. Youth and yoga. History, philosophy, concept, myths and misconceptions about yoga; Yoga traditions and its impacts, Yoga as a tool for healthy lifestyle, preventive and curative method.

TEACHING SCHEDULE

PRACTICAL [AEC-123 / NSS-II]

Exercise No.	Topic	Exercise Title/ Sub-topics
1	**Orientation on NSS**	Introduction to NSS, its Objectives, History and Role in community service.
2	**Youth Leadership**	Discuss the importance and role of youth leadership, types and traits of leadership and qualities of good leaders.
3	**Life Competencies**	Understanding life competencies, their importance and Practical exercises in problem-solving and decision-making.
4	**Interpersonal Communication**	Practice exercises to improve interpersonal communication skills, Focusing on active listening and effective communication.
5	**Youth Development Programs**	Overview of youth development programs, Policies at national and state levels and Understanding youth-led organizations.
6	**Health, Hygiene, and Sanitation**	Practical activities on the importance of hygiene and sanitation, including Swachh Bharat Abhiyan tasks.
7	**Nutrition and Health Education**	Discuss the role of food, nutrition, and safe drinking water in health; Explore the impact of waterborne diseases.
8	**National Health Programs**	Introduction to key national health programs and their roles in promoting public health and awareness on reproductive health.
9	**Youth Health and Lifestyle**	Sessions on healthy lifestyle choices including exercise, balanced diet and stress management.
10	**HIV/AIDS Awareness**	Educational activities on HIV/AIDS, its prevention, and reducing stigma; Awareness on reproductive health.
11	**Substance Abuse Awareness**	Discussing the dangers of drug and substance abuse, its impact on health and practical ways to prevent addiction.
12	**First Aid and Home Nursing**	Hands-on training in first aid techniques including handling injuries, CPR basics and home nursing care.
13	**Introduction to Yoga**	Introduction to the History, Philosophy and various Traditions of Yoga as a Holistic health practice.
14	**Yoga Practice**	Practical Yoga Sessions focusing on Asanas, Pranayama and Meditation for a healthy lifestyle.
15	**Yoga as Preventive and Curative Tool**	Understanding and Practicing Yoga as a preventive and curative approach for physical and mental health.
16	**Reflection on NSS and Youth Development**	Group Discussion and Reflection on the role of NSS in community building and personal growth, Focusing on youth leadership.

Course No. : AEC-123	Course Title : National Cadet Corps-II (NCC-II)	Credit Hrs.:1(0+1)

SYLLABUS

Objectives: (i) To develop qualities of character, courage, comradeship, discipline, leadership, secular outlook, spirit of adventure and sportsmanship and the ideals of selfless service among the youth to make them useful citizen,

(ii) To create a human resource of organized trained and motivated youth to provide leadership in all walks of life including the Armed Forces and be always available for the service of the nation.

PRACTICAL

Arms Drill- Attention, stand at ease, stand easy. Getting on parade. Dismissing and falling out. Ground/take up arms, examine arms. Shoulder from the order and vice-versa, present from the order and vice-versa. Saluting at the shoulder at the halt and on the march. Short/long trail from the order and vice-versa. Guard mounting, Guard of honor, Platoon/Coy Drill. Characteristics of rifle (.22/.303/SLR), ammunition, fire power, stripping, assembling, care, cleaning, and sight setting. Loading, cocking, and unloading. The lying position and holding. Trigger control and firing a shot. Range Procedure and safety precautions. Aiming and alteration of sight. Theory of groups and snap shooting. Firing at moving targets. Miniature range firing. Characteristics of Carbine and LMG. Introduction to map, scales, and conventional signs. Topographical forms and technical terms. The grid system. Relief, contours, and gradients. Cardinal points and finding north. Types of bearings and use of service protractor. Prismatic compass and its use. Setting a map, finding north and own position. Map to ground and ground to map. Knots and lashings, Camouflage and concealment, Explosives and IEDs. Field defenses obstacles, mines and mine lying. Bridging, waterman ship. Field water supplies, tracks and their construction. Judging distance. Description of ground and indication of landmarks. Recognition and description of target. Observation and concealment. Field signals. Section formations. Fire control orders. Fire and movement. Movement with/without arms. Section battle drill. Types of communication, media, latest trends and developments.

TEACHING SCHEDULE

PRACTICAL (AEC-123/ NCC-II)

Exercise No.	Topic	Exercise Title/ Sub-topics
1	**Basic Arms Drill**	Attention, stand at ease, stand easy, getting on parade, dismissing and falling out.
2	**Advanced Arms Drill**	Ground/take up arms, examine arms, shoulder from the order and vice versa.
3	**Saluting with Arms**	Saluting at the shoulder both at a halt and while on the march.
4	**Rifle Handling Techniques**	Short/long trail from the order and vice-versa, guard mounting and guard of honor procedures.
5	**Platoon and Company Drill**	Practice and demonstration of platoon and company drill formations.
6	**Rifle Characteristics and Handling**	Characteristics of rifles (.22/.303/SLR), ammunition, firepower, and basic care, cleaning and sight setting.
7	**Rifle Operations and Safety**	Loading, cocking, unloading, safety procedures; lying position, trigger control and firing a shot.
8	**Range Procedures and Target Practice**	Range procedures, aiming, sight alteration, theory of groups, snap shooting and firing at moving targets.
9	**Map Reading Basics**	Introduction to maps, scales, conventional signs, topographical forms and the grid system.
10	**Advanced Map Skills**	Relief, contours, gradients, cardinal points, bearings, and use of the service protractor.
11	**Field Navigation with Compass**	Use of prismatic compass, setting a map, finding north, positioning, map-to-ground and ground-to-map.
12	**Field Engineering Skills**	Knots and lashings, camouflage, handling explosives, IEDs, field defenses, obstacles and mines.
13	**Watermanship and Field Water Supplies**	Bridging techniques, field water supplies, track construction and distance judgment.
14	**Target Recognition and Indication**	Identifying and describing targets, observing, concealment, field signals and indication of landmarks.
15	**Section Battle Drills and Movement**	Section formations, fire control orders, fire and movement, movement with/without arms, section battle drill.
16	**Communication Skills and Modern Trends**	Types of communication, media and latest trends in NCC communication.

Semester	**:**	**II**		
Course No.	**:**	**AEC-124**	**Credit Hrs.**	**: 2(1+1)**
Course Title	**:**	**Personality Development**		
Gradial Common Course across all UG Degrees				

SYLLABUS

Objectives: To make students realize their potential strengths and cultivate their inter-personal skills and improve employability.

THEORY

Personality: Definition, Nature of personality, Theories of personality and its types. The humanistic approach - Maslow's self-actualization theory, Shaping of personality, Determinants of personality, Myers-Briggs Typology Indicator, Locus of control and performance, Type A and Type B Behaviours, Personality and Organizational Behaviour. Foundations of individual behavior and Factors influencing individual behavior, Models of individual behavior, Perception and Attributes; Factors affecting perception, Attribution theory and Case studies on Perception and Attribution. Learning: Meaning and Definition, Theories and Principles of Learning, Learning and Organizational behavior, Learning and Training, Learning feedback. Attitude and Values, Intelligence- Types of Intelligence, Theories of intelligence, Measurements of intelligence, Factors influencing intelligence, Intelligence and Organizational behavior, Emotional intelligence. Motivation- Theories and Principles, Teamwork and Group dynamics.

PRACTICAL

MBTI Personality Analysis, Learning Styles and Strategies, Motivational Needs, Firo-B, Interpersonal Communication, Teamwork and Team Building, Group Dynamics, Win-Win Game, Conflict Management, Leadership Styles, Case Studies on Personality and Organizational Behavior.

TEACHING SCHEDULE

THEORY [AEC-124]

Lecture No.	Topic	Sub-topics / Key Points	Weightage (%)
1	**Personality**	Definition, Nature of Personality	5
2	**Theories of Personality and its Types**	The Humanistic Approach- Maslow's self-actualization theory; Types-Extroversion, Introversion, Conscientiousness, Agreeableness	10
3		Shaping of Personality - improving communication skills, stepping out of comfort zone, learning to say no, tapping into creativity, getting curious, giving yourself a daily affirmation, practicing self-care. Determinants of Personality- Physical, Intellectual, Social and Psychological	10
4		Myers- Briggs Typology indicator Four Indicators- Introvert/Extrovert, Thinking/ Feeling, Sensing/ Intuiting, Judging/ Perception, Locus of Control and Performance	10
5		Type A and Type B Behaviours Theory	5
6	**Personality and Organizational Behaviours**	Difference between Personality and Organizational Behaviours	5
7		Foundations of individual behaviours, Factors influencing individual behaviour- Personality, Values, Motivation, Perspectives and Social impacts	5
8		Models of Individual Behaviour- Rational Economic man, Social man, The Self Actuating man, Complex man	5
9	**Perception**	Attributes and Factors affecting perception; Attribution theory and Case studies on Perception and Attribution	10
10	**Learning**	Meaning, Definition; Theories and Principles of Learning	10
11		Difference between Learning and Organizational behavior; Difference between Learning and Training; Feedback of Learning	5
12	**Attitude and Value**	Meaning, Definitions, Concept	5
13	**Intelligence**	Types of Intelligence, Theories of intelligence	
14		Measurement of intelligence Factors affecting intelligence Difference between intelligence and organizational behaviour, Emotional intelligence	5
15	**Motivation**	Meaning, Theories and Principles	5
16	**Team & Group Dynamics**	Meaning, Definitions, Concept	5
		Total =	**100**

TEACHING SCHEDULE

PRACTICAL [AEC-124]

Exercise No.	Exercise Topic
1	Myers- Briggs Type Indicator (MBTI) analysis- Extroversion/ Introversion
2	Myers- Briggs Type Indicator (MBTI) analysis- Sensing/ Intuition
3	Myers- Briggs Type Indicator (MBTI) analysis- Thinking/Feeling
4	Myers- Briggs Type Indicator (MBTI) analysis- Judging/ Perception
5	Learning Styles and Strategies
6	Motivational Needs
7	Fundamental Interpersonal Relations Orientation Behaviour (FIRO-B)
8	Interpersonal Communication
9	Team Work
10	Team Building
11	Group Dynamics
12	Win-Win Game
13	Conflict Management
14	Leadership Styles
15	Case Studies on Personality
16	Case Studies on Organizational Behaviour

Suggested Readings [AEC-124]:

1. **Andrews, Sudhir, 1988,** How to Succeed at Interviews. 21st(rep.) New Delhi. Tata -McGraw Hill.
2. **Heller, Robert, 2002,** Effective Leadership. Essential Manager Series. DK Publishing.
3. **Hindle, Tim, 2003,** Reducing Stress. Essential Manager Series. DK Publishing.
4. **Kumar, Pravesh, 2005,** All about Self- Motivation. New Delhi. Goodwill Publishing House.
5. **Lucas, Stephen, 2001,** Art of Public Speaking. New Delhi. Tata - McGraw Hill.
6. **Mile, D.J., 2004,** Power of Positive Thinking. Delhi. Rohan Book Company.
7. **Smith, B., 2004,** Body Language. Delhi: Rohan Book Company.
8. **Shaffer, D. R., 2009,** Social and Personality Development (6th Edn). Belmont, CA: Wadswo.

Semester	**:**	**II**	
Course No.	**:**	**MDC-122**	**Credit Hrs. : 3(2+1)**
Course Title	**:**	**Entrepreneurship Development and Business Management**	

SYLLABUS

Objectives:

(i) To provide an insight into the concept and scope of entrepreneurship.
(ii) To expose the student to various aspects of establishment and management of a small business unit.
(iii) To enable the student to develop financially viable agribusiness proposal.

THEORY

Development of entrepreneurship, motivational factors, social factors, environmental factors, characteristics of entrepreneurs, entrepreneurial attributes/competencies. Concept, need for and importance of entrepreneurial development. Evolution of entrepreneurship, objectives of entrepreneurial activities, types of entrepreneurs, functions of entrepreneurs, importance of entrepreneurial development and process of entrepreneurship development. Environment scanning and opportunity identification need for scanning–spotting of opportunity-scanning of environment– identification of product/ service – starting a project; factors influencing sensing the opportunities. Infrastructure and support systems- good policies, schemes for entrepreneurship development; role of financial institutions and other agencies in entrepreneurship development. Steps involved in functioning of an enterprise. Selection of the product / services, selection of form of ownership; registration, selection of site, capital sources, acquisition of manufacturing know how, packaging and distribution. Planning of an enterprise, project identification, selection and formulation of project; project report preparation, Enterprise management. Production management – product, levels of products, product mix, quality control, cost of production, production controls, Material management. Production management – raw material costing, inventory control. Personal management – manpower planning, labour turn over, wages / salaries. Financial management / Accounting – funds, fixed capital and working capital, costing and pricing, long term planning and short-term planning, book keeping, journal, ledger, subsidiary books, annual financial statement and taxation. Marketing management- market, types, marketing assistance, market strategies. Crisis management- raw material, production, leadership, market, finance, natural etc.

PRACTICAL

Visit to small scale industries/agro-industries, Interaction with successful entrepreneurs/ agric-entrepreneurs. Visit to financial institutions and support agencies. Preparation of project proposal for funding by different agencies.

TEACHING SCHEDULE

THEORY [MDC-122]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1	Introduction to Entrepreneurship	Meaning and Definitions of an Entrepreneur, Entrepreneurship; Concept & Scope of Entrepreneurship	6
2	Importance of Entrepreneurship	Importance of Entrepreneurship in Agribusiness	
3	Entrepreneurship Development	Need for and objectives of Entrepreneurial development	4
4	Motivational Factors	Types of motivational factors, Role of social and environmental factors in entrepreneurship	4
5	Characteristics of Entrepreneurs	Characteristics, Entrepreneurial attributes and Competencies	4
6	Types of Entrepreneurs	Various types and their significance	4
7	Functions of Entrepreneurs	Key roles and Responsibilities	2
8	Evolution of Entrepreneurship	Historical perspective and Growth	3
9	Process of Entrepreneurship Development	Stages and Approaches in developing entrepreneurship	4
10	Environmental Scanning	Need for scanning, Techniques	2
11	Opportunity Identification	Spotting and Analysing opportunities	2
12	Infrastructure and Support Systems	Policies, Schemes and Role of financial and other agencies in entrepreneurship development	4
13	Enterprise Functioning Steps	Steps to establish an enterprise	4
14	Selection of Products/Services	Choosing products, Services and Business forms	3
15	Enterprise Location and Capital Sources	Registration, Site selection, Capital sources / Acquisition	3
16	Manufacturing and Distribution	Acquiring manufacturing know-how, Packaging and Distribution essentials	3
17	Planning of an Enterprise	Short term and Long-term planning of an enterprise	3
18-19	Project Formulation	Project identification, Selection, Steps in project formulation and Report preparation, etc.	8
20	Enterprise Management	Basics and Importance of managing an enterprise	3

Continued….

21	Production Management	Product types, Levels of products, Product mix, Quality control, Cost of production, Production control	4
22	Material Management	Raw material costing and Inventory control strategies	4
23	Personnel Management / Human Resource Management	Manpower planning, Labour turnover, Wages / Salaries	4
24	Financial Management	Funds, Fixed and Working capital, Costing, Pricing, Book-keeping basics	4
25-26	Accounting and Taxation	Journals, Ledgers, Subsidiary books, Annual financial statements, Taxation basics	4
27	Marketing Management	Market, Types of markets, Marketing assistance	4
28-29	Market Strategies and Pricing	Marketing strategies, Pricing strategies and Market penetration	4
30	Crisis Management	Crisis types, Strategies for managing raw material, etc.	2
31	Leadership in Crisis Situations	Role of leadership in handling crises	2
32	Financial Crises and Solutions	Strategies for financial crisis management	2
		Total=	**100**

TEACHING SCHEDULE

PRACTICAL [MDC-122]

Exercise No.	Exercise Topic/Title
1	Visit to Small-Scale Industries/ Agro-Industries. (Objective: To understand setup and operations of small-scale units)
2	Interaction with Successful Entrepreneurs. (Objective: To gain insights from real-life entrepreneurial experiences)
3	Case Study on Agro-Entrepreneurs. (Objective: To analyse successful agribusiness ventures)
4	Visit to Financial Institutions. (Objective: To learn about funding options and financial support)
5	Identification of Agribusiness Ideas. (Objective: To identify viable agribusiness ideas based on demand)
6	Analysing Project Proposals. (Objective: To study structure and elements of project proposals)

Continued…

7	Preparing a Project Proposal. (Objective: To develop a basic proposal for an agribusiness venture)
8	Project Report Writing Techniques. (Objective: To practice format and structure for project reports)
9	Marketing Strategies Case Study. (Objective: To analyse effective marketing strategies in agribusiness)
10	Production and Cost Control Analysis (Objective: To study basic cost control measures in production)
11	Inventory Control Simulation (Objective: To apply inventory management methods in a hypothetical setup)
12	Basic Bookkeeping (Objective: To practice fundamental bookkeeping for small businesses)
13	Market Research Techniques (Objective: To use surveys and questionnaires for market insights)
14	Project Proposal Presentation (Objective: To present project ideas for feedback)
15	Review of Project Proposal (Objective: To refine project proposals based on feedback)
16	Final Evaluation of Proposals (Objective: To assess and finalize projects)

Suggested Readings [MDC-122]:

1. **Charantimath P.M. 2009.** Entrepreneurship Development and Small Business Enterprises. Pearson Publications, New Delhi.
2. **Desai V. 2015.** Entrepreneurship: Development and Management, Himalaya Publishing House.
3. **Desai Vasant. 1997.** Small Scale Industries and Entrepreneurship. Himalaya Publ. House.
4. **Gupta C.B. 2001.** Management Theory and Practice. Sultan Chand and Sons.
5. **Indu Grover. 2008.** Handbook on Empowerment and Entrepreneurship. Agrotech Public Academy.
6. **Khanka S.S. 1999.** Entrepreneurial Development. S. Chand and Co.
7. **Mehra P. 2016.** Business Communication for Managers. Pearson India, New Delhi.
8. **Pandey M. and Tewari D. 2010.** The Agribusiness Book. IBDC Publishers, Lucknow.
9. **Singh D. 1995.** Effective Managerial Leadership. Deep and Deep Publ.
10. **Singhal R.K. 2013.** Entrepreneurship Development and Management, Katson Books.
11. **Tripathi P.C and Reddy P.N. 1991.** Principles of Management. Tata McGraw Hill.

Semester	**:**	**II**	
Course No.	**:**	**VAC-121**	**Credit Hrs. : 3(2+1)**
Course Title	**:**	**Environmental Studies and Disaster Management**	
Gradial Common Course across all UG Degrees			

SYLLABUS

Objectives : (i) To expose and acquire the knowledge on the environment,

(ii) To gain the state-of-the-art skill and expertise on management of disasters.

THEORY

Introduction to Environment - Environmental studies - Definition, scope and importance - Multidisciplinary nature of Environmental Studies - Segments of Environment - Spheres of Earth - Lithosphere - Hydrosphere - Atmosphere - Different layers of atmosphere. Natural Resources: Classification - Forest resources. Water resources. Mineral resources, Food resources. Energy resources. Land resources. Soil resources. Ecosystems - Concept of an ecosystem - Structure and function of an ecosystem - Energy flow in the ecosystem. Types of Ecosystems. Biodiversity and its conservation: Introduction, Definition, Types. Biogeographical Classification of India. Importance and Value of Biodiversity. Biodiversity Hotspots. Threats and Conservation of Biodiversity.

