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.

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

TEACHING SCHEDULE

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.

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 Standeasy, 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**

TEACHING SCHEDULE

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 nonlinguistic 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.

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

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 farmingbased 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 Agribased 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 Aquaculturebased 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 Farmingbased Livelihood Systems	Climate, Market fluctuations, Input costs; Mitigation strategies etc.	4
26	Success Factors in Farmingbased 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 Farmingbased 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 Farmingbased Livelihood Projects	Developing Cost-Benefit analysis; Identifying Break-Even points
13	Case Study of Start-ups in Agrisectors	Analysing real-world Start-ups; Identifying success factors

14	Group Project: Develop a Farmingbased 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: ExogenousPhysical (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.
	Mushroom farm design and Infrastructure required for commercial unit:

18-19

(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.* ICARIIFSR, 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.