Environmental Pollution: Definition, Cause, Effects and Control measures of: (a) Air pollution. (b) Water pollution. (c) Soil pollution. (d) Marine pollution. (e) Noise pollution. (f) Thermal pollution. (g) Light pollution. Solid Waste Management: Classification of solid wastes and management methods, Composting, Incineration, Pyrolysis, Biogas production, Causes, Effects and Control measures of urban and industrial wastes. Social Issues and the Environment: Urban problems related to energy. Water conservation, Rain water harvesting, Watershed management. Environmental Ethics: Issues and possible solutions, Climate change, Global warming, Acid rain, Ozone layer depletion, Nuclear accidents and Holocaust. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Human Population and the Environment: Environment and Human Health: Human Rights, Value Education. Women and Child Welfare. Role of Information Technology in Environment and Human health.

VAC-121…..

Disaster Management– Disaster: Definition - Types - Natural Disasters: Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, heat and cold waves. Man-made Disasters: Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, road accidents, rail accidents, air accidents, sea accidents. International and National strategy for disaster reduction. Concept of disaster management, National disaster management framework; Financial arrangements; Role of NGOs, Community-based organizations and media in disaster management. Central, state, district and local administration in disaster control; Armed Forces in disaster response; Police and other organizations in disaster management.

PRACTICAL

Visit to a local area to document environmental assets river/forest/grassland/hill/mountain. Energy: Biogas production from organic wastes. Visit to wind mill/hydro power/solar power generation units. Biodiversity assessment in farming system. Floral and faunal diversity assessment in polluted and un polluted system. Visit to local polluted site-Urban/Rural/Industrial/Agricultural to study of common plants, insects and birds. Environmental sampling and preservation. Water quality analysis: pH, EC and TDS. Estimation of Acidity, Alkalinity. Estimation of water hardness. Estimation of DO and BOD in water samples. Estimation of COD in water samples. Enumeration of *E. coli* in water sample. Assessment of Suspended Particulate Matter (SPM). Study of simple ecosystems – Visit to pond /river / hills. Visit to areas affected by natural disaster.

TEACHING SCHEDULE

THEORY [VAC-121]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1	Introduction to Environmental Studies	Definition, Scope and Importance; Multidisciplinary nature	4
2	Segments of Environment	Spheres of Earth – Lithosphere, Hydrosphere, Atmosphere and Different Layers of Atmosphere.	4
3-5	Natural Resources	Classification of resources; Forest, water, mineral, food, energy, land, and soil resources	10
6-7	Concept of an Ecosystem	Concept, Structure, Function and Energy flow in ecosystems	5
8-9	Types of Ecosystems	Terrestrial, Aquatic, Agro-ecosystems, Forest ecosystems and Human-modified ecosystems	5
10-12	Biodiversity and its Conservation	Importance, Value, Types, Bio-geographical classification, Hotspots, Threats, Conservation strategies	8
13-16	Environmental Pollution	Definition, Causes, Effects, Control measures: Air, Water, Soil, Marine, Noise, Thermal and Light pollution	12
17-18	Solid Waste Management	Classification of solid wastes; Management methods like, Composting, Incineration, Pyrolysis, Biogas production	6
19	Urban and Industrial waste	Causes, Effects and Control measures of Urban and Industrial waste	4
20	Social Issues Related to the Environment	Urban energy problems, Water conservation, Rainwater harvesting, Watershed management	4
21-22	Environmental Ethics	Issues, Possible solutions, Climate change, Global warming, Acid rain, Ozone layer depletion, Nuclear accidents and Holocaust.	6
23	Environment Protection Laws	Environment Protection Act, Air and Water (Pollution) Acts, Wildlife Protection Act, Forest Conservation Act	4

Continued….

24-25	Human Population and Environment	Environment and human health, Human rights, Value education, Women and child welfare, Role of IT in environment and health	5
26-28	Introduction to Disaster Management	Definition, Types of natural and man-made disasters; Floods, Droughts, Cyclones, Earthquakes, Landslides, Fires	10
29-30	Disaster Management Framework	National and International strategies, disaster response framework, Financial arrangements, Role of NGOs and media	5
31	Central and Local Administration in Disasters	Role of Central, State, District and Local Administrations; Coordination in disaster response	4
32	Disaster Response Organizations	Central, State, District and Local Administrations in Disaster Control; Role of Armed Forces, Police and Other organizations in disaster response &control	4
		Total =	**100**

TEACHING SCHEDULE

PRACTICAL [VAC-121]

Exercise No.	Exercise Title
1	Visit to a local area to document environmental assets: River /Forest / Grassland / Hill / Mountain.
2	Visit to Biogas production, Windmill, Hydro/Solar power generation units
3	To assess floral and faunal diversity in farming systems.
4	Assessment of biodiversity in farming system.
5	Floral and faunal diversity assessment in polluted and unpolluted system.
6	Visit to Local Polluted Site - Urban/Rural/Industrial/Agricultural to study the common plants, insects and birds. Environmental sampling and preservation.
7	Water quality analysis: pH and electrical conductivity (EC) in water samples.

Continued…

8	Estimation of total dissolved solids (TDS) in water samples
9	Estimation of acidity and alkalinity in water samples.
10	Estimation of water hardness in water samples.
11	Determination of dissolved oxygen (DO) and biological oxygen demand (BOD) in water samples.
12	Performing COD estimation on water samples.
13	Enumeration of *E. coli* in water samples to check for contamination.
14	Assessment of Suspended Particulate Matter (SPM) in an environmental sample.
15	Study of simple ecosystem – Visit to Pond/River/Hills.
16	Visit to areas affected by natural disaster.

Suggested Readings (VAC-121):

1. **De, A.K. 2010.** Environmental Chemistry. Published by New Age International Publishers, New Delhi. ISBN:139788122426175.384 pp.
2. **Dhar Chakrabarti, P.G. 2011.** Disaster Management - India's Risk Management Policy Frameworks and Key Challenges. Published by Centre for Social Markets (India), Bangaluru. 36 pp.
3. **Erach Bharucha,** Text Book for Environmental Studies. University Grants Commission, New Delhi.
4. **Parthiban, K.T., Vennila, S., Prasanthrajan, M. and Umesh Kanna, S. 2023**. Forest, Environment, Biodiversity and Sustainable development. Narendra Publishing House, New Delhi, India.
5. **Prasanthrajan, M. and Mahendran, P.P. 2008.** A Text Book on Ecology and Environmental Science.1st Edn. ISBN 8183211046. Agrotech Publishing Academy, Udaipur - 313 002.
6. **Prasanthrajan, M. 2018.** Objective Environmental Studies and Disaster Management, ISBN 9789387893825. Scientific Publishers, Jodhpur, India. 146 pp.
7. **Sharma, P.D. 2009.** Ecology and Environment, Rastogi Publications, Meerut, India.
8. **Tyler Miller and Scot Spoolman. 2009.** Living in the Environment (Concepts, Connections, and Solutions). Brooks/Cole, Cengage Learning Publication, Belmont, USA.

Semester	**:**	**II**		
Course No.	**:**	**AGRO-121**	**Credit Hrs.**	**: 3(2+1)**
Course Title	**:**	**Introduction to Major Field Crops**		

SYLLABUS

Objectives:

(i) To provide in-depth understanding about crop response to variable agronomic factors.

(ii) To inculcate the skill of raising field crops with appropriate agronomic practices for higher productivity.

THEORY

Classification and Distribution of field crops, Definition, Concept and Principles of Multiple cropping, Mixed cropping, Intercropping, Relay and Alley cropping, Crop rotation. Economic importance, Soil and Climatic requirement, Varieties, Cultural practices for raising major cereals (Rice, Wheat, Maize), Pulses (Gram, Soybean, Arhar, Moong), Oilseeds (Rapeseed and Mustard, Sunflower, Groundnut), Cash crops (Cotton, Sugarcane) and Fodder crops (Sorghum, Bajra, Berseem, Oats). Principles and Practices of green manuring.

PRACTICAL

Identification of crop plants, seeds, weeds. Preparation of cropping schemes. Methods of sowing, fertilizer and herbicide applications in field crops. Calculation of fertilizer and herbicide doses.

TEACHING SCHEDULE

THEORY [AGRO-121]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1	Definition of Agronomy, Scope and Importance of Agronomy	Definitions of Agriculture and Agronomy, Brief historical sketch of Agriculture and Scope and Importance of Agronomy	4
2	Agro-climatic Zones of India and Maharashtra	Agro-climatic zones of India, Agro-climatic zones of Maharashtra.	2
3-4	Classification and Distribution of Field Crops	Based on ontogeny (Life cycle), Based economic use (Agronomic), Scientific or Botanical classification, Based on season, Based on climatic condition, Classification based on photosynthesis, Classification based on length of photoperiod required for floral initiation.	4
5	Tillage	Definition of Tillage, Tilth and Classification of Tillage	2
6	Methods of Sowing	Broadcasting, Dibbling, Sowing behind the country plough or putting seed behind plough furrow, Seed drilling/line sowing, Planting, Nursery transplanting	2
7-8	Cropping System	Definition of Cropping system, Cropping pattern, Cropping scheme, Classification of cropping system- Monoculture, Multiple cropping, Fallow in rotation, Parallel and Sequential multiple cropping**.**	4
9	Crop Rotation	Definition, Principles of Crop rotation, Characteristics of good rotation, Advantages and Disadvantages	2
10-11	Manures and Fertilizers	Classification of manures, Bulky and Concentrated organic manures	2
		Classification of fertilizers, Nitrogenous, Phosphatic and Potassic fertilizer	2
12	Methods of Fertilizer Application	Broadcasting, Placement, Band placement, Pellet application, Fertigation etc.	2
13	Principles and Practices of Green Manuring	Characteristic of green manuring crop, Classification of green manuring	4

Continued…

14-18	Cultivation of Cereals	Rice, Maize, Sorghum, Pearl millet and Minor millets	20
19-23	Cultivation of Pulses	Pigeon pea, Greengram, Blackgram, Chickpea, Horsegram and Cowpea	20
24-28	Cultivation of Oilseeds	Groundnut, Sunflower, Rapeseed, Mustard and Soybean	10
29-30	Cultivation of Cash Crops	Cotton and Sugarcane	10
31-32	Cultivation of Fodder Crops	Sorghum, Bajra, Berseem and Oats	10
		Total=	**100**

TEACHING SCHEDULE

PRACTICAL [AGRO-121]

Exercise No.	Exercise Title
1	Acquaintance of College Farm
2	Identification of seeds of field crops and preparation of Crop Herbarium.
3	Study of tillage implements: Primary and secondary tillage implements.
4	Preparation of cropping scheme.
5	Practice of puddling and paddy transplanting **or** other intercultural operation(s) in relevant major regional field crop(s).
6	Study of different methods of sowing, seeding implements and working with them.
7	Determination of purity and germination percentage of seed.
8	Calculation of plant population for different field crops.
9	Identification and classification of manures and fertilizers.
10	Calculation of fertilizer doses for different field crops.
11	Methods of fertilizer application.
12	Identification of weeds and preparation of Weed Herbarium.
13	Preparations of herbicide spray solutions.
14	Participation in ongoing field operations and actual working in field for raising crops.
15	Preparation of compost and FYM.
16	Preparation of calendar of operations of different field crops.

Suggested Readings [AGRO-121]:

1. **Anonymous, 2023.** Package of Practices for *Kharif* Crops.
2. **Anonymous, 2023.** Package of Practices for *Rabi* Crops.
3. **Reddy, T.Y. and Reddy, G.H.S. 2020.** Principles of Agronomy, Kalyani Publishers, Ludhiana.
4. **Singh Chidda, 2020.** Modern Techniques of Raising Field Crops, Oxford and IBH Publication.

Semester	**:**	**II**	
Course No.	**:**	**PSMA-121**	**Credit Hrs. : 3(2+1)**
Course Title	**:**	**Commercial Production of Spices and Plantation Crops**	

SYLLABUS

Objectives: To inculcate the skill of raising spices and plantation crops with appropriate knowledge of agronomic practices for higher productivity.

THEORY

Present status and Importance of Spice crops, Soil and Climate requirements, Commercial varieties, Site selection, Layout, Sowing time and Methods, Nutritional and Irrigation requirements, Intercropping, Weed control, Physiological disorders, Harvesting, Post-harvest management and Plant protection measures of the following crops: Black pepper, Turmeric, Ginger, Garlic, Clove, Cinnamon, Fenugreek, Cumin, Ajowain, Coriander, Fennel, Cardamom, Vanilla, Betelvine and Celery. Area, Production and Export potential of plantation crops, Varietal wealth, Cultivation systems, Multitier cropping, High density planting, Nutritional and Irrigation requirements, Weed management, Training and Pruning, Physiological disorders, Maturity indices, Harvesting, Post-harvest management and Plant protection measures of the following crops: Coffee, Tea, Cashew, Rubber, Coconut, Arecanut, Cocoa and Oil palm. State-level Recommendations, National Varieties and Recommendations.

PRACTICAL

Identification of seeds and plants, Propagation, Nursery raising, Field layout, Planting methods, Cultural practices, Harvesting and Handling, Visit to fields and marketing centers.

TEACHING SCHEDULE

THEORY [PSMA-121]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1-2	Present status and Importance of Spices and Plantation crops	Introduction, Brief history, Scope and Importance, Present status of Spice and Plantation industry, Constraint faced in production of Spice and Plantation	5
3-4	Black pepper	Soil and Climate requirements, Commercial varieties, Site selection, Layout, Sowing time and Methods, Nutritional and Irrigation requirements, Intercropping, Weed control, Physiological disorders, Harvesting, Post-harvest management and Plant protection measures	10
5-6	Turmeric	Soil and Climate requirements, Commercial varieties, Site selection, Layout, Sowing time and Methods, Nutritional and Irrigation requirements, Intercropping, Weed control, Physiological disorders, Harvesting, Post-harvest management and Plant protection measures	10
7-8	Ginger, Garlic	Soil and Climate requirements, Commercial varieties, Site selection, Layout, Sowing time and Methods, Nutritional and Irrigation requirements, Intercropping, Weed control, Physiological disorders, Harvesting, Post-harvest management and Plant protection measures	7.5
9-10	Clove and Cinnamon	Soil and Climate requirements, Commercial varieties, Site selection, Layout, Sowing time and Methods, Nutritional and Irrigation requirements, Intercropping, Weed control, Physiological disorders, Harvesting, Post-harvest management and Plant protection measures	7.5
11-14	Fenugreek, Cumin Ajwain, Coriander Fennel, Celery	Soil and Climate requirements, Commercial varieties, Site selection, Layout, Sowing time and Methods, Nutritional and Irrigation requirements, Intercropping, Weed control, Physiological disorders, Harvesting, Post-harvest management and Plant protection measures (Tabular Format Information)	7.5

Continued…

15-16	Cardamom (Small and Large)	Soil and Climate requirements, Commercial varieties, Site selection, Layout, Sowing time and Methods, Nutritional and Irrigation requirements, Intercropping, Weed control, Physiological disorders, Harvesting, Post-harvest management and Plant protection measures	5
17-18	Vanilla, Betelvine	Soil and Climate requirements, Commercial varieties, Site selection, Layout, Sowing time and Methods, Nutritional and Irrigation requirements, Intercropping, Weed control, Physiological disorders, Harvesting, Post-harvest management and Plant protection measures	5
19-22	Tea, Coffee, Rubber	Area, Production and Export, Soil and Climate, Commercial varieties, Cultivation systems, High density planting, Nutritional and Irrigation requirements, Weed management, Training and Pruning, Physiological disorders, Maturity indices, Harvesting, Post-harvest management and Plant protection measures	7.5
23-25	Cashew	Area, Production and Export, Soil and Climate, Commercial varieties, Cultivation systems, High density planting, Nutritional and Irrigation requirements, Weed management, Training and Pruning, Physiological disorders, Maturity indices, Harvesting, Post-harvest management and Plant protection crops.	10
26-28	Coconut	Area, Production and Export, Soil and Climate, Commercial varieties, Cultivation systems, High density planting, Nutritional and Irrigation requirements, Weed management, Training and Pruning, Physiological disorders, Maturity indices, Harvesting, Post-harvest management and Plant protection crops.	10
29-31	Cocoa, Oil palm, Arecanut	Area, Production and Export, Soil and Climate, Commercial varieties, Cultivation systems, High density planting, Nutritional and Irrigation requirements, Weed management, Training and Pruning, Physiological disorders, Maturity indices, Harvesting, Post-harvest management and Plant protection crops.	10
32	JOINT AGRESCO Recommendations, National Varieties and Recommendations		05
		Total =	**100**

TEACHING SCHEDULE

PRACTICAL [PSMA-121]

Exercise No.	Exercise Title
1	Identification of plantation crops.
2	Identification of spice crops.
3	Propagation techniques in plantation crops.
4	Propagation techniques in spice crops.
5	Nursery techniques in plantation crops.
6	Nursery techniques in spice crops.
7	Field layout for spices and plantation crops.
8	Planting methods for spices and plantation crops.
9	Cultural practices in plantation crops.
10	Cultural practices in spice crops.
11	Maturity standards and harvesting of spice and plantation crops.
12	Post-harvest management of spices.
13	Post-harvest management of plantation.
14	Study of methods of extraction of oils and oleoresins.
15	Visit to market (Market study).
16	Visit to commercial spice and plantation farms.

Suggested Readings [PSMA-121]:

1. **Kumar, N. 2018.** Introduction to Spices, Plantation Crops, Medicinal and Aromatic Plants, Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi.
2. **Peter, K.V. 2002.** Plantation Crops, National Book Trust, India, New Delhi.
3. **Pruthi, J.S. 1998.** Major Spices of India Crop Management and Post Harvest Technology, ICAR, Krishi Anusandhan Bhavan, Pusa, New Delhi.

Semester	**:**	**II**		
Course No.	**:**	**VS-121**	**Credit Hrs.**	**: 3(1+2)**
Course Title	**:**	**Plant Propagation and Nursery Management in Vegetables, Flowers and Medicinal crops**		

SYLLABUS

Objectives:

(i) To study the biology and types of propagation, tissue culture and physiology of seed, seed storage and dormancy.

(ii) To gain knowledge of nursery management, nursery establishment and nursery techniques for plant propagation.

(iii) To study propagation from specialized structures in major vegetable crops, flower crops, medicinal and aromatic plants.

THEORY

Nursery management practices for vegetables, flowers and medicinal crops, Biology of plant propagation, Sexual and Asexual plant propagation, physiology of seed, seed storage and dormancy, physiology of cutting, layering, grafting, budding. Tissue culture, Maintenance of elite germplasm and mother stock. Propagation from specialized modified plant parts, crop specific plant propagation practices in commercial vegetables and flowers. Nursery techniques and crop specific propagation methods of medicinal crops.

PRACTICAL

Identification of planting material, commercial varieties of vegetable, flowers and medicinal crops. Propagation and multiplication, seed production. Potting, repotting and maintenance of houseplants. Practices in manuring, drip and fertigation, foliar nutrition, growth regulator application, pinching, disbudding, staking. Harvesting techniques. Crop-specific plant propagation practices. Visit to local nurseries and florist centers. Marketing requirements and strategies for sale of important crops.

TEACHING SCHEDULE

THEORY [VS-121]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1	Plant propagation: Vegetables, Flowers and Medicinal crops	Definition- Plant propagation, Need of Plant propagation, its significance, Generating uniformity in production of genetically pure and biotic stress-free plant propagating material.	10
2	Sexual and Asexual Methods of Plant propagation	Definitions, Aim of propagation, Methods of propagation: Sexual and Asexual, its merits and demerits.	10
3	Physiology of Seed and Seed Storage	Definitions; Seed germination, Seedling emergence, Environmental factors: Temperature, Moisture, Oxygen and Light. Seed storage, Types of seed storage, Factors affecting seed storage.	05
4	Seed Dormancy	Definition of Seed dormancy, Types of Seed dormancy: Exogenous (due to the external factors) Endogenous (physiological factors). Factors affecting seed dormancy	10
5	Treatments to overcome Seed Dormancy in Vegetables, Flowers and Medicinal crops	Seed treatments/ Methods of breaking Seed dormancy: Scarification methods: Mechanical scarification, Acid scarification, Hot water treatment; Stratification method: Chilling treatment	
6	Nursery Management Practices and Components of Nursery for Vegetables, Flowers and Medicinal crops	Definition of Nursery, Importance and Role, Site selection and Layout of nursery, Types of Nursery: On the basis of duration, plant produced and structure used	05
7	Propagation Structures in Nursery Production	Detail information of propagation structures in nursery production: Mist chamber, Humidifiers, Greenhouses, Glasshouses, Cold frames, Hot beds and Polyhouses	05

Continued…

8	Growing Medium used for Nursery Plants and Containers used	Objectives and Features of growing media, Different propagating media, Soil and Soilless media. Features of ideal containers, Types of plant containers: Clay pots, Pro-trays, Micro-bags, Polythene bags, etc.	05
9	Biology of Plant Propagation	Relating to life cycles in plants, Genes impact on propagation, Cell division: Mitosis and Meiosis, etc.	05
10	Vegetative Propagation Method: Propagation from Specialized Modified Plant Parts and Cuttings	Separation and Division of plant parts. Def'n- Bulbs, Corms, Tuber, Runners, Suckers, Offset, Rhizomes, etc. Def'n- Cutting, Types of cuttings: Stem cutting (hardwood, semi-hard wood, softwood, herbaceous), Leaf cutting, Root cutting.	10
11	Vegetative Propagation Method: Layering	Def'n- Layering, Types of Layering, Merits and Demerits, Limitations	05
12	Vegetative Propagation Method: Grafting and Budding	Definitions, Types of grafting and budding, Use of rootstock for vegetable grafting	05
13	Plant Tissue Culture Techniques	Role of Tissue Culture Techniques, its Methods viz., Micropropagation, Micro-grafting and Meristem culture, Embryo culture, etc.	05
14	Maintenance of Elite Germplasm and Mother Stock	Evaluation, Maintenance and Conservation of elite germplasm and mother stock for further use in propagation of Vegetable, Flower and Medicinal plants	05
15	Use of Growth Regulators in Plant Propagation, Plant Protection Measures in Nursery	Def'n- Plant growth regulators and their role in sexual and asexual propagation (in brief)	05
		Insect-pest and disease control and Precautionary measures in nursery	05
16	JOINT AGRESCO - State Recommendations, National Varieties and Recommendations		05
		Total=	**100**

TEACHING SCHEDULE

PRACTICAL [VS-121]

Exercise No.	Exercise Title
1	Identification of planting material used in vegetable, flower and medicinal crops.
2	Identification of different garden tools and implements used for propagation.
3	Location and site selection for layout of nursery.
4	Study of various soil and soilless media for plant propagation.
5-6	Preparation of nursery beds and sowing of seeds.
7	Study of seed germination, raising of rootstock/ seedlings.
8	Study of different propagation structures in nursery production.
9	Potting, reporting and preparation of plant material for potting
10-11	Seed treatments for breaking seed dormancy, including germination and growth of seedlings.
12	Methods of irrigation.
13	Methods of propagation: sexual and asexual, its merits and demerits.
14	Practicing different cutting methods in vegetables, flowers and medicinal plants.
15	Practicing different grafting methods in vegetables, flowers and medicinal plants.
16	Practicing different budding methods in vegetables, flowers and medicinal plants.
17	Practicing different layering methods in vegetables, flowers and medicinal plants.
18	Practicing different types of runners, offsets and other specialized plant organs for propagation.
19	Preparation of growth regulators for seed germination and vegetative propagation
20	Use of mist chamber in plant propagation and hardening of plants.
21	Digging/uprooting, labeling and packing of nursery plant.
22	Use of plant protection measures in nursery.
23	Crop-specific plant propagation practices.
24	Study of drenching, foliar application of nutrients and fertigation.
25	Application of manures and fertilizer mixtures.
26	Raising, maintenance and cost of different nursery structures.
27	Maintenance of nursery record.
28	Marketing requirements and strategies for sale of important crops.
29	Visit to Local Nurseries and Florist Centres.
30	Visit to Plant Tissue Culture Laboratory.
31	Cost of establishment of propagation structures.
32	Accreditation of Nursery.

Suggested Readings [VS-121]:

1. **Hartmann and Kester.** Plant Propagation: Principles and Practices.
2. **Tarai Ranjan Kumar.** Plant Propagation and Nursery Management.

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B.Sc. (Hons.) Horticulture

#List/ Bouquet of Skill Enhancement Courses (SECs)

Sr. No.	Course No.	Course Title	Credit Hrs.
1.	**SEC-xxx**	Mushroom Cultivation	2(0+2)
2.	**SEC-xxx**	Orchard Floor Management	2(0+2)
3.	**SEC-xxx**	Apiculture	2(0+2)
4.	**SEC-xxx**	Landscape Gardening	2(0+2)
5.	**SEC-xxx**	Packing and Packaging of Horticultural Crops	2(0+2)
6.	**SEC-xxx**	Farm Machinery	2(0+2)
7.	**SEC-xxx**	Introduction to Forestry	2(0+2)
8.	**SEC-xxx**	Installation, Operation and Maintenance of Microirrigation System	2(0+2)
9.	**SEC-xxx**	Computer Programming and Data Structures	2(0+2)
10.	**SEC-xxx**	Turf and Turf Management	2(0+2)
11.	**SEC-xxx**	Post-harvest Management of Horticulture Crops	2(0+2)
12.	**SEC-xxx**	Nursery Production in Horticulture Crops	2(0+2)
13.	**SEC-xxx**	Seed production Techniques in Vegetables Crops	2(0+2)
14.	**SEC-xxx**	Sericulture	2(0+2)
15.	**SEC-xxx**	Dairy Management	2(0+2)
16.	**SEC-xxx**	Ornamental Fishery	2(0+2)
17.	**SEC-xxx**	Poultry Management	2(0+2)
18.	**SEC-xxx**	Biofertilizers and Biopesticides	2(0+2)

Note: (i) Skill Enhancement Courses can be added/offered as per the facilities and resources available at the respective universities/colleges based on the relevance to the region and the UG degree subject.

(ii) The host University/ College may also choose suitable SEC courses from those listed under other UG degree programs.

(iii) Above list/ bouquet of SEC courses is an indicative list and subject to modification as applicable therein.

(iv) In case of unavailability of the detailed course-wise syllabus/ teaching schedules of any of above SEC courses, the same can be primarily developed and followed at College/ University level in the academic year, 2024-25. However, the same can be obtained from the respective UG Degree Coordinator/ Discipline Coordinators and can be followed w.e.f. AY, 2025-26.

Skill Enhancement Courses (SECs): Detailed Syllabi

[in continuation of the SECs syllabi given under I semester curriculum]

Semester	**:**	**II**			
Course No.	**:**	**SEC-xxx**	**Credit Hrs.**	**:**	**2(0+2)**
Course Title	**:**	**Landscape Gardening**			

SYLLABUS

Objectives:

(i) To impart skill in identification of ornamental plants,

(ii) To impart skills in preparation of garden designs.

TEACHING SCHEDULE

PRACTICAL [SEC-xxx]

Exercise No.	Exercise Title
1-2	Identification and use of garden tools and equipments.
3	Study of growth characters, identification and classification of ornamental trees.
4	Study of growth characters, identification and classification of ornamental shrubs.
5	Study of growth characters, identification and classification of ornamental climbers.
6	Study of growth characters, identification and classification of ground covers.
7	Study of growth characters, identification and classification of indoor plants.
8-10	Making and maintenance of edge and hedge.
11-13	Making and maintenance of topiary.
14-15	Establishment and maintenance of a lawn.
16-17	Bonsai making.
18	Art principles of landscaping.
19-20	Planning, designing and layout of Formal gardens.

Continued…

21-22	Planning, designing and layout of Informal gardens.
23-24	Planning, designing and establishment of garden features.
25-26	Landscape design process: Landscape drafting tools and dimensioning, graphic symbols and notations.
27	Site analysis and landscape designing of Residential building.
28	Site analysis and landscape designing of Public buildings.
29	Site analysis and landscape designing of Religious places.
30	Landscape planning of Roads and Roundabouts.
31	Visit to Community Parks.
32	Visit to Institutional Gardens.

Suggested Readings [SEC-xxx]:

1. **G.S. Randhawa and A.K. Mukhopadhyay.** Floriculture in India. Allied Publisher Pvt. Ltd.
2. **J.S. Arora.** Introductory Ornamental Horticulture. Kalyani Publishers.
3. **A.K. Tiwari**. Fundamentals of Ornamental Horticulture and Landscape Gardening. NIPA.
4. **J.E. Ingels.** Landscaping Principles and Practices. Delmer Cengage Learning.

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Semester	**:**	**II**			
Course No.	**:**	**SEC-xxx**	**Credit Hrs.**	**:**	**2(0+2)**
Course Title	**:**	**Turf and Turf Management**			

SYLLABUS

Objectives:

(i) To impart hands-on training on practical aspects of turf management practices.

(ii) To impart entrepreneurial skills in turf establishment.

TEACHING SCHEDULE

PRACTICAL [SEC-xxx]

Exercise No.	Exercise Title
1-2	Site analysis for turf establishment.
3-4	Field preparation and layout for turf making.
5-6	Identification and classification of turf grasses.
7-9	Turf establishment methods.
10	Sod production.
11	Turf irrigation management.
12	Nutrient management in turf grasses.
13-14	Special practices in turf management.
15	Rejuvenation of old and withered turf.
16	Equipments for turf management.
17-18	Selection and maintenance of grasses for Golf course.
19-20	Selection and maintenance of grasses for Cricket ground.
21-22	Turfing for Roof top gardens.
23	Applications and use of Turf growth regulators (TGRs).
24	Identification of seasonal turf grass weeds.
25	Integrated approaches for turf weed management.

Continued…

26	Identification and management of turf grass diseases.
27	Identification and management of turf grass insect-pests.
28	Identification and management of turf grass abiotic stress and disorders.
29	Identification and management of turf grass nutrient deficiencies.
30-32	Visits to Commercial/ Institutional/ School/ Religious gardens and Golf court.

Suggested Readings [SEC-xxx]:

1. **G.S. Randhawa and A.K. Mukhopadhyay.** Floriculture in India. Allied Publisher Pvt. Ltd.
2. **J.S. Arora.** Introductory Ornamental Horticulture. Kalyani Publishers.
3. **A.K. Tiwari**. Fundamentals of Ornamental Horticulture and Landscape Gardening. NIPA.
4. **J.E. Ingels.** Landscaping Principles and Practices. Delmer Cengage Learning.

Course Curriculum of Third Semester as per the ICAR-Sixth Deans' Committee Report for the Academic Programmes in HORTICULTURE

- UG-Certificate in Horticulture
- UG-Diploma in Horticulture
- UG-Degree: B.Sc. (Hons.) Horticulture

Mahatma Phule Krishi Vidyapeeth, Rahuri

Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola

Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani

Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli

Maharashtra Agricultural Universities Examination Board, Pune

Compiled & Submitted by

Dr. P.C. Mali

Associate Dean, College of Horticulture, Mulde (Dr.BSKKV)

UG Degree Syllabus State Coordinator

with

UG Degree Syllabus Discipline Coordinators &

DICC - UG Degree Syllabus Core Committee

Submitted to the

Directors of Instruction Coordination Committee

~ w.e.f. AY, 2025-26 ~

Course Curriculum of Third Semester as per the
ICAR-Sixth Deans' Committee Report for Academic Programmes in
HORTICULTURE

Course Layout

B.Sc. (Hons.) Horticulture

Semester: III (New) ***w.e.f.*** **Academic Year: 2025-26**

Sr. No.	Course No.	Course Title	Credits Hrs.	Remark
1.	**AEC-235**	Physical Education, First Aid, Yoga Practices and Meditation	2(0+2)	--
2.	**MDC-233**	Agricultural Marketing and Trade	3(2+1)	--
3.	**VS-232**	Commercial Vegetable Production	4(3+1)	--
4.	**SSAC-231**	Fundamentals of Soil Science	3(2+1)	--
5.	**FS-232**	Commercial Fruit Production	4(3+1)	--
6.	**PATH-231**	Disease Management of Horticultural Crops	3(2+1)	--
7.	**SEC-235**	Skill Enhancement Course-V [#] (*To be offered from the list of SEC Courses*)	2(0+2)	--
8.	**OC-1/ OC-2/…**	Online Course(s)/ MOOCs[†]	As opted by student	**NG**
		Total Credits Hrs.=	**21(12+9)**	**G**

AEC: Ability Enhancement Course, **MDC**: Multidisciplinary Course,
SEC: Skill Enhancement Course, **OC**: Online Course, **G**: Gradial, **NG**: Non-gradial

[†]**Note:** It is mandatory for each Student to complete **total 10 credits** (Non-gradial) of **Online Courses** from available resources across III to VIII semesters under the guidance of assigned Faculty/ Advisor.

Course-wise Syllabus with Teaching Schedules

Semester	**:**	**III**			
Course No.	**:**	**AEC-235**	**Credit Hrs.**	**:**	**2(0+2)**
Course Title	**:**	**Physical Education, First Aid, Yoga Practices and Meditation**			
Gradial Common Course across all UG Degrees					

SYLLABUS

Objectives : (i) To make the students aware about Physical Education, First Aid and Yoga Practices,

(ii) To disseminate the knowledge and skill how to perform physical training, perform first aid and increase stamina and general wellbeing through Yoga.

PRACTICAL

Physical Education; Training and Coaching- Meaning and concept; Aerobic and Aerobic exercises; Calisthenics, Weight Training, Circuit Training, Interval Training, Fartlek Training; Effect of Exercise on Muscular, Respiratory, Circulatory and Digestive systems; Balanced Diet and Nutrition- Effect of Diet on Performance; Physiological Changes due to ageing and Role of exercise on ageing process; Personality, its dimensions and types, Role of Sports in Personality Development; Motivation and Achievements in Sports; Learning and Theories of Learning; Adolescent Problems and its Management; Posture; Postural Deformities, Exercises for Good Posture.

Yoga: History of Yoga, Types of Yoga, Introduction to Yoga.

- Asanas (Definitions and Importance)- Padmasan, Gaumukhasan, Bhadrasan, Vajrasan Shashakasan, Pashchimothasan, Ushtrasan, Tadasan, Padhastasan, Ardhchandrasan, Bhujangasan, Utanpadasan, Sarvangasan, Parvatasan, Patangasan, Shishupalanasan- left & right leg, Pavanmuktasan, Halasan, Sarpasan, Ardhdhanurasan, Shawasan.
- Suryanamaskar, Pranayama (Definitions and Importance)- Omkar, Suryabhedan, Chandrabhedan, Anulom, Vilom, Shitali, Shitkari, Bhastrika, Bhramari.
- Meditation (Definitions and Importance)- Yogic Kriyas (Kapalbhati), Tratak, Jalneti and Tribandh
- Mudras (Definitions and Importance)- Gyanmudra, Dhyanmudra, Vayumudra, Akashmudra, Prutvimudra, Shunyamudra, Suryamudra, Varunmudra, Pranmudra, Apanmudra, Vyanmudra, Uddanmudra.
- Role of Yoga in Sports.
- Teaching of Asanas- Demonstration, Practice, Correction and Practice.

History of Sports and Ancient games, Governance of Sports in India; Important Sporting events- Awards in sports, History, Latest rules, Measurement of playfield, Specifications of equipment, Skill, Technique, Style and Coaching of major games (Cricket, Football, Table tennis, Badminton, Volleyball, Basketball, Kabaddi and Kho-Kho) and Athletics.

Need and Requirement of First Aid: First Aid techniques, Equipment and Upkeep First Aid techniques; First aid-related with respiratory system; First aid-related with Heart, Blood and Circulation; First Aid-related with wounds and injuries; First Aid-related with Bones, Joints muscles related injuries; First Aid-related with Nervous system and Unconsciousness; First Aid-related with Gastrointestinal Tract, Skin Burns; First Aid-related with Bites and stings, poisoning; First Aid-related with Sense organs; Handling and transport of injured traumatized persons- Sports injuries and their Treatments.

TEACHING SCHEDULE

PRACTICAL [AEC-235]

Exercise No.	Topic	Exercise Title / Sub-topics
1	**Physical Education**	To study the training and coaching- Meaning and concept of Physical Education.
2 - 7	**Methods of Training**	To study the method of training - Aerobic and Aerobic Exercises.
		To study the method of training - Calisthenics
		To study the method of training - Weight Training
		To study the method of training - Circuit Training
		To study the method of training - Interval Training
		To study the method of training - Fartlek Training
8	**Effect of Exercise**	To study the effect of exercise on Muscular, Respiratory, Circulatory and Digestive systems.
9	**Balanced Diet and Nutrition**	To study the Balanced Diet and Nutrition- Effect of diet on performance.
10	**Physiological Changes**	To study the physiological changes due to ageing and role of exercise on ageing process.
11	**Personality Development**	To study the dimensions and types - Role of sports in personality development.

Continued…

12	**Motivation and Achievements in Sports**	To study the Motivation and Achievements in Sports
13	**Learning and Theories of Learning**	To study the Learning and Theories of Learning
14	**Adolescent Problems and its Management**	To study the Adolescent Problems and its Management
15	**Posture**	To study the Postural Deformities, Exercises for Good Posture
16 - 22	**Yoga**	To study the Introduction, History and Types of Yoga
		To study the Asanas: Padmasan, Gaumukhasan, Bhadrasan, Vajrasan Shashakasan, Pashchimotasan, Ushtrasan, Tadasan, Padhastasan, Ardhchandrasan, Bhujangasan, Utanpadasan, Sarvangasan, Parvatasan, Patangasan, Shishupalanasan- left leg- right leg, Pavanmuktasan, Halasan, Sarpasan, Ardhdhanurasan, Shawasan.
		To study the Suryanamaskar, Pranayama, Omkar, Suryabhedan, Chandrabhedan, Anulom, Vilom, Shitali, Shitkari, Bhastrika, Bhramari.
		To study the Meditation, Yogic Kriyas (Kapalbhati), Tratak, Jalneti and Tribandh
		To study the Mudras: Gyanmudra, Dhyanmudra, Vayumudra, Akashmudra, Prutvimudra, Shunyamudra, Suryamudra, Varunmudra, Pranmudra, Apanmudra, Vyanmudra, Uddanmudra.
		To study the Role of Yoga in Sports
		To study the Demonstration, Practice, Correction and Practice of Asanas.
23 - 26	**Sports**	To study the History of Sports and Ancient Games
		To study the Governance of Sports in India
		To study the Awards in Sports, History, Latest rules, Measurement of playfield, Specifications of equipment in important sporting events.
		To study the Skill, Technique, Style and Coaching of major games (Cricket, Football, Table Tennis, Badminton, Volleyball, Basketball, Kabaddi and Kho-Kho and Athletics).

Continued...

27 - 32	**First Aid**	To study the Need and Requirement of First Aid- First Aid techniques, Equipment and Upkeep.
		To study the First aid related with Respiratory system, Heart, Blood and Circulation.
		To study the First aid related with Wounds and Injuries, Bones, Joints muscles related injuries.
		To study the First aid related with Nervous system Unconsciousness, Sense organs.
		To study the First aid related with Gastrointestinal Tract, Skin Burns, Bites and Stings, Poisoning.
		To study the Handling and Transport of Injured Traumatized Persons- Sports Injuries and their Treatments.

Semester	**:**	**III**		
Course No.	**:**	**MDC-233**	**Credit Hrs.**	**: 3(2+1)**
Course Title	**:**	**Agricultural Marketing and Trade**		
Gradial Common Course among 3 UG Degrees (with different Course Nos.) viz., **B.Sc. (Hons.) Horti. / B.Tech. (Food Tech.) / B.Sc. (Hons.) ABM**				

SYLLABUS

Objectives:

(i) To understand the fundamentals of Agricultural Marketing and Trade,

(ii) To analyse the factors influencing supply and demand in agricultural markets,

(iii) To explore different marketing channels and strategies in Agriculture,

(iv) To examine the role of Government Policies and Regulations in agricultural markets.

THEORY

Agricultural Marketing: Concepts and Definitions of Market, Marketing, Agricultural Marketing, Market structure, Marketing mix and Market segmentation, Classification and Characteristics of Agricultural markets; Demand, Supply and Producer's surplus of agri-commodities: 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; 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; Marketing process and Functions: Marketing process concentration, dispersion and equalization; Exchange functions – buying and selling; physical functions – storage, transport and processing; Facilitating functions – packaging, branding, grading, quality control and labeling (Agmark); Market functionaries and marketing channels: Types and importance of agencies involved in agricultural marketing; meaning and Definition of Marketing Channel; Number of channel levels; Marketing channels for different farm products; Integration, Efficiency, Costs and Price spread: Meaning, Definitions and Types of market integration; Marketing efficiency; Marketing costs, margins and price spread; Factors affecting cost of marketing; Reasons for higher marketing costs of farm commodities; Ways of reducing marketing costs; Role of Govt. in agricultural marketing: Public sector institutions- NAFED, TRIFED, NCDC, APEDA, CWC, SWC,FCI, CACP, DMI – their objectives and functions;

Cooperative marketing in India; Risk in marketing: Types of risk in marketing; Speculation and hedging; An overview of futures trading; Agricultural prices and policy: Meaning and functions of price; Administered prices; Need for agricultural price policy; Trade: Concept of International Trade and its need, Theories of absolute and comparative advantage. Present status and prospects of international trade in agri-commodities; WTO; Agreement on Agriculture (AoA) and its implications on Indian Agriculture; IPR. Role of APMC and its relevance in the present-day context.

PRACTICAL [MDC-233]

Plotting and study of demand and supply curves and calculation of elasticities; Study of relationship between market arrivals and prices of some selected commodities; Computation of marketable and marketed surplus of important commodities; Study of price behaviour over time for some selected commodities; Construction of index numbers; Visit to a local market to study various marketing functions performed by different agencies, Identification of marketing channels for selected commodity; Collection of data regarding marketing costs, margins and price spread and Presentation of report in the class; Visit to market institutions - NAFED, SWC, CWC, Cooperative Marketing Society etc.- To study their organization and functioning. Application of principles of comparative advantage of International Trade.

TEACHING SCHEDULE

THEORY [MDC-233]

Lecture No.	Topic	Sub-topics / Key Points	Weightage (%)
1	Market and Marketing	Meaning – Definitions – Components of market – Market structure – Meaning – Components – Market conduct – Market performance	4
2	Agricultural Marketing	Meaning – Definition – Scope – Subject matter – Importance of Agricultural Marketing in economic development.	6
3		Market structure, Marketing mix and Market segmentation	
4	Classification and Characteristics of Agricultural Market	Classification of markets – On the basis of Location, Area of coverage, Time span, Volume of transaction, Nature of transaction, Number of commodities, Degree of competition, Nature of commodities, Stage of marketing, Extent of public intervention, Type of population served, Accrual of marketing margins.	4
5	Demand and Supply	Demand, Supply and Producer's surplus of agri-commodities: Nature and Determinants of demand and Supply of farm products,	4
6	Producer's Surplus	Meaning- Marketable surplus- Marketed surplus- Importance- Factors influencing marketable surplus of agri-commodities	4
7 - 8	Pricing and promotion strategies	Pricing and promotion strategies; Pricing Considerations and Approaches – Cost-based and Competition-based pricing	6
9	Market Promotion	Advertising, Personal selling, Sales promotion and Publicity – their Meaning and Merits & Demerits;	4
10	Marketing Process and Functions	Marketing Process Concentration, Dispersion and Equalization	12
11		Marketing functions – Meaning -Exchange functions – Buying and Selling	
12		Physical Functions – Storage, Transport and Processing	
13		Facilitating Functions – Packaging, Branding, Grading, Quality control and Labeling (AGMARK)	
14	Market Functionaries and Marketing Channels	Types and Importance of agencies involved in Agricultural Marketing;	8
15 - 16		Meaning and Definition of Marketing Channel; Number of channel levels; Marketing channels for different farm products;	

Continued…

17	Market Integration	Definition-Types of Market integration- Horizontal, Vertical and Conglomeration-	4
18	Marketing Efficiency	Meaning- Definitions- Technical or Physical or Operational efficiency- Pricing or Allocative efficiency	4
19	Marketing Cost	Marketing Cost- Margins- Price spread- Factors affecting the costs of marketing- Reasons for higher marketing costs of agricultural commodities- Ways of reducing marketing costs for farm products	4
20	Role of Govt. in Agricultural Marketing	Govt. in Agricultural Marketing- Remedial measures Regulated markets-Definition- Important features of Regulated markets, Functions, Progress and Defects	4
21 - 22	Public Sector Institutions	Objectives and Functions of: ~ National Agricultural Cooperative Marketing Federation (NAFED)- Tribal Cooperative Marketing Development Federation (TRIFED)- National Cooperative Development Corporation (NCDC)- Agricultural and Processed Food Products Export Development Authority (APEDA)- Central Warehousing Corporation (CWC)- State Warehousing Corporations (SWC)- Food Corporation of India (FCI)- Commission for Agricultural Cost and Prices (CACP)- Directorate of Marketing & Inspection (DMI)-	6
23	Cooperative Marketing	Meaning- Structure- Functions of Cooperative Marketing Societies-	2
24	Risk in Marketing	Types of Risk in Marketing-	6
25		Speculation & Hedging-; An overview of Futures trading-	
26	Agricultural Prices and Policy	Meaning and Functions of Price; Administered prices; Need for Agricultural Price Policy	4
27 - 28	International Trade	Concept of International Trade and its Need, International trade- Definition- International vs. Interregional trade- Free trade vs. Protection-	10
29		Theories of Absolute and Comparative Advantage	
30		Present status and Prospects of international trade in Agri-commodities; GATT and WTO	
31		Agreement on Agriculture (AoA) and its implications on Indian Agriculture; Intellectual Property Rights (IPR)	
32	APMC	Role of APMC and its relevance in the present-day context	4
		Total =	**100**

TEACHING SCHEDULE

PRACTICAL [MDC-233]

Exercise No.	Exercise Title
1	Plotting and Study of demand and supply curves.
2	Calculation of price and income elasticity of demand.
3	Study of the relationship between market arrivals and prices of selected commodities.
4	Computation of marketable and marketed surplus of important commodities.
5	Study of price behaviour (seasonal indices) over time for selected commodities.
6	Construction of simple and weighted price index numbers.
7	Visit to the local market to study different marketing functions performed by different Agencies.
8	Study and Identification of marketing channels for selected commodities.
9	Collection of data and estimation of marketing cost, marketing margin and price spread of selected commodities.
10	Introduction to different Public Agricultural Marketing Web Portals- (AgMarkNet, MSAMB).
11	Visit to NAFED –Organisational and Functional Study.
12	Visit to SWC/CWC- Study of Warehousing Operations.
13	Visit to Co-operative Marketing Society –Functional analysis.
14	Visit to Local Processing Unit.
15	Application of Absolute Advantage Theory in International Trade.
16	Application of Comparative Advantage Theory in International Trade.

Suggested Readings [MDC-233]:

1. **Acharya S.S. and Agarwal N.L.** 2006. Agricultural Marketing in India, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. **Chinna S.S.** 2005. Agricultural Economics and Indian Agriculture. Kalyani Pub, New Delhi.
3. **Dominic Salvatore**, Micro Economic Theory.
4. **Kohls Richard L. and Uhl Josheph N.** 2002. Marketing of Agricultural Products, Prentice-Hall of India Private Ltd., New Delhi.
5. **Kotler and Armstrong.** 2005. Principles of Marketing, Pearson Prentice-Hall.
6. **Lekhi R. K. and Joginder Singh.** 2006. Agricultural Economics. Kalyani Publishers, Delhi.
7. **Memoria C.B., Joshi R.L. and Mulla N.I.** 2003. Principles and Practice of Marketing in India, Kitab Mahal, New Delhi.
8. **Pandey Mukesh and Tewari Deepali.** 2004. Rural and Agricultural Marketing, International Book Distributing Co. Ltd, New Delhi.
9. **Sharma R.** 2005. Export Management, Laxmi Narain Agarwal, Agra.

Semester	**:**	**III**	
Course No.	**:**	**SSAC-231**	**Credit Hrs. : 3(2+1)**
Course Title	**:**	**Fundamentals of Soil Science**	

SYLLABUS

Objectives: To make the students aware about the importance of soil in relation to soil formation, texture, structure, water, temperature, aeration, nutrient availability, Soil Microbiology and soil survey.

THEORY

Composition of earth's crust, Soil as a Natural body - Major components. Eluviation, Illuviation formation of various soils. Physical parameters; Texture - Definition, Methods of textural analysis, Stock's law, Assumption, Limitations, Textural classes, Use of textural triangle; Absolute Specific gravity / Particle density, Definition, Apparent Specific Gravity / Bulk density - Factors influencing, Field bulk density. Relation between BD (Bulk Density), AD - Practical problems. Pore space - Definition, Factors affecting Capillary and Non-capillary porosity, Soil colour - Definition, its Significance, Colour variable, Value hue and Chroma. Munsell colour chart, Factors influencing, Parent material, Soil moisture, Organic matter, Soil structure- Definition, Classification, Clay prism like structure, Factors influencing genesis of soil structure, Soil consistency, Plasticity, Atterberg's constants. Soil air, Air capacity, Composition, Factors influencing, Amount of air space, Soil air renewal, Soil temperature - Sources and Distribution of heat, Factors influencing, Measurement, Chemical properties, Soil colloids, Organic, Humus, Inorganic, Secondary silicate, Clay, Hydrous oxides. Ion exchange, Cation-Anion importance, Soil water, Forms, Hygroscopic, Capillary and Gravitational, Soil moisture constants, Hygroscopic coefficient, Wilting point, Field capacity, Moisture equivalent, Maximum water holding capacity, Energy concepts, PF scale, Measurement, Gravimetric - Electric and Tensiometer methods - Pressure plate and Pressure membrane apparatus - Neutronprobe - Soil water movement- Classification - Aerial photography - Satellite of soil features - their Interpretation; Soil orders; Land capability classification; Soil of different eco-systems and their properties, Rock and Minerals classification, Pedogenic process. Objectives of Soil Science research institute in India (NBSS and LUP, ISSS, LTFE and NSSTL). Management of Soil crusting, Soil compaction and Soil compression. Soil Biology benefits and harmful effects. Methods and Objective of Soil survey, Remote sensing application in soil and plant Studies, Soil degradation.

PRACTICAL [SSAC-231]

Collection and preparation of soil samples, Estimation of moisture, EC, pH and Bulk density. Textural analysis of soil by Robinson's pipette method. Description of soil profile in the field. Quantification of minerals and their abundance. Determination of Soil colour using Munsell chart. Estimation of water holding capacity and Hydraulic conductivity of soils. Estimation of Infiltration rate using Double Ring Infiltrometer method. Estimation of soil moisture using gypsum block and neutron probe method. Soil compaction measurement with Penetrometer. Determination of pore space of soil. Determination of field capacity and permanent wilting point of soil. Determination of soil water potential characteristic curves by tensiometer and pressure plate apparatus. Aggregate size distribution analysis of soil. Air capacity of soil by field method. Nursery raising/ procurement and transplanting, Management and maintenance of the crop, Post-harvest handling, Quality control and marketing.

TEACHING SCHEDULE

THEORY [SSAC-231]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1 - 2	Composition of Earth's Crust, Soil as a Natural Body - Major Components	History and Development of Soil Science, its Scope and Importance. Soil as natural body, Pedological and Edaphological concept of soil	4
3 - 5	Rock and Minerals Classification	Definition, Classification, Properties	6
6 - 7	Processes and Factors of Soils Formation	Eluviation, Illuviation formation of various soils, Pedogenic process, Development of soil profile and Components. Soils of India and Maharashtra	10
8 - 12	Soil Physical Properties	Physical parameters; Texture - Definitions, Methods of textural analysis, Stock's Law, Assumption, Limitations, Textural classes, Use of textural triangle	4
		Absolute Specific gravity / Particle density, Definitions, Apparent Specific gravity / Bulk density - Factors influencing, Field bulk density. Relation between BD (Bulk Density), Practical problems	4
		Pore space - Definition, Factors affecting capillary and non-capillary porosity	2
		Soil structure, Definition, Classification, Clay prism like structure, Factors influencing genesis of soil structure	4
		Soil consistency, Plasticity, Atterberg's constants	2
13	Soil Colour	Definition, its Significance, Colour variable, Value, Hue and Chroma, Munsell colour chart, Factors influencing, Parent material, Soil moisture, Organic matter	4
14	Soil Air	Air capacity, Composition, Factors influencing, Amount of air space, Soil air renewal, Effect on plant growth	4

Continued…

15	Soil Temperature	Soil temperature, Sources and Distribution of heat, Factors influencing, Measurement	4
16 - 17	Soil Colloids	Chemical properties, Soil colloids, Organic, Humus, Inorganic, Secondary Silicate, Clay, Hydrous oxides	4
18	Ion Exchange	Mechanisms, Capacity, Cation-Anion importance	4
19 - 20	Soil Water	Forms, Hygroscopic, Capillary and Gravitational, Soil moisture constants, Hygroscopic Coefficient, Wilting point, Field capacity, Moisture equivalent, Maximum water holding capacity, Energy concepts, PF scale, Measurement, Gravimetric - Electric and Tensiometer methods - Pressure plate and Pressure membrane apparatus - Neutronprobe -Soil water movement - Classification	8
21	Aerial Photography Satellite of Soil Features - Their Interpretation	Characteristics, Factors influence, Classification of aerial photography	4
22 - 23	Soil Taxonomy	Salient features of Soil Taxonomy Soil orders, Land capability classification	4
24	Soil Survey	Methods and Objective of soil survey, Types and Importance	4
25	Soil of Different Eco-systems and Their Properties	Different eco-systems and their properties	4
26	Objectives of Soil Science Research Institute in INDIA	NBSS and LUP, ISSS, LTFE and NSSTL	4
27 - 28	Management of Soil Crusting, Soil Compaction and Soil Compression	Kind, Characteristics, Causes, Management of these soils	4
29	Soil Biology	Soil Macro- and Microorganism, Their Beneficial and Harmful effects on soil and plant	4
30 - 31	Remote Sensing Application in Soil and Plant Studies	Definition, Utility, Principles / Stages and Application in Agriculture	4
32	Soil Degradation	Types, Causes, Effects and Managements	4
		Total=	**100**

TEACHING SCHEDULE

PRACTICAL [SSAC-231]

Exercise No.	Exercise Topic/ Title
1	Practical collection and preparation of soil samples.
2	Estimation of moisture, EC, pH and bulk density.
3	Estimation of bulk density of soil.
4	Textural analysis of soil by international pipette method.
5	Description of soil profile in the field.
6	Quantification of minerals and their abundance.
7	Determination of Soil colour using Munsell Chart.
8	Estimation of Water holding capacity and Hydraulic conductivity of soils.
9	Estimation of infiltration rate using Double ring infiltrometer method.
10	Estimation of soil moisture using Gypsum block and Neutron probe method.
11	Soil compaction measurement with Penetrometer.
12	Determination of pore space of soil.
13	Determination of Field capacity and Permanent wilting point of soil.
14	Determination of soil water potential characteristic curves by Tensiometer and Pressure plate apparatus.
15	Aggregate size distribution analysis of soil.
16	Air capacity of soil by Field method.

Suggested Readings [SSAC-231]:

1. **Das D.K.** 2011. Introductory Soil Science. Third Revised Edition Kalyani Publishers. Ludhiana.
2. Fundamentals of Soil Science by Indian Society of Soil Science. Second Revised Edition 2009. Indian Society of Soil Science. New Delhi.
3. **Nyle C Brady and Weil Ray R.** 2016. The Nature and Properties of Soils. 15th Edition. Prentice Hall of India Pvt Ltd. New Delhi.
4. **Sharma Pradeep K.** 2017. Introduction to Soil Physics. First Edition, Westville Publishing House, New Delhi. Report of ICAR- Sixth Deans' Committee, P 888.
5. **Saha A.K.** 2008. Text Book of Soil Physics. Reprinted. Kalyani Publishers. Ludhiana.
6. **Sehgal J.A.** 2005. Textbook of Paedology Concepts and Applications. Kalyani Publishers.

Semester	**: III**		
Course No.	**: FS-232**	**Credit Hrs.**	**: 4(3+1)**
Course Title	**: Commercial Fruit Production**		

SYLLABUS

Objectives : To acquaint the students with the cultivation techniques for commercially important tropical, sub-tropical and temperate fruit crops.

THEORY

Area, Production and Export potential, Varieties, Soil and Climate requirements, Propagation techniques, Planting density and Systems, Training and Pruning, High Density Planting, Ultra-High-Density Planting, Mechanization, Management of water, Nutrient and Weeds, Physiological disorders, Special production problems, Insect-Pests, Diseases and their Control measures. Post-harvest technology, Harvest indices, Harvesting methods, Grading, Packaging and Storage of the following crops: Mango, Banana, Citrus, Guava, Litchi, Grapes, Papaya, Pineapple, Ber, Aonla, Pomegranate, Sapota, Jamun, Date palm, Apple, Pear, Peach, Plum, Cherry, Almond, Apricot, Walnut, Kiwi fruit, Hazelnut, Chestnut, Pecan nut and Strawberry. Plantation crops - Oil Palm and Palmyrah palm.

PRACTICAL

Description and identification of varieties. Training and pruning, Application of manure, fertilizer and irrigation, Weed control, Maturity standards, Harvesting, Handling, Grading and Packaging of fruits. Visit to commercial orchards.

TEACHING SCHEDULE

THEORY [FS-232]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1 - 2	Area, Production and Export Potential Fruit and Plantation Crops	Introduction, brief History, Origin and Distribution and Present status, Constraint faced in production of fruit crops and plantation crops	7
3	Planting Density and Systems	High-Density Planting, Ultra High-Density Planting and Square, Rectangle, Diagonal, Hexagonal, Contour etc. Planting systems in fruit crops	5
4	Mechanization in Fruit and Plantation Crops	Scope and Importance of Mechanization in fruit and plantation crops. Advantages and Disadvantages of Mechanization in fruit and plantation crops	5
5 - 7	Mango	Varieties, Soil and Climate requirements, Propagation techniques, Training and Pruning, Management of water, Nutrient and Weeds, Physiological disorders, Special production problems, Insect-Pests, Diseases and their Control measures. Post-harvest technology, Harvest indices, Harvesting methods, Grading, Packaging and Storage	7
8 - 10	Banana and Papaya		7
11 - 14	Citrus (Mandarin, Sweet orange, Lime, Lemon, Pummelo)		7
15 - 18	Guava and Litchi		7
19 - 21	Grapes and Strawberry		7
22 - 25	Pineapple, Kiwi and Pomegranate		7
26 - 28	Ber, Aonla and Date palm		7
29 - 31	Sapota and Jamun		6
32 - 34	Apple, Pear and Peach		7
35 - 37	Plum, Apricot and Cherry		7
38 - 39	Almond and Hazelnut		3
40 - 42	Chest Nut, Pecan Nut and Walnut		5
43 - 44	Palmyra palm and Oil palm		2
45 - 46	Post-Harvest Technology followed in fruit and plantation crops	Importance, Major causes of losses, units of operation for post-harvest management in fruits and plantation crops	4
47 - 48	Summarized Revision		
		Total =	**100**

TEACHING SCHEDULE

PRACTICAL [FS-232]

Exercise No.	Exercise Title
1 - 2	Description and identification of varieties.
3 - 4	Study of Training and pruning in different fruit crops.
5 - 6	Application of manure and fertilizers in fruit crops.
7 - 8	Study of irrigation systems in different fruit crops.
9	Study of Weed control in different fruit crops.
10 -11	Maturity standards of different fruits crops.
12 - 13	Harvesting and handling of different fruits crops.
14 - 15	Grading and packaging of fruits crops.
16	Visit to commercial orchards.

Suggested Readings [FS-232]:

1. **Bal J. S.** Fruit Growing.
2. **Chattopadhyay T K.** A Textbook on Pomology Vol I-IV.
3. **George Acquaah.** Horticulture Principles and Practices.
4. ICAR. Handbook of Horticulture, Vol- I and II.
5. **Singh Ranjit.** Fruits. New Book Trust, New Delhi, 303 p.

Semester	**:**	**III**		
Course No.	**:**	**VS-232**	**Credit Hrs.**	**: 4(3+1)**
Course Title	**:**	**Commercial Vegetable Production**		

SYLLABUS

Objectives: Student shall gain expertise on commercial cultivation of vegetable crops.

THEORY

Importance of Olericulture. Vegetable gardens. Vegetable classification, Area, Production and Varieties. Package of practices of Tomato, Brinjal, Chillies, Capsicum, Moringa, Okra. Cucurbitaceous vegetables- Cucumber, Ridge gourd, Ash gourd, Snake gourd, Bottle gourd, Bitter gourd, Sponge gourd, Pumpkin, Melons. Cole crops - Cabbage, Cauliflower, Knol-khol. Bulb crops - Onion and Garlic. Beans and Peas - French beans, Cluster beans, Dolichos beans, Peas, Cowpea. Tuber crops - Potato, Sweet potato, Tapioca, Colocasia, Yams. Root crops - Carrot, Radish, Turnip, Beet root. Leafy vegetables – Broccoli, Lettuce, Spinach, Chinese cabbage and Asparagus.

PRACTICAL

Identification of vegetable crops and seeds; Planning, layout and maintenance of kitchen garden; Direct sowing of vegetables, Bed preparation and method of nursery sowing; Transplanting of vegetable seedlings; Method of fertilizer application and calculation of different fertilizer doses; Intercultural operations in vegetable crops, Harvesting, grading and packaging of vegetable crops, Economics of vegetable crops, Visit to commercial vegetable farms.

TEACHING SCHEDULE

THEORY [VS-232]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1 - 2	Importance of Olericulture	Scope and Importance of Olericulture, Nutritional importance, Medicinal importance	8
3 - 5	Vegetable Gardens	Kitchen, Market, Truck, Vegetable Garden for processing, for seed production, floating garden, etc.	7
6 - 9	Vegetable Classification	Botanical classification, Cultural, Hardiness, Parts used, Season of cultivation, etc.	7
10 - 13	Solanaceous Vegetables: (Tomato, Brinjal, Chilli, Capsicum)	Area, Production, Economic importance and Export potential, Description of varieties and hybrid, Climate and Soil requirements, Seed rate, Preparation of field, Nursery practices; Transplanting of vegetable crops and Planting for directly sown/transplanted vegetable crops. Spacing, Planting systems, Water and Weed management; Nutrient management and Deficiencies, Use of chemicals and growth regulators. Cropping systems, Harvest, Yield, Post-harvest handling, Economics and Marketing of given crops	10
14 - 15	Moringaceae and Malvaceae Vegetables (Moringa and Okra)		8
16 - 24	Cucurbitaceous Vegetables: (Cucumber, Ridge gourd, Ash gourd, Snake gourd, Bottle gourd, Bitter gourd, Sponge gourd, Pumpkin, Water melon, Musk melon)		10
25 - 27	Cole Crops: (Cabbage, Cauliflower, Knol-khol)		8
28 - 29	Bulb Crops: (Onion, Garlic)		8
30 - 34	Beans and Peas: (French beans, Cluster beans, Dolichos Beans, Peas, Cowpea)		6
35 - 39	Tuber Crops: (Potato, Sweet potato, Tapioca, Colocasia, Yams)		8
40 - 42	Root Crops: (Carrot, Radish, Turnip, Beet root)		8
43 - 45	Leafy Vegetables: (Amaranthus, Coriander, Fenugreek, Mustard)		6
46 - 48	Exotic Vegetables: (Broccoli, Lettuce, Spinach, Chinese cabbage, Asparagus)		6
		Total=	**100**

TEACHING SCHEDULE

PRACTICAL [VS-232]

Exercise No.	Exercise Title
1	Identification of Tropical and Subtropical vegetable crops.
2	Identification of Temperate vegetable crops.
3	Identification of Tuber crops.
4	Raising vegetable seedlings of improved varieties.
5	Field preparation and layout for vegetable and tuber crops.
6	Seed treatment and sowing of vegetable and tuber corps.
7	Planting and transplanting of vegetables and tuber crops.
8	Integrated weed management in vegetable and tuber crops.
9	Methods of irrigation.
10	Use of plant growth Regulators in vegetable production.
11 - 12	Identification of nutritional deficiencies in vegetable crops and tuber crops along with remedies.
13	Identification of physiological disorders in vegetable and tuber crops.
14	Harvesting indices and maturity standards in vegetable and tuber crops.
15	Packaging and storage of vegetable and tuber crops.
16	Visit to commercial vegetable and tuber production plot.

Suggested Readings [VS-232]:

1. **Bose and Som.** 2003. Vegetable Crops. Vol I, II and III. Naya Prakash.
2. **Dhaliwal M.S.** 2014. Handbook of Vegetable Crops. Kalyani Publishers.
3. **Fageria M.S.**, **Choudhary B.R. and Dhaka.** Vegetable Crop Production Technology, Vol-II. Kalyani Publishers.
4. **Hazara and Som.** 2015. Technology for Vegetable Production and Improvements. Naya Prokash.
5. **ICAR** 2019. Handbook of Horticulture. Vol-1 and 2, ICAR, New Delhi.

Semester	**:**	**III**	
Course No.	**:**	**PATH-231**	**Credit Hrs. : 3(2+1)**
Course Title	**:**	**Disease Management of Horticultural crops**	

SYLLABUS

Objectives:

(i) To study the basics Plant Pathology,

(ii) To identify various pathogen structures and diagnose the diseases of horticultural crops in field,

(iii) To understand the disease cycle and epidemiology of various diseases of horticultural crops,

(iv) To give an overview of various disease management methods (Cultural, Physical Biological, Chemical).

THEORY

Etiology, Symptoms, Mode of spread, Epidemiology and Integrated Management of the diseases of Fruits, Plantation, Medicinal, Aromatic, Vegetables, Ornamental and Spice crops *viz.* Mango, Litchi, Banana, Grape, Citrus, Guava, Sapota, Papaya, Jack fruit, Pineapple, Pomegranate, Ber, Apple, Pear, Peach, Plum, Almond, Walnut, Strawberry, Tomato, Brinjal, Chilli, Bhindi, Cabbage, Cauliflower, Radish, Knol-khol, Pea, Beans, Beet root, Onion, Garlic, Fenugreek, Ginger, Potato, Areca nut, Coconut, Oil palm, Coffee, Tea, Cocoa, Cashew, Rubber, Turmeric, Pepper, Cumin, Cardamom, Nutmeg, Coriander, Clove, Cinnamon, Jasmine, Rose, Crossed, Tuberose, Gerbera, Anthurium, Geranium, Marigold, Gladiolus. Important post-harvest diseases of Fruit, Plantation, Medicinal, Aromatic, Vegetables, Ornamental and Spice crops and their management. Etiology, Symptoms and Integrated management of important plant parasitic nematodes of Fruits - (Tropical, Sub-tropical and Temperate) Vegetables, Tuber, Ornamental, Spice and Plantation crops.

PRACTICAL

Observations of disease symptoms, Identification of casual organisms and Host-Parasite relationship of important diseases of Fruits, Plantation, Medicinal, Aromatic, Vegetables, Ornamental and Spice crops. Collection and preservation of diseased plant specimen.

TEACHING SCHEDULE

THEORY [PATH-231]

Lecture No.	Topics with Sub-topics/ Key Points	Weightage (%)
Fundamentals of Plant Pathology		**20**
1	Introduction, Scope, Importance and Objectives of Plant Pathology; Different Concepts and Terminologies used in Plant Pathology	8
	Historical Development of Plant Pathology	
2	Causes of Plant diseases (Biotic- Fungi, Bacteria, Actinomycetes, Mycoplasma, Protozoa, Algae etc.; Mesobiotic- Virus, Viroid and Abiotic Factors); General Characters of plant pathogens, Symptoms and Signs	8
3	Survival, Perpetuation and Dissemination of plant pathogens/ diseases	4
	Pathogenicity; Disease triangle; Infection process and Avenues of Penetration	
4	Principles of Plant Disease Management; Classification of Fungicides	
Etiology, Symptoms, Mode of spread and Integrated Management of Diseases in respect of following Fruit, Vegetable, Plantation, Spice and Ornamental Crops:		
Fruit Crops *viz*;		**30**
5 - 6	Mango: Powdery mildew, Anthracnose, Die-back, Gummosis, Pink disease, Malformation, Red rust, Loranthus	6
7 - 8	Banana: Panama wilt, Anthracnose, Leaf spot, (Sigatoka), Erwinia rot, Infectious chlorosis, Bunchy top, Cigar end rot	
9 - 10	Grape: Downy mildew, Powdery mildew, Anthracnose, Bacterial canker, Fan leaf. Pomegranate: Oily spot, Anthracnose	6
11 - 12	Citrus: Gummosis, Anthracnose, Ganoderma root rot, Powdery mildew, Canker, Greening. Tristeza, Exocortis, Khaira	6
13	Guava: Wilt, Canker Sapota: Fruit rot Litchi: Anthracnose, Fruit rot	4
14	Papaya: Foot rot, Powdery mildew, Anthracnose, Mosaic, Leaf curl, Ring spot	3
15	Jackfruit: Die-back, Fruit rot Pineapple: Heart rot, Base rot, Wilt Strawberry: Leaf spot, Anthracnose, Wilt Ber: Powdery mildew	
16	Apple: Scab, Fire blight, Mosaic	5

Continued…

Vegetable Crops *viz*;		**30**
17 - 18	Tomato: Damping off, Early and Late blight, Wilts: Fusarial, Verticillium, Bacterial, Virus: Mosaic, Spotted wilt virus	10
19	Potato: Early and Late blight, Scab, Bacterial ring rot, Viruses: X, Y, Roll, Rugose, Crinkle	
20	Brinjal: Bacterial wilt, Phomopsis blight, Rust, Little leaf	
21	Chili: Powdery mildew, Anthracnose / Ripe fruit rot, *Churda Murda,*	
22	Ladies finger (Bhendi/Okra): Powdery mildew, Yellow vein mosaic	2
23	Cabbage/Cauliflower: Club root, Downy mildew, Powdery mildew	8
24	Radish: White rust, Knol-khol: Major disease, Beet root: Major disease	
25	Pea: Powdery mildew, Wilt, Enation and Necrosis virus Beans: Powdery mildew in Cluster and other Beans, Bacterial and *Alternaria* blight, Anthracnose, Bean mosaic diseases	6
26	Onion: *Alternaria* blight, Smudge, Downey mildew Garlic: Major disease	4
Plantation Crops *viz*;		**10**
27	Arecanut: Koleroga Coconut: Root wilt, Stem bleeding, Bud rot, Cadang-Cadang, Lethal yellow	6
28	Coffee: Rust Tea: Blister blight Betelvine: *Phytophthora* wilt, *Sclerotium* root rot Cocoa: Anthracnose, Witches broom	4
Spice Crops *viz*;		**05**
29	Pepper: *Phytophthora* foot rot, Anthracnose, Slow wilt Ginger: Rhizome rot Turmeric: Leaf spot, Rhizome rot Cardamom: Major diseases Nutmeg: Die-back, wilt	05
30	Coriander: Powdery mildew, Stem gall Clove: Die-back, *Colletotrichum* Cinnamon: Leaf spot, Die-back Cumin: Wilt, Powdery mildew	
Ornamental Crops *viz*;		**05**
31	Rose: Powdery mildew, Rust, Die-back, Stem canker Chrysanthemum: Leaf spot, Powdery mildew Merigold: Alternaria spot / Blight Jasmine: Rust, Anthracnose	05
32	Gladiolus, Carnation: Major diseases Gerbera: Powdery mildew, Leaf blight Crossandra: Wilt Geranium: Major diseases	
Total=		**100**

TEACHING SCHEDULE

PRACTICAL [PATH-231]

Exercise No.	Exercise Title
1	Study of microscope and acquaintance with various laboratory equipments.
2	Study of different plant disease symptoms.
3	Preparation of culture media.
4	Isolation and purification of plant pathogens.
5	Preparation of Bordeaux mixture.
6	Methods of applications of fungicides.
Observations of Disease symptoms; Identification of causal organisms and Host-parasite relationship; Collection and Preservation of Diseased Plant Specimens of important diseases of following crops ~	
7 - 9	Identification, specimen collection and management of major diseases of Fruit crops: Mango, Banana, Citrus, Grape, Guava, Sapota, Papaya, Pomegranate, Strawberry, Pineapple, etc
10 - 13	Identification, specimen collection and management of major diseases of Vegetable crops: Solanaceous, Cucurbitaceous, Cole crops, Root vegetables, Peas and Beans, Bulb crops, etc.
14	Identification, specimen collection and management of major diseases of Plantation crops: Coconut, Arecanut, Cocoa, Coffee, etc.
15	Identification, specimen collection and management of major diseases of Spices crops: Black pepper, Nutmeg, Clove, Cardamom, Turmeric, Ginger, etc.
16	Identification, specimen collection and management of major diseases of Ornamental crops: Rose, Gladiolus, Marigold, Chrysanthemum, etc.

Suggested Readings [PATH-231]:

1. **Gupta S.K. and Thind T.S.** 2018. Disease Problems in Vegetable Production. Scientific Publishers India, P.586.
2. **Gupta S.K., Sharma R.C. and Sharma M.** 2017. Diseases of Vegetable. Ornamental and Spice crops. Scientific Publishers India.
3. **Mehrotra R.S. and Aggarwal A.** 2003. Plant Pathology. 2nd Edn. Tata McGraw Hill Publication Com Ltd, P.846.
4. **Pathak V.N.** 1989. Diseases of Fruit Crops. Oxford and IBH Publication Comp. New Delhi, P. 309.
5. **Rangaswami G. and Mahadevan A.** 2002. Diseases of Crop Plants in India. 4th Edition. Prentice Hall of India Pvt. Ltd. New Delhi, P. 536.
6. **Singh R.S.** 1987. Diseases of Vegetable Crops. 2nd Edition. Oxford and IBH Publication. Comp. New Delhi, P. 362.
7. **Singh R.S.** 2018. Plant Diseases. 10th Edn. Oxford and IBH Publication. New Delhi, P. 821.
8. **Singh R.S**. 2018. Diseases of Fruit Crops. 2nd Edn. Med Tech. New Delhi, P. 281.

B.Sc. (Hons.) Horticulture

#List/ Bouquet of Skill Enhancement Courses (SECs)

[in continuation of the SECs' Syllabi prescribed under I and II semesters]

Sr. No.	Course No.	Course Title	Credit Hrs.
1.	**SEC-xxx**	Mushroom Cultivation	2(0+2)
2.	**SEC-xxx**	Apiculture	2(0+2)
3.	**SEC-xxx**	Orchard Floor Management	2(0+2)
4.	**SEC-xxx**	Landscape Gardening	2(0+2)
5.	**SEC-xxx**	Packing and Packaging of Horticultural Crops	2(0+2)
6.	**SEC-xxx**	Farm Machinery	2(0+2)
7.	**SEC-xxx**	Introduction to Forestry	2(0+2)
8.	**SEC-xxx**	Installation, Operation and Maintenance of Micro-Irrigation System	2(0+2)
9.	**SEC-xxx**	Computer Programming and Data Structures	2(0+2)
10.	**SEC-xxx**	Turf and Turf Management	2(0+2)
11.	**SEC-xxx**	Post-Harvest Management of Horticulture Crops	2(0+2)
12.	**SEC-xxx**	Nursery Production in Horticulture Crops	2(0+2)
13.	**SEC-xxx**	Seed Production Techniques in Vegetables Crops	2(0+2)
14.	**SEC-xxx**	Sericulture	2(0+2)
15.	**SEC-xxx**	Dairy Management	2(0+2)
16.	**SEC-xxx**	Ornamental Fishery	2(0+2)
17.	**SEC-xxx**	Poultry Management	2(0+2)
18.	**SEC-xxx**	Biofertilizers and Biopesticides	2(0+2)
19.	**SEC-xxx**	Horti-Tourism	2(0+2)

Note: (i) Skill Enhancement Courses can be added/offered as per the facilities and resources available at the respective universities/colleges based on the relevance to the region and the UG degree subject.

(ii) The host University/ College may also choose suitable SEC courses from those listed under other UG degree programs.

(iii) Above list/ bouquet of SEC courses is an indicative list and subject to modification as applicable therein.

(iv) In case of unavailability of the detailed course-wise syllabus/ teaching schedules of any of above SEC courses, the same can be primarily developed and followed at College/ University level in the current academic year. However, the same can be obtained from the respective UG Degree Coordinator/ Discipline Coordinators and can be followed w.e.f. AY, 2025-26.

Course Curriculum of Fourth Semester as per the ICAR-Sixth Deans' Committee Report for the Academic Programmes in HORTICULTURE

- UG-Certificate in Horticulture
- UG-Diploma in Horticulture
- UG-Degree: B.Sc. (Hons.) Horticulture

Mahatma Phule Krishi Vidyapeeth, Rahuri

Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola

Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani

Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli

Maharashtra Agricultural Universities Examination Board, Pune

Compiled &Submitted by

Dr. P.C. Mali

Associate Dean, College of Horticulture, Mulde (Dr.BSKKV)

UG Degree Syllabus State Coordinator

with

UG Degree Syllabus Discipline Coordinators &

DICC - UG Degree Syllabus Core Committee

Submitted to the

Directors of Instruction Coordination Committee

~ w.e.f. AY, 2025-26 ~

Course Curriculum of Fourth Semester as per the ICAR-Sixth Deans' Committee Report for Academic Programme in HORTICULTURE

Course Layout

B.Sc. (Hons.) Horticulture

Semester: IV (New) ***w.e.f.*** **Academic Year: 2025-26**

Sr. No.	Course No.	Course Title	Credit Hrs.	Remark
1.	**VAC-242**	Agricultural Informatics and Artificial Intelligence	3(2+1)	--
2.	**HORT-242**	Precision Farming and Protected Cultivation	3(2+1)	--
3.	**VS-243**	Seed Production of Vegetable, Tuber and Spice Crops	3(2+1)	--
4.	**FMP-241**	Farm Power and Machinery for Horticulture	3(2+1)	--
5.	**HORT-243**	Urban and Peri-Urban Horticulture	2(1+1)	--
6.	**ENTO-241**	Pest Management of Horticultural Crops	3(2+1)	--
7.	**AGRO-242**	Introductory Agrometeorology and Climate Change	2(1+1)	--
8.	**SEC-246**	Skill Enhancement Courses-VI[#] (*To be offered from the list of SEC Courses*)	2(0+2)	--
9.	**OC-1/OC-2/..**	Online Courses/ MOOCs[†]	As opted by student	NG
		Total Credit Hrs.=	**21(12+9)**	**G**
VAC: Value-added Course, **SEC**: Skill Enhancement Course, **OC**: Online Course, **G**: Gradial, **NG**: Non-gradial				
Post-IV Semester (Only for Exit option for award of UG-Diploma)				
10.	**INT-242**	Internship (10-Week)	10(0+10)	NG

[†] **Note:** It is mandatory for each Student to complete **total 10 credits** (Non-gradial) of **Online Courses** from available resources across III to VIII semesters under the guidance of assigned Faculty/Advisor.

Course-wise Syllabus with Teaching Schedules

Semester : **IV**		
Course No. : **VAC-242**	**Credit Hrs. : 3(2+1)**	
Course Title : **Agricultural Informatics and Artificial Intelligence**		
Gradial Common Course across B.Sc. (Hons.) Agriculture, B.Sc. (Hons.) Horticulture, B.Tech. (Biotechnology), B.Tech. (Food Technology), B.Sc. (Hons.) Agri. Business Management, B.Sc. (Hons.) Forestry, B.F.Sc. (Hons.), B.Sc. (Hons.) Community Science		

SYLLABUS

Objectives :

(i) To acquaint students with the basics of computer applications in Agriculture, multimedia, database management, application of mobile app and decision-making processes etc.,

(ii) To provide basic knowledge of computer with applications in Agriculture,

(iii) To make the students familiar with Agricultural-Informatics, its components and applications in Agriculture and Artificial Intelligence.

THEORY

Introduction to Computers, Anatomy of Computers, Memory Concepts, Units of Memory, Operating System: Definition and types, Applications of MS-Office® for creating, Editing and Formatting a document, Data presentation, Tabulation and graph creation, Statistical analysis, Mathematical expressions, Database- concepts and types, creating database, Uses of DBMS in Agriculture, Internet and World Wide Web (WWW): Concepts and components. Computer programming: General concepts, Introduction to general programming concepts and standard input/output operations. e-Agriculture, concepts, design and development; Application of innovative ways to use information and communication technologies (IT) in Agriculture, Computer Models in Agriculture: Statistical, weather analysis and crop simulation models, concepts, input-output files, limitation, advantages and application of models for understanding plant processes, sensitivity, verification, calibration and validation, IT applications for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management, Smartphone mobile apps in Agriculture for farm advice: Market price, post-harvest management etc. Geospatial technology: Techniques, components and uses for generating valuable agri-information, Decision support systems: Concepts, components and applications in Agriculture. Agriculture Expert System: Soil Information Systems etc. for

supporting farm decisions. Preparation of contingent crop planning and crop calendars using IT tools, Digital India and schemes to promote digitalization of agriculture in India. Introduction to Artificial Intelligence, background and applications, Turing test. Control strategies, Breadth-first search, Depth-first search, Heuristics search techniques: Best-first search, A*algorithm, IoT and Big Data; Use of AI in Agriculture for autonomous crop management and health, monitoring livestock health, intelligent pesticide application, yield mapping and predictive analysis, automatic weeding and harvesting, sorting of produce and other food processing applications; Concepts of Smart Agriculture, Use of AI in Food and Nutrition Science etc.

PRACTICAL

Study of computer components, accessories, practice of important DOS Commands, Introduction of different operating systems such as Windows, Unix/ Linux, creating files and folders, File Management. Use of MS-WORD and MS-PowerPoint for creating, editing and presenting a scientific document, MS-EXCEL - Creating a spreadsheet, Use of statistical tools, Writing expressions, Creating graphs, Analysis of scientific data. MS-ACCESS: Creating Database, preparing queries and reports, Demonstration of Agri-information system, Introduction to World Wide Web (WWW) and its components, Introduction of programming languages such as- Visual Basic, Java, Fortran, C, C++, Hands-on practice on Crop Simulation Models (CSM), DSSAT/Crop-Info/Crop Syst/Wofost, Preparation of inputs file for CSM and study of model outputs, Computation of water and nutrient requirements of crop using CSM and IT tools, Use of smart phones and other devices in agro-advisory and dissemination of market information, Introduction of Geospatial Technology, AR/VR demonstration, India Digital Ecosystem of Agriculture (IDEA).

TEACHING SCHEDULE

THEORY [VAC-242]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1- 3	**Introduction to Computers,** **Anatomy of Computers** **Memory Concepts:** **Operating System:**	Definitions; Characteristics of Computer; Components of Computer; CPU: CU, ALU, MU; Input Devices; Output Devices; Units of Memory: bit to TB, Types: Primary, Secondary; Definitions and Types: Single user, Multi-user and features. OS Special Types (Brief Overview): Batch, Real-Time, Time Sharing, Distributed, Network OS. Functions of operating system	7
4 - 6	**Applications of MS Office®**	MS Word: Creating a New Document, Formatting option features; Insertion of Table; MS Excel: Creating worksheet and graph, Functions for Data Analysis: AVERAGE, COUNT, SUM, MIN, MAX, MEDIAN, MODE, STDEV, STDEVP, VAR, VARP, CORREL, PERCENTILE; Mathematical functions in MS-Excel: SUM, AVERAGE, AVERAGEIF, COUNT, COUNTIF, MOD, ROUND	7
7 - 9	**Database and DBMS**	Database: Definitions, Concepts and Types; Uses of DBMS in Agriculture; Characteristics of Database; Structure of Database Management System, Tables: Concept of view, Primary key, Foreign key; Creating Database: SQL query: Create, Insert, Select, Delete, Update. Form: Steps for Creating Forms, Entering Data in forms, Report using MS-ACCESS: Steps for Creating Reports, Printing reports.	7

Continued…

10	**Internet and World Wide Web (www)**	Concepts and components; Internet: Introduction; Definition of LAN, WAN, MAN and Internet Internet Service Provider (ISP); World Wide Web; Hypertext; Web Browser; Web Page and Websites; E-Mail: Creating Email, Email Addresses, Using Email, Sending the message, CC and BCC; Search Engine	7
11 - 12	**Introduction to Computer Programming**	Computer Programming: Introduction, General concepts, Standard input/output operations.	7
13 - 14	**e-Agriculture**	Concepts, Application & Importance of IT in e-Agriculture; AGRINET: Introduction, Objectives; Advantages and Challenges in Agriculture.	7
15 - 16	**Computer Models in Agriculture**	Statistical, Weather Analysis and Crop Simulation Models; Concepts, Input-output files, Limitation, Advantages and Application of models for understanding plant processes, Sensitivity, Verification, Calibration and Validation	7
17 - 19	**IT and IoT Applications in Agriculture**	IT Applications & their role in Agriculture with emphasis on Computation of Water and Nutrient Requirement of Crop; IoT - Definition, Benefits/ Applications/ Uses in Agriculture: Precision Farming, Agricultural Drones, Smart Greenhouses, Drones; Challenges.	7

Continued…

20 - 21	**Computer-controlled Devices; Smartphone Apps and Geospatial Technology**	Computer-controlled Devices (Automated systems) for Agri-input management- Examples of Automation Devices: Robotics Application in Planting, Drones for Irrigation, Harvest Automation Tools, Automated Tractors etc., AWS - Automatic Weather Station, AIS - Automatic Irrigation System. Smartphone Mobile Apps in Agriculture- Introduction- Irrigation Systems, Fertilizer Application, Pest and Disease Management; Seeding and Planting, Harvesting Systems; Weather Forecasting, Soil Testing and Analysis, Crop Management, Market Prices; Farm Management, Financial & Insurance Services. Geospatial Technology (*in brief*) – Introduction, Techniques, Components and Uses for generating valuable agri-information.	7
22 - 23	**Decision Support System (DSS)**	DSS: Introduction, Concepts, Components, Types and Applications in Agriculture.	7
24 - 25	**Agriculture Expert System (AES)**	AES: Introduction, Concepts, Components and Applications in Agriculture- Soil Information Systems for supporting farm decisions.	7
26 - 27	**Contingent Crop Planning using IT Tools**	Preparation of Contingent Crop Planning and Crop Calendars: Introduction, Definition, Benefits, Steps to prepare Contingent Crop Planning & Calendars using IT Tools.	7
28 - 30	**Digital India and Schemes to promote Digitalization of Agriculture in India**	Digital India and Schemes to Promote, Digitalization of Agriculture in India; Digital Agriculture in India: Status, Challenge, Digital India and Initiatives in Agriculture Sector. Digital Agriculture or NeGP-A 2.0	8
31- 32	**Introduction to and Uses of Artificial Intelligence (Overview)**	Introduction to Artificial Intelligence, Background and Applications, Turing test. Control strategies, Breadth-first search, Depth-first search, Heuristics search techniques: Best-first search, A*algorithm, IoT and Big Data; Use of AI in Agriculture for autonomous crop management and health, monitoring livestock health, intelligent pesticide application, yield mapping and predictive analysis, automatic weeding and harvesting, sorting of produce and other food processing applications; Concepts of Smart Agriculture, Use of AI in Food and Nutrition Science etc.	8
		Total =	**100**

TEACHING SCHEDULE

PRACTICAL [VAC-242]

Exercise No.	Exercise Title
1 - 2	Study of computer components, accessories, practice of important DOS command; Introduction to different Operating systems- such as Windows, Unix/ Linux; Creating files and folders, Files Management.
3 - 4	Use of ~ MS-WORD: Creating files and folders; Files management and MS-POWERPOINT: Presentation for creating, editing and presenting scientific documents. MS-EXCEL: Mathematical calculations; Preparation of Spread sheets; Use of statistical tools; Writing expressions; Creating graphs; Analysis of scientific data.
5	MS-ACCESS: Creating Database; Preparing queries and reports.
6	Demonstration of Agri-information system(s)
7 - 8	Introduction of Programming Languages & Program in C-Language: a) Program to enter name and print name b) Program to calculate sum and subtraction of numbers c) Program to calculate Area of Circle d) Program to calculate Area of Triangle e) Program to calculate Area of Rectangle
9	Introduction to Internet, World Wide Web (WWW) and its components.
10 - 11	Hands-on Practice on Crop Simulation Models (CSM): CROPWAT 8.0/ DSSAT/ Crop-Info/ CropSyst/ Wofost/ etc. Computation of water and nutrient requirements of crop using CSM and IT tools.
12	Use of Smartphone Apps (developed by SAUs) and other devices in agro-advisory and dissemination of market information
13	Introduction to Geospatial Technology (Use of Open-source GIS Tools)
14	Study/ Demonstration of general AR/VR tools (as available)
15	Hands-on Practice on Decision Support System (DSS);
16	Introduction to India Digital Ecosystem of Agriculture (IDEA)

Suggested Readings [VAC-242]:

1. Fundamentals of Computer by V. Rajaraman, PHI Learning.
2. Introduction to Information Technology by Pearson.
3. Introduction to Database Management System by C.J. Date, Pearson Education, N. Delhi.
4. Concepts and Techniques of Programming in C by Dhabal Prasad Sethi and Manoranjan, Wiley India.
5. Introductory Agri Informatics by Mahapatra, Subrat K. *et al.*, Jain Brothers Publication.
6. Russell, Stuart, Artificial Intelligence: A Modern Approach, Pearson Edition 2013.
7. Nilson N.J. 2001. Principles of Artificial Intelligence. Narosa Publ.
8. Agricultural Informatics and Artificial Intelligence for B.Tech.(Agril Technology) by Prashant Publ.

- ***Online Resources: (VAC-242)***

- https://en.wikipedia.org/wiki/Computer
- https://www.javatpoint.com/computer
- https://iasri.icar.gov.in/
- https://www.nrsc.gov.in/EO_Agr_Objective?language_content_entity=en
- https://www.agrimoon.com
- https://www.agriinfo.in
- https://eagri.org
- https://www.agriglance.com
- https://agritech.tnau.ac.in
- https://loksabhadocs.nic.in/Refinput/New_Reference_Notes/English/Agriculture_and_Digital_India.pdf
- https://www.investindia.gov.in/team-india-blogs/digitalisation-agriculture-india
- http://courseware.cutm.ac.in/wp-content/uploads/2020/06/Session-11-Preparation-of-Contingent-Crop-Planning-and-Crop-Calendars-Using-IT-Tools.pdf
- https://optimizeias.com/indias-digital-ecosystem-for-agriculture/
- https://www.igi-global.com/chapter/introduction-to-agricultural-information-systems/266572#:~:text=Agricultural%20Information%20Systems%3A%20Information%20system,knowledge%20utilization%20by%20agricultural%20producers.
- https://cropcalendar.apps.fao.org/#/home
- http://www.irdindia.in/journal_ijrdmr/pdf/vol4_iss1/7.pdf
- https://learn.microsoft.com/en-us/office365/servicedescriptions/office-applications-service-description/office-applications
- https://ebooks.inflibnet.ac.in/hsp16/chapter/application-of-software-in-statisticalanalysis-i-microsoft-excel/
- http://eagri.org/eagri50/STAM102/index.html
- https://edu.gcfglobal.org/en/internetbasics/using-a-web-browser/1/
- https://www.javatpoint.com/what-is-world-wide-web
- https://www.mdpi.com/journal/agriculture/special_issues/Decision_Support_Systems_Application
- https://apps.gov.in/ministry/ministry-agriculture
- http://courseware.cutm.ac.in/wp-content/uploads/2020/06/Session-11-Preparation-of-Contingent-Crop-Planning-and-Crop-Calendars-Using-IT-Tools.pdf
- https://apps.mgov.gov.in/apps_by_category;jsessionid=8206D0DAE69F48FB50962462A8922C23?name=Agriculture

➢ ***Tools available for Student for Academic Purpose only: (VAC-242)***

1. DSSAT (Decision Support System for Agrotechnology Transfer)
- Purpose: A comprehensive crop modeling tool.
- Use: Simulates plant growth, development, and yield for various crops under different management and environmental conditions.
- Download: https://dssat.net/

2. APSIM (Agricultural Production Systems Simulator)
- Purpose: A powerful plant simulation tool.
- Use: Models the effects of environmental variables like soil, climate, and management strategies on plant growth and crop yield.
- Download: https://www.apsim.info/

3. Open Sim Root
- Purpose: A root growth modeling software.
- Use: Helps understand plant root growth processes, interactions with soil, and how they respond to environmental conditions.
- Download: Available as open-source software via research platforms like Git Hub. https://gitlab.com/rootmodels/OpenSimRoot

4. Virtual Plant
- Purpose: A tool for visualizing and modeling plant metabolic and regulatory networks.
- Use: Helps in understanding complex plant processes such as gene regulation, metabolic pathways, and how they respond to environmental conditions.

  Download: https://sourceforge.net/projects/virtualplant/

5. R Studio (with Bioconductor and Plant Modeling Libraries)
- Purpose: A programming environment for statistical computing.
- Use: Using plant modeling libraries like plant and photosynthesis, researchers can model plant growth, carbon assimilation, and nutrient cycling.
- Download: https://posit.co/downloads/

6. WOFOST (World Food Studies)
- Purpose: A plant process and crop growth simulation model developed by the FAO.
- Use: Helps in understanding crop development, photosynthesis, and biomass accumulation under different environmental and management conditions.
- Download: https://www.wur.nl/en/research-results/research-institutes/environmental-research/facilities-tools/software-models-and-databases/wofost/downloads-wofost.htm

7. Green Lab
- Purpose: A plant growth model focused on plant architecture and functional growth processes.
- Use: Simulates plant organ development and growth processes, integrating functional and structural aspects of plant behavior.
- Download: https://greenlab.cirad.fr/GLUVED/html/P3_Tools/Tool_simul_003.html

Semester	**:**	**IV**		
Course No.	**:**	**HORT-242**	**Credit Hrs.** **:**	**3(2+1)**
Course Title	**:**	**Precision Farming and Protected Cultivation**		

SYLLABUS

Objectives: The students will learn about the basic of cultivation of plants under protected conditions.

THEORY

Precision Farming – Laser levelling, Mechanized direct seed sowing; Seedling and sapling transplanting, Site specific input application. Protected cultivation technology: Introduction, Techniques of protected cultivation, Types of greenhouses, Plant response to greenhouse environment, Planning and design of greenhouses, Design criteria of greenhouse for cooling and heating purposes. Greenhouse equipment, Materials of construction for traditional and low-cost greenhouses. Irrigation systems used in protected cultivation, Typical applications, Passive solar greenhouse, Hot air greenhouse heating systems, Greenhouse drying. Cost estimation and Economic analysis. Choice of crops for cultivation under protected structures, problems/ constraints of greenhouse cultivation and future strategies. Growing media, Soil culture, Type of soil required, Drainage, Flooding and Leaching, Soil pasteurization in peat moss and mixtures, Rock wool and other inert media, Nutrient Film Technique (NFT)/ Hydroponics.

PRACTICAL

Laser leveling procedure and Field visit. Study and field visit for mechanized direct seed sowing and transplanting. Study of different types of greenhouses based on shape, construction and cladding materials. Studies on different environment control parameters in greenhouses. Estimation of drying rate of agricultural products inside greenhouse. Testing of soil and water to study its suitability for growing crops in protected structures. The study of fertigation requirements for greenhouse crops and estimation of EC and pH in the fertigation solution. The study of various growing media used in raising of greenhouse crops and their preparation and pasteurization/sterilization. Visit to commercial protected cultivation structures. Economics of protected cultivation.

TEACHING SCHEDULE

THEORY [HORT-242]

Lecture No.	Topics	Sub-topics / Key Points	Weightage (%)
1	Introduction to Precision Farming	Definition, Importance, Scope, History and Needs of Precision Farming	6
2 - 4	Laser Levelling, Mechanized, Direct Seed Sowing, Seedling and Sapling transplanting; Mapping of Soils and Plant Attributes	Components of laser levelling, Mechanism benefits of land levelling. Introduction of Direct Seed, Seedling and Sapling Transplanting; Advantages; Definitions, Scientific methods of Soil mapping, Traditional and Digital soil mapping.	10
5 - 7	Protected Cultivation Technology	Introduction, Concepts and Applications of Protected Cultivation; Structures such as - Greenhouses, Polyhouses or Net houses. Types of G.H. based on Shape, Utility, Construction and Cladding materials. Principles and Tools of Site-specific Input Application; Benefits and Challenges	10
8 - 11	Plant Response to Greenhouse Environment, Planning and Design of Greenhouses, Design Criteria of Green Houses for Cooling and Heating Purposes	Light, Temperature, R.H, Ventilation and CO_2, Selecting a Site, Orientation, Interior layout, Structural design loads, Foundations, Frames, Cladding materials, Roof slope and How interior components can influence the greenhouse environment	10
12 - 13	Greenhouse Equipments, Material of Construction for Traditional and Low-Cost Greenhouses	Commercial lightings, Cooling and ventilation, Fan and Pad system, Slant wall fans, Power vent doors, Environmental controls, CO_2 generators, Electrical panels, Greenhouse coverings accessories, Film polycarbonate shade cloth	10
14 - 16	Different Types of Irrigation Systems Used in Greenhouses and their Typical Applications	Rules of watering, Hand watering, Perimeter, Overhead sprinklers, Boom watering, Drip irrigation, Mister and Foggers	6

Continued...

17 - 19	Passive Solar Greenhouses: Hot Air Greenhouse, Heating Systems and Greenhouse Drying	Concept of Passive solar system, Basic principles, Solar heat storage, Orientation, Solar heat absorption, Features of Typical passive solar G.H. Methods of heat transfer - Convection, Conduction and Radiation. Heating systems: Unit heater system, Central heating system, Radiant heater system and Solar heating systems. Drying of Agril. produce inside G.H.: Greenhouse dryer, Types of solar dryer.	10
20 - 21	Estimation of Cost and Economic Analysis of Protected Cultivation	Computation of individual cost components, Components of cost analysis, Cost estimation for G.H. construction	6
22 - 24	Choice of Crops for Cultivation under Protected Structures: their Constrains/ Problems of Greenhouse Cultivation and Future Strategies	Major crops grown under Protected Cultivation: Capsicum, Cucumber, Tomato, Cabbage, Cauliflower, Broccoli, Chinese cabbage, Spinach, Lettuce etc. Environmental constraints, Technical, Labour-related, Economic and Marketing constraints. Future Strategies: Policy initiatives, R & D initiatives, Marketing initiatives, Farmer level initiatives	8
25	Growing Media	Characteristics of Ideal Growing Media; Soil culture, Type of soil required (in brief)	2
26 - 27	Drainage, Flooding and Leaching	Drainage: Benefits of drainage, Types of drainage systems; Leaching: Concept, Nitrogen and Phosphorous leaching and their control measures	8
28 - 31	Soil Pasteurization in Peat Moss and Mixtures, Rock Wool and Other Inert Medias	Methods of disinfection like, Solarization, Steam, Chemical and Biological control, Soil pasteurization, Fumigation and Solarization	8
32	Hydroponics and Nutrient Film Technique (NFT)	Introduction, Need, Mechanism of Hydroponics and Concept of NFT, Uses/ Applications, NFT system flow rate and Channel slope	6
		Total =	**100**

TEACHING SCHEDULE

PRACTICAL [HORT-242]

Exercise No.	Exercise Title
1	To study laser levelling procedure by field visit.
2	To study mechanized, direct seed sowing, seedling and sapling transplanting by field visit.
3 - 6	To study different types of greenhouses based on shapes, construction and cladding material.
7	Studies on different environment control parameters in greenhouses.
8	To estimate drying rate of agricultural products in shade greenhouses.
9	Testing of soil and water to study its suitability for growing crops in protected structures.
10	Study of fertigation requirements for greenhouse crops.
11	Estimation of E.C and pH in the fertigation solution.
12	Study of various growing medias used in raising of greenhouse crops and their preparation and pasteurization/sterilization.
13 - 14	Visit to commercial protected cultivation structures.
15	Estimation of economics of protected cultivation.
16	Revision

Suggested Readings [HORT-242]:

1. Brahma, S. 2019. Precision Farming and Protected Cultivation. NIPA, New Delhi.
2. Michael, A.M. 2008. Irrigation Theory and Practices. Vikas Publishing House Pvt. Ltd., New Delhi.
3. Kumar, S. 2002. Precision Farming and Protected Cultivation: Concepts and Applications. Narendra Publishing House, New Delhi.

Semester	**: IV**		
Course No.	**: VS-243**	**Credit Hrs.**	**: 3(2+1)**
Course Title	**: Seed Production of Vegetable, Tuber and Spice Crops**		

SYLLABUS

Objectives:

i) Students will acquire skill for certification and storage of seed production of vegetable, tuber and spice crops,

ii) Students will be trained for on-farm operations of different seed multiplication activities of vegetable, tuber and spice crops.

THEORY

Introduction and History of seed industry in India. Definition of Seed, Classes- Types of seed. Differences between Grain and Seed. Importance and Scope of vegetable seed production in India. Principles of vegetable seed production. Role of temperature, humidity and light in vegetable seed production, Land requirements, Climate, Season, Planting time, Nursery management, Seed rate, Rouging, Seed extraction and Storage, Packaging and Labelling of Cole crops, Root vegetables, Solanaceous vegetables, Cucurbits, Okra, Leafy vegetables, Bulb crops, Tuber crops like Potato, Spice crops like Coriander, Fenugreek, Leguminous vegetables and Exotic vegetables. Seed germination and purity analysis. Seed priming and pelleting, Field and seed standards. Seed drying and extraction. Seed legislation.

PRACTICAL

Study of seed structure, colour, size, shape and texture. Field inspection of seed crops. Practices in rouging. Harvesting and seed extraction. Germination and purity analysis. Methods of seed production, Seed certification in cole crops, root vegetables, bulb crops, solanaceous vegetables, cucurbits, okra, leafy vegetables, leguminous vegetables and exotic vegetables. Seed processing machines. Visit to seed production units.

TEACHING SCHEDULE

THEORY [VS-243]

Lecture No.	Topic	Sub-topics / Key Points	Weightage (%)
1 - 2	Introduction and History of Seed Industry in India	Seed: Definitions, Classes -Types of Seed. Differences between Grain and Seed; Introduction to seed production and History of seed industry of vegetables, tuber and spice crops in India.	8
3 - 4	Importance, Scope and Principles of Seed Production	Importance and Scope of Vegetable Seed Production in India. Principles of Seed Production in Vegetable, Tuber and Spice crops.	8
5	Role of Climate in Seed Production	Role of Temperature, Humidity and Light in Vegetable Seed Production,	4
6 - 8	Cole Crops: Cabbage, Cauliflower, Knol-khol, Sprouting Broccoli	Crop-wise Seed Production Technology of Vegetables, Tubers and Spices - (Propagation methods, Isolation distance, Rouging, Maintenance of Genetic Purity); Crop-wise Seed Quality Management - (Planting material, Harvesting, Processing, Seed standards); Land Requirements, Climate, Season, Planting Time, Nursery Management, Seed Rate, Rouging, Seed Extraction and Storage, Packaging and Labelling.	8
9 - 10	Root Vegetables: Radish, Carrot		4
11 - 13	Solanaceous Crops: Tomato, Chilli, Brinjal, Bell pepper		8
14 - 15	Cucurbits: Cucumber, Bitter gourds, Pumpkin, Watermelon		8
16	Malvaceous crop: Okra		7
17 - 18	Leafy Vegetables: Fenugreek, Amaranthus, Palak		4
19 - 20	Bulb Crops: Onion, Garlic		7
21 - 22	Tuber crops: Potato, Sweet potato		4
23	Seed Spice Crops: Coriander, Fenugreek		4
24 - 25	Leguminous Vegetables: Pea, French bean, Dolichos bean		4
26	Exotic Vegetables: Lettuces, Pak Choi, Asparagus, Cherry Tomato		4
27	Seed Germination and Purity Analysis	Definitions; Principles and Methods of seed germination testing (Dormancy, Viability, Standard germination tests); Seed purity analysis and Quality evaluation (*in brief*)	4
28	Seed Priming and Seed Pelleting	Definitions, Importance/ Advantages, Methods of Seed Priming and Seed Pelleting, Materials (*in brief*)	4

Continued...

29	Field and Seed Standards	Field and Seed Standards (Isolation distance, rouging, crop inspection stages, Certification norms)	4
30 - 31	Seed Extraction, Drying, Processing and Storage of Seed	Use of various methods to extract, dry, process and storage of vegetable seeds	4
32	Seed Legislation	Enacting of Seed Act/ Rules; Seed Control Order *(Overview in brief)*	2
		Total =	**100**

TEACHING SCHEDULE

PRACTICAL [VS-243]

Exercise No.	Exercise Title
1	To study of seed structure, colour, size, shape and texture.
2	To study objectives and practices of field inspection of seed crops.
3	To study objectives and practices in rouging.
4	To examine seed sampling techniques and types of seed samples.
5	To study seed testing techniques for determination of percent germination, viability, purity.
6	To study seed classes or types on the basis of physical and genetical purity.
7	To study harvesting, extraction, processing, drying of seeds.
8	To study packaging, labelling and storage of seeds.
9	To study methods of seed production in cole crops.
10	To study Methods of seed production in root vegetables.
11	To study Methods of seed production in bulb crops.
12	To study methods of seed production in solanaceous crops.
13	To study methods of seed production in cucurbitaceous crops.
14	To study methods of seed production in leafy vegetables and exotic vegetables.
15	To study methods of seed production in leguminous vegetables.
16	To visit to seed production units.

Suggested Readings [VS-243]:

1. Arya Singh P. 2003. Vegetable Seed Production Principles. Kalyani Publishers. Ludhiana.
2. Hazra P. and Som M.G. 2009. Vegetable Seed Production and Hybrid Technology. Kalyani Publishers, Ludhiana.
3. Kulkarni G.N. 2002. Principles of Seed Technology. Kalyani Publishers, Ludhiana.
4. Ram H.H., Upadhyay R., Dubey R. K. and Mandal B.C. 2017. Vegetable Seed Production Principles and Practices. Kalyani Publishers, Ludhiana.
5. Singh, S.P. 2001. Seed Production of Commercial Vegetables. Agrotech Publishing, Udaipur.

Semester	**: IV**		
Course No.	**: FMP-241**	**Credit Hrs.**	**: 3(2+1)**
Course Title	**: Farm Power and Machinery for Horticulture**		

SYLLABUS

Objectives: To acquaint students of the tools available at his disposal for doing the work in Horticulture (Mechanical power sources: Engines/tractors; Machines and tools for harvesting the horticultural produce: Tillage equipment, Planting equipment, Plant care equipment).

THEORY

Basic concepts of various forms of energy; Tractors, Power tillers and their Types and Uses. Introduction about IC Engines: Basic principles of operation of compression, ignition and spark ignition engines; Two stroke and Four stroke engines; Crank system, Valve system, Fuel supply system, Cooling and Lubrication systems; Power transmission systems; Broad understanding of performance and efficiency. Tillage: Objectives, Method of ploughing. Primary tillage implements: Construction and Function of improved indigenous ploughs, Mould board ploughs, Disc and Rotary ploughs, Offset rotavators. Secondary tillage implements construction and function of cultivators, harrows, levellers, ridgers and bund formers. Adjustments affecting performance in tillage equipment. Calculation of bite length of rotavator. Post-hole digger. Introduction about planting and transplanting equipment: Potato planters, Small seed planter, Nursery sowing machinery, Vegetable transplanters, Plastic mulch and Drip laying machinery. Introduction about intercultural machinery. Sprayers: Types, Working principle, Manual and Tractor operated, Gun-type and Boom type. Special purpose sprayers: Aeroblast sprayers, Electrostatic sprayers, Sprayer calibration and Nozzle spacing. Safety features and Safe use, Shrub cutters, Pick positioner; Grafting, Pruning and Training tools and Equipment; Sweep, Rotary Weeders, Tractor operated pruners. Crop harvesting equipment: Potato Diggers, Fruit-pluckers, Seed extraction machine.

PRACTICAL

Calculation of force, power and energy. IC engines – showing the components of dismantled engines. Familiarization with engine systems. Primary and secondary tillage implements: hitching, adjustments and operations. Operation of post-hole digger. Operation of planting and transplanting machinery. Operation of vegetable transplanter, plastic mulch and drip laying machinery. Operation of Inter-culture equipment including off-set rotavator in orchard; calibration of plant protection equipment, Calculation of dilution ratio and Operation; Operation of power weeder, shrub cutter. Operation of crop harvesting equipment and seed extraction machine. Operation of shrub cutters, fruit-pluckers, pick positioner.

TEACHING SCHEDULE

THEORY [FMP-241]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1	Basic Concepts of Various Forms of Energy	Introduction and Scope of Farm Mechanization; Forms and sources of energy in Agriculture; Merits & Demerits of various forms of energy	10
2 - 3	Tractors and Power Tillers	Types/ Classification and Uses; Selection of tractor, Operation of power tiller	
4 - 7	Introduction about IC Engines	Basic Principles of Operation of Compression; Ignition and Spark Ignition Engines; Two-Stroke and Four-Stroke Engines; Engine components, Engine terminology and examples	20
8 - 9	Internal Combustion Engine Components, Systems and Power Transmission	Crank System: Components and construction, Working principle; Valve System: Types of valves and valve mechanisms, its operation; Fuel Supply System: in CI and SI engines.	10
10		Cooling and Lubrication Systems: Air cooling and Water cooling, Types of lubrication system	
11		Power Transmission Systems: Working of Clutch, Gearbox and Differential	
12	Broad Understanding of Performance and Efficiency	Engine performance parameters, Factors influencing engine performance	
13	Tillage	Definition, Objectives, Classification/ Methods	20
14 - 16	Primary Tillage Implements	Construction and Functions of improved indigenous ploughs, Mould board ploughs, Disc and Rotary ploughs, Offset rotavators.	
17 - 19	Secondary Tillage Implements	Types, Construction and Functions of Cultivators, Harrows, Levellers, Ridgers and Bund formers, Post-hole digger	
20	Adjustments Affecting Performance in Tillage Equipment & Calculations	Adjustments in Mould board plough and Disc plough	
21		Calculation of Bite Length of Rotavator	

Continued...

22 - 24	Introduction about Planting and Transplanting Equipment	Potato Planters, Small Seed Planter, Nursery Sowing Machinery, Vegetable Transplanters, Plastic Mulch and Drip Laying Machinery; Sowing equipment, Seed drill calibration	10
25	Intercultural Machinery & Sprayers	Introduction about Intercultural Machinery (in brief); Sprayers: Types and Working Principles of various sprayers; Manual and Tractor-operated, Gun-type and Boom type	10
26 - 27	Special Purpose Sprayers & their Safety	Working Principle of Aeroblast and Electrostatic sprayers; Sprayer calibration and Nozzle spacing; Examples	
28		Safety Features and Safe Use of Sprayer	
29 - 31	Horticultural Tools/ Implements/ Equipment	Shrub Cutters: Types, Construction and working principle, Applications. Pick Positioner: Purpose, design and operational features. Grafting Tools: Types and design of grafting tools, Methods of grafting and tool use (in brief). Pruning Tools: Types and working of pruning tools. Training Tools: Training systems and supporting structures, Tools used. Sweep, Rotary Weeders, Tractor-operated Pruners: Purpose and Features	20
32	Horticultural Crops Harvesting Tools/ Equipment	Potato diggers, Fruit-pluckers, Seed extraction machine: Purpose, Types and Advantages	
		Total =	**100**

TEACHING SCHEDULE

PRACTICAL [FMP-241]

Exercise No.	Exercise Title
1	Calculation of Force, Power and Energy.
2 - 3	Identification of various engine components (Both CI and SI engines).
4 - 5	Familiarization with engine systems (Cooling, Lubrication, Fuel supply).
6	Introduction of primary and secondary tillage implements.
7	Adjustments in operations of Mould board plough and Disc plough.
8	Familiarization with operation and components of post-hole digger.
9	Familiarization with operation and components of planting and transplanting machinery.
10	Operation of vegetable transplanter, plastic mulch and drip laying machinery.
11	Operation of Inter-culture equipment including offset rotavator in orchard.
12	Calibration of plant protection equipment and calculation of dilution ratio and operation.
13	Operation of power weeder and shrub cutter.
14	Operation of crop harvesting equipment and seed extraction machine.
15	Operation of shrub cutters, fruit-pluckers and pick positioner.

Suggested Readings [FMP-241]:

1. Sahay Jagdishwar. Elements of Agricultural Engineering.
2. Kepner, R.A., Bainer, R. and Barger, E.L. Principles of Farm Machinery.
3. Michael, A.M. and Ojha, T.P. Principles of Agricultural Engineering.
4. Culpin C. Farm Machinery.
5. Rodichev V. and Rodicheva G. Tractors and Automobiles.

Semester : IV		
Course No. : HORT-243	**Credit Hrs. : 2(1+1)**	
Course Title : Urban and Peri-Urban Horticulture		

SYLLABUS

Objectives:

i) To acquaint the students about the urban and peri-urban horticulture and its types,

ii) To impart the knowledge about the cultivation practices of horticultural crops in urban and per-urban areas.

THEORY

Introduction to Urban and Peri-urban Horticulture: Definition, Importance, Characteristics and Scope. Types of Urban and Peri-urban gardens and their characteristics: Terrace gardening, Vegetable gardening, Container gardening, Rooftop gardens, Community gardens, Vertical gardens, Hydroponics and Aeroponics. Selection of site, Planting material, Media (soil and soilless) preparation and Nutrient management for cultivation of vegetables, herbs, fruits, flowers and ornamental plants. Protected cultivation in urban and peri-urban areas. Making and maintenance of lawns. Interior and exterior landscaping in urban and peri- urban households. Water and Waste management, Waste water recycling and its Use in landscaping. Insect - pest and Disease management in Urban Horticulture.

PRACTICAL

Site selection and layout of various urban and peri-urban gardens. Preparation of growing media and potting mixtures. Types of containers, nursery raising and planting for rooftop gardens. Irrigation and nutritional management in urban and peri-urban horticulture. Visit to fruit nutrition garden, vegetable kitchen garden and public gardens.

TEACHING SCHEDULE

THEORY [HORT-243]

Lecture No.	Topic	Sub-topics / Key Points	Weightage (%)
1 - 2	Scope and Importance of Urban and Peri-urban Horticulture	Urban and Peri-urban Horticulture: Introduction, Definitions, Importance and Scope	10
3 - 4	Types of Urban and Peri-urban Horticulture	Types of urban and peri-urban gardens and their characteristics; Terrace garden, Container gardening, Rooftop gardens, Community gardens	10
5		Vegetable gardening	10
6		Vertical gardens	5
7 - 8		Hydroponics and Aeroponics	10
9	Site Selection	Selection of site, Criteria, (Climatic and environmental factors, Physical and infrastructural considerations, Accessibility)	10
10	Planting Material, Planting Media	Types and quality of planting material; Planting media and substrates, Media (Types- Soil and Soilless), Media preparation and management, Characteristics of ideal media, Examples	10
11	Nutrient Management	Nutrient management for cultivation of vegetables, herbs, fruits, flowers and ornamental plants	5
12	Protected Cultivation in Urban and Peri-urban Households	Types of protected structures/ greenhouse for households; Crop selection and management practices; Advantages and constraints	10
13	Lawn	Types of lawn grasses and selection; Making and Maintenance	10
14	Interior and Exterior Landscaping	Definitions; Principles and Elements of landscaping; Plants and Materials	5
15	Water and Waste Management	Water use and irrigation management; Waste water recycling, Solid and organic waste management; their re-use in landscaping (*in brief*)	2
16	Insect-Pests and Disease Management	Identification and Management (*in brief*)	3
		Total=	**100**

TEACHING SCHEDULE

PRACTICAL [HORT-243]

Exercise No.	Exercise Title
1 - 2	Site selection and layout of various urban and peri-urban garden.
3 - 4	Preparation of growing media and potting mixtures.
5	Study of types of containers.
6	Nursery raising and planting for rooftop gardens.
7	Irrigation management in urban and peri-urban horticulture.
8	Nutritional management in urban and peri-urban horticulture.
9 - 11	Study of Terrace garden, Container gardening, Rooftop garden and Community gardens.
12	Study of Vegetable gardening.
13	Study of Vertical gardens.
14 - 15	Study of Hydroponics and Aeroponics.
16	Visit to Fruit nutrition garden, Vegetable kitchen garden and Public gardens.

Suggested Readings [HORT-243]:

1. Singh A., Patel, N.L. and Ahlawat, T.R. 2016. Handbook of Urban and Peri-urban Horticultre; Publisher: Ambica; 1st Edn.

2. Sumangla, H.P, Malhotra, S.K. and Chowdappa, P. 2013. Urban and Peri-urban Horticulture- A Perspective.

Semester	**:**	**IV**			
Course No.	**:**	**ENTO-241**	**Credit Hrs.**	**:**	**3(2+1)**
Course Title	**:**	**Pest Management of Horticultural Crops**			

SYLLABUS

Objectives:

i) To study the methods of pest control, recent technologies for insect pest management and IPM,

ii) To study distribution, host range, bio-ecology, injury, integrated management of important insect pests affecting horticultural crops,

iii) To analyze insecticides' residue problems in fruits, vegetables, plantation, ornamental spice, medicinal and aromatic crops.

THEORY

Classification of insect pests. Dynamics of EIL and ETL. Methods of Pest control- Host plant resistance, Cultural, Mechanical, Physical, Legislative, Biological and Chemical control. Recent technologies for insect-pest management. IPM- Importance and Principles. Scientific name, Order, Family, Host range, Distribution, Biology, Ecology, Nature of damage and Management of important insect-pests of various fruits (Tropical, Sub-tropical and Temperate), vegetable, ornamental, plantation, spice, medicinal, aromatic crops and under-protected conditions. Pest surveillance. Storage insects- Scientific name, Order, Family, Host range, Distribution, Biology, Ecology, Nature of damage and Management of important insect-pests attacking stored fruit, vegetable, plantation, ornamental, spice, medicinal and aromatic crops produced and their processed products. Insecticide formulations, types of formulations. First-aid and antidote Insecticides residue problems in fruit, vegetable, plantation, ornamental, spice, medicinal and aromatic crops and their maximum residue limits (MRLs). Waiting periods for insecticides on various crops.

PRACTICAL

Identification of insect-pests of various fruit, vegetable, plantation, ornamental, spice, medicinal and aromatic crops in field and their produce during storage and their symptoms of damage. Identification of biocontrol agents and natural enemies. Insecticide formulations. Pesticide application appliances. Calculation of insecticide quantity for preparing spray material.

TEACHING SCHEDULE

THEORY [ENTO-241]

Lecture No.	Topic	Sub-topics / Key Points	Weightage (%)
1	Classification of Insect-Pests	Classification of insect-pests and Concept of economic damage. Population dynamics of EIL, ETL	20
2	Methods of Pest Control	Methods of Pest Control- Host-plant resistance, Cultural, Mechanical, Physical, Legislative, Biological and Chemical	
3	Recent Technologies	Use of Drone for Insect-Pest Management; Use of AI in Pest Management	
4	IPM	IPM- Definition, Importance and Principles, Advantages of IPM	
Scientific name, Order, Family, Host range, Distribution, Bio-Ecology, Nature of damage and Integrated Management of following important Insect-pests of various fruit, vegetable, ornamental, plantation, spice, medicinal, aromatic crops and under-protected conditions:			
Fruit Crops (Tropical, Sub-tropical and Temperate):			
5	Citrus	Lemon butterfly, White fly, Black fly, Leaf miner, Fruit sucking moth, Citrus psylla, Citrus aphids, Mealy bug, Citrus thrips, Scale insects	20
6	Mango	Mango stem borer, Mango stone weevil, Mango fruit fly, Mealy bugs, Mango hoppers, Shoot borer, Thrips, Slug caterpillar, Midge fly, Leaf gall	
7	Grapevine	Flea beetle/ Udadya beetle, Thrips, Stem Girdler, Mealy bug	
	Strawberry	Aphid, Thrips, Fruit borer	
8	Guava	Fruit fly, Spiraling white fly, Bark-eating caterpillar, Fruit borers, Green scale, Mealy bug	
	Custard apple	Mealy bug, Fruit fly	
9	Banana	Root stock weevil/ Rhizome weevil, Pseudostem borer, Fruit rust thrips, Aphids, Tingid or Lace wing bug, Leaf-eating caterpillar, Skipper	
	Papaya	Papaya mealy bugs, White fly, Green peach aphid, Ash weevils	
10	Sapota	Chiku moth/ Sapota leaf webber, Sapota seed borer, Fruit fly, Stem borer, Hairy caterpillar, Leaf folder, Bud borer	
11	Coconut	Rhinoceros beetle, Black-headed caterpillar, Red palm weevil, Rugose spiralling whitefly	
12	Arecanut	Spindle bug	
	Cashew nut	Inflorescence caterpillar, Tea mosquito bug, Cashew stem and root borer, Thrips, Apple and Nut borer	
13	Apple	Codling moth, Wooly aphid, Apple leaf blotch miner	
	Fig	Jassids, Stem borer	

Continued….

14	Ber	Ber fruit borer, Ber fruit fly	
	Aonla	Bark borer, Seed borer	
	Dragon fruit	Fruit fly, Mealy bug, White grub, Scale insect	
15	Pomegranate	Anar caterpillar, Fruit sucking moth *(Eudocima fullonica, Eudocima materna*, *Achoea janata* L.), Thrips, Shot hole borer, Bark-eating caterpillar, Mealy bug, Whitefly, Aphids	
Vegetable Crops:			20
16	Brinjal	Brinjal shoot and fruit borer, Jassids/ Leaf hopper, Aphids, White fly, Hadda beetle, Brinjal leaf roller, Lace wing bug, Stem borer	
17	Okra	Shoot & fruit borer, Leafhoppers, Aphids, White fly, Leaf Roller, *Helicoverpa,* Flea beetle, Leaf miner	
18	Tomato	Fruit borer, Leaf miner- *Liriomyza* and *Tuta absoluta,* Aphids, Thrips, White Fly	
	Chilli	Thrips, Fruit borer (*Helicoverpa*)	
19	Potato	Potato tuber moth, Cutworm, Thrips, Jassids	
	Sweet potato	Sweet potato weevil, Sweet potato leaf eating caterpillar/ Sphinx caterpillar	
20	Cruciferous crops- (Cauliflower, Cabbage, Broccoli and Knol-khol)	Diamond back moth, Aphids, Painted bug, Cabbage butterfly, Leaf eating caterpillar, Flea beetle, Head borer and Mustard saw fly	
21	Cucurbitaceous vegetables	Fruit fly, Aphids, Leaf miner, whitefly, Thrips, Pumpkin beetle, Blister beetle	
22	Colocassia and Moringa	Leaf eating caterpillar, Webworm, Stem borer, Spodoptera, Aphids, Budworm	
Plantation Crop and Spice Crops:			20
23	Turmeric and Ginger	Rhizome fly, Shoot borer, Rhizome Scale, Leaf roller, Thrips	
	Onion and Garlic	Onion and Garlic thrips**,** Bulb fly	
	Coriander	Aphids	
	Curry leaf	Scale insect, Psylla, Lemon butterfly	
	Black pepper	Pollu beetle/ Flea beetle, Mealy bug	
	Cardamom	Thrips, Shoot and capsule borer	
Flower Crops:			
24	Tube rose, Rose, Gerbera, Carnation	Thrips, White fly, Bud borer, Leaf miner, Mealy bug	
Ornamental Crops:			
25	Ornamental crops	Mealy bug, Scale insects	
Plantation Cash Crops:			
26	Tea	Tea green leaf hopper, Tea mosquito bug	
	Coffee	Coffee seed borer, Coffee berry borer	
Medicinal and Aromatic Crops:			
27	Medicinal crops-	Betelvine, Safed Musali, Shatavari, Ashwagandha, Alo vera (their Major insect-pests only)	
	Aromatic plants-	Camphor, Citronella, Geranium, Lemon grass, Jasmine (their Major insect-pests only)	

Continued...

28	**Storage Insect-Pest of Horticultural Crops**	Indian meal moth, Red rust floor beetle, Dried fruit borer, Khapra beetle, Resin moth, Fig and almond moth, Saw toothed moth, Saw tooth grain beetle	20
29	**Pest Surveillance**	Pest surveillance, Types of surveillance and Importance	
30 - 32	**Insecticides Residue Problems in Fruit, Vegetable, Plantation, Spice, Medicinal and Aromatic Crops**	Insecticide formulation, Different types of formulations. First-aid and antidote	
		Insecticides residue problems in fruit vegetables plantation, spice, medicinal and aromatic crops and their Maximum residue limits (MRLs); Waiting periods for insecticides on various crops.	
		Total =	**100**

TEACHING SCHEDULE

PRACTICAL [ENTO-241]

Exercise No.	Exercise Title
1	Identification of insect-pests of various tropical fruit crops.
2	Identification of insect-pests of various subtropical fruit crops.
3	Identification of insect-pests of temperate fruits.
4 - 5	Identification of insect-pests of vegetables.
6	Identification of insect-pests of ornamental crops.
7	Identification of insect-pests of various spices and aromatic crops.
8	Identification of insect-pests of plantation crops.
9	Identification of storage insect-pests of horticultural crops.
10	Polyphagous and non-insect pests such as rat, snail slug and squirrel with their management.
11	Maximum Residue Limits (MRLs) waiting periods of insecticides on various horticultural crops.
12	Identification of parasitoids and predator, types and their role in pest management.
13	Insecticide formulation, types and different types of formulation. First-aid and antidotes.
14	Pesticide appliances such as sprayers dusters, tractor-mounted sprayers, drone.
15	Calculation of insecticide quantity for preparing spray material.
16	Guidelines for export fruits such as mango, grape and pomegranate.

Suggested Readings [ENTO-241]:

1) Atwal A.S. and Dhaliwal G.S. Agricultural Pests of South Asia and their Management.
2) David, B.V. and Rammurthy, V.V. Elements of Economic Entomology.
3) Pedigo L.P. Entomology and Pest Management.
4) Venu Gopal Rao. Insect Pest Management.
5) Pradhan, S. Insect Pests of Crops.
6) Awasthi, V.B. Introduction of General and Applied Entomology.
7) Shrivastav, K.P. A Textbook of Applied Entomology-Vol I and II.
8) David, V. and Ananthkrishan. Elements Economic Entomology.

Semester	**:**	**IV**		
Course No.	**:**	**AGRO-242**	**Credit Hrs. :**	**2(1+1)**
Course Title	**:**	**Introductory Agrometeorology and Climate Change**		

SYLLABUS

Objectives: To train the students with respect to management the climate aberration for sustainable crop production.

THEORY

Agrometeorology – Definition, Scope. Earth atmosphere - its Composition, Extent and Structure. Atmospheric weather variables. Elements and Factors of weather and climate. Atmospheric pressure. Wind, Types, Daily and Seasonal variation. Cyclone, Anticyclone. Land and Sea breeze. Solar radiation - Solar constant, Depletion, Short and Long wave, Thermal radiation, Net radiation, Albedo. Atmospheric temperature, Inversion, Lapse rate, Daily and Seasonal variations, Vertical profile. Energy balance of earth. Atmospheric humidity, Saturation, Vapor pressure, Condensation. Dew, Fog, Mist, Frost. Precipitation, Process, Types. Cloud formation and Classification. Artificial rainmaking. Monsoon - Mechanism and Importance in Indian Agriculture. Weather hazards. Agriculture and Weather relations. Modifications of microclimate. Climatic normal for crop and livestock production. Weather forecasting- Types and Applications. Climate change and Impacts on Agriculture.

PRACTICAL

Visit to Agrometeorological observatory. Site selection of observatory and Exposure of instruments and Weather data recording. Measurement of total, short and long wave radiations and their estimation using Planck's intensity law. Measurement of albedo and sunshine duration, computation of radiation intensity using BSS. Measurement of maximum and minimum air temperatures, tabulation, trend and variation analysis. Measurement of soil temperature and computation of soil heat flux. Determination of vapor pressure and relative humidity. Determination of dew point temperature. Measurement of atmospheric pressure and analysis of atmospheric conditions. Measurement of wind speed and wind direction, preparation of wind rose. Measurement, tabulation and critical analysis of rainfall. Computation of drought indices. Measurement of open pan-evaporation and evapotranspiration. Computation of PET and AET.

TEACHING SCHEDULE

THEORY [AGRO-242]

Lecture No.	Topic	Sub-topics / Key Points	Weightage (%)
1	Agrometeorology	Definition, Different terminologies and Scope of Meteorology in General and Agrometeorology	10
2	Weather and Climate	Distinguish between Weather and Climate, Elements and Factors affecting weather and climate	5
3	Earth Atmosphere	Composition and Structure of Atmosphere	5
4	Solar Radiation	Definition, Terminologies, Solar constant, Heat balance, Albedo, Greenhouse effect, Role of radiation in Agriculture and Factors affecting solar radiation	5
5	Atmospheric Temperature	Definition, Factors affecting atmospheric temperature, Vertical and Horizontal temperature variation and Role of temperature in crop production	5
6	Soil Temperature	Factors affecting soil temperature, Temperature variation and Importance of soil temperature	5
7	Atmospheric Pressure	Definition, Vertical and Horizontal pressure variation	5
8	Wind	Wind, Types, Daily and Seasonal variation. Cyclone, Anticyclone. Land and Sea breeze	5
9	Atmospheric Humidity	Different terminologies and Importance of humidity in Agriculture	5
10	Condensation and Precipitation	Forms of condensation. Dew, Fog, Mist, Frost. etc. Precipitation process, Forms of precipitation, Monsoon mechanism and Importance in Indian Agriculture	10
11	Cloud	WMO Cloud classification, Cloud formation and Artificial rain-making	5
12	Weather Hazards	Drought, its Type and Mitigation, Agriculture and Weather relations. Modifications of microclimate and climatic normal for crop and livestock production	5
13	Weather Forecasting	Methods, Types and Applications	5
14	Climate Change	Climate change - Causes. Global warming - Causes, Effect of climate change on Horticulture. Past and Future changes in greenhouse gases within the atmosphere	10
15	Plants Sense and Respond to Changes in CO_2 Concentration	Plants sense and respond to changes in CO_2 concentration, Measurement of short-term effects and mechanisms underlying the observed responses in C_3 and C_4 species	10
16	Remote Sensing	Crop weather calendar, Different drought monitoring index, NDVI and Crop modelling	5
		Total =	**100**

TEACHING SCHEDULE

PRACTICAL [AGRO-242]

Exercise No.	Exercise Title
1	Site selection for Agromet Observatory and Plan of layout of Standard Meteorological Observatory.
2	Study of meteorological instruments and methods of recording observation.
3	Measurement of atmospheric temperature.
4	Measurement and recording of soil temperature.
5	Measurement of rainfall.
6	Measurement of wind velocity with the help of cup counter anemometer.
7	Study of wind vane and drawing of wind rose.
8	Measurement of sunshine duration and solar radiation.
9	Measurement of evaporation (atmospheric/ soil).
10	Measurement of bright sunshine hours with the help of Campbell stokes sunshine recorder.
11	Measurement of relative humidity.
12	Measurement of atmospheric pressure.
13	Measurement of dew.
14	Visit to IMD Meteorological Observatory.
15	Preparation of synoptic charts and weather reports, symbols etc.
16	Study of Automatic Weather Station (AWS).

Suggested Readings [AGRO-242]:

1. Avi, H.S. 1985. Introduction to Agrometeorology. Oxford and IBH Publishing Co.,New Delhi.
2. Lenka, D. 2006. Climate, Weather and Crops in India. Kalyani Publishers, New Delhi.
3. Mavi, H.S. and Tupper, G.J. 2005. Agrometeorology – Principles and Applications of Climate Studies in Agriculture. International Book Publishing Co., Lucknow.
4. Mavi, H.S. 1994. Introduction to Agrometeorology. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
5. Nanjappa, H.V. and Ramachandrappa, B.K. 2007. Manual on Practical Agricultural Meteorology. Agrobios India. Jodhpur.
6. Pattersen, S. 1958. Introduction to Meteorology. Mc. Graw Hill Book Co. Inc., New York.
7. Prasad Rao, G.S.L.H.V. 2008. Agricultural Meteorology. Prentice Hall of India Pvt. Ltd., New Delhi.
8. Srivastava, A.K. and Tyagi, P.K. 2011. Practical Agricultural Meteorology. New Delhi Publishing Agency, New Delhi.
9. Yellamanda Reddy, T. and Sankara Reddi, G.H. 2010. Principles of Agronomy. Kalyani Publishers, New Delhi.

#List/ Bouquet of Skill Enhancement Courses (SECs)

[in continuation of the SECs' Syllabi prescribed under I, II and III semesters]

Sr. No.	Course No.	Course Title	Credit Hrs.
1.	**SEC-xxx**	Mushroom Cultivation	2(0+2)
2.	**SEC-xxx**	Apiculture	2(0+2)
3.	**SEC-xxx**	Orchard Floor Management	2(0+2)
4.	**SEC-xxx**	Landscape Gardening	2(0+2)
5.	**SEC-xxx**	Packing and Packaging of Horticultural Crops	2(0+2)
6.	**SEC-xxx**	Farm Machinery	2(0+2)
7.	**SEC-xxx**	Introduction to Forestry	2(0+2)
8.	**SEC-xxx**	Installation, Operation and Maintenance of Micro-Irrigation System	2(0+2)
9.	**SEC-xxx**	Computer Programming and Data Structures	2(0+2)
10.	**SEC-xxx**	Turf and Turf Management	2(0+2)
11.	**SEC-xxx**	Post-Harvest Management of Horticulture Crops	2(0+2)
12.	**SEC-xxx**	Nursery Production in Horticulture Crops	2(0+2)
13.	**SEC-xxx**	Seed Production Techniques in Vegetables Crops	2(0+2)
14.	**SEC-xxx**	Sericulture	2(0+2)
15.	**SEC-xxx**	Dairy Management	2(0+2)
16.	**SEC-xxx**	Ornamental Fishery	2(0+2)
17.	**SEC-xxx**	Poultry Management	2(0+2)
18.	**SEC-xxx**	Biofertilizers and Biopesticides	2(0+2)
19.	**SEC-xxx**	Horti-Tourism	2(0+2)

Note: (i) Skill Enhancement Courses can be added/offered as per the facilities and resources available at the respective universities/colleges based on the relevance to the region and the UG degree subject.

(ii) The host University/ College may also choose suitable SEC courses from those listed under other UG degree programs.

(iii) Above list/ bouquet of SEC courses is an indicative list and subject to modification as applicable therein.

(iv) In case of unavailability of the detailed course-wise syllabus/ teaching schedules of any of above SEC courses, the same can be primarily developed and followed at College/ University level in the current academic year. However, the same can be obtained from the respective UG Degree Coordinator/ Discipline Coordinators and can be followed w.e.f. AY, 2025-26.

Course No. : SEC-xxx	**Credit Hrs. : 2(0+2)**
Course Title : Nursery Production in Horticultural Crops	

SYLLABUS

Objectives:

i) To impart skills in different methods of plant propagation.

ii) To impart skills in various nursery management activities.

PRACTICAL

Layout of model nursery, Tools and Equipment - Identification and Application. Different methods of breaking seed dormancy- Stratification, Scarification and Use of Plant Growth Regulators. Extraction and storage of healthy seeds, Seed bed preparation, Identification and Raising of root stocks for different fruit plants, Soil solarization, Preparation of potting mixtures. Selection of healthy scion wood, Practices in different methods of plant propagation like cutting, layering, budding and grafting in fruit plants. Micropropagation - Explant preparation, Media preparation, Culturing-Meristem tip culture, Axillary bud culture, Micro-grafting and Hardening of plants. Nursery management practices i.e. Weed control, Irrigation, Nutrition, Removal of sprouts etc. Protection of nursery plants against adverse climatic conditions. Protected structures. Diagnosis and control of important diseases and pests in the nursery, Lifting and Packing of nursery plants, Visit to commercial tissue culture laboratories and accredited nurseries.

TEACHING SCHEDULE

PRACTICAL [SEC-xxx]

Exercise No.	Exercise Title
1 - 2	Study and Layout of Model Nursery.
3 - 4	Identification and application of nursery tools and equipment.
5	Study of methods of extraction and storage of healthy seeds.
6	Study of seed bed preparation.
7 - 8	Identification and raising of rootstocks for different fruit plants.
9	Study of soil solarization and preparation of potting mixtures.
10 - 11	Study of selection of healthy scion wood.
12 - 13	Practices in different methods of plant propagation like, cutting and layering in fruit plants.
14 - 15	Practices in different methods of plant propagation like, budding and grafting in fruit plants.
16 - 17	Study of Micropropagation - explant preparation and media preparation.
18 - 19	Study of Micropropagation - culturing - meristem tip culture, axillary bud culture and micro-grafting.
20	Study of hardening of micropropagated plants.
21	Study of different nursery management practices i.e. weed control and irrigation.
22	Study of different nursery management practices i.e. nutrition and removal of sprouts etc.
23	Study of protection of nursery plants against adverse climatic conditions.
24	Study of different protected structures used in nursery.
25 -26	Diagnosis and control of important diseases and pests in the nursery.
27	Lifting and packing of nursery plants.
28	Visit to Commercial Tissue Culture Laboratories.
29 - 30	Visit to Accredited Nurseries.