

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

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



Mahatma Phule
Krishi Vidyapeeth,
Rahuri



Dr. Panjabrao
Deshmukh Krishi
Vidyapeeth, Akola



Vasanttrao Naik
Marathwada Krishi
Vidyapeeth, Parbhani



Dr. Balasaheb Sawant
Konkan Krishi
Vidyapeeth, Dapoli



Maharashtra Agricultural
Universities Examination
Board, Pune

Compiled & Submitted by

Dr. S.B. Kharbade

Dean (F/A) & DI and Associate Dean, PGI, MPKV, Rahuri.

UG Degree Syllabus State Coordinator

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 AGRICULTURE**

Course Layout

B.Sc. (Hons.) Agriculture

Semester: I (New)

w.e.f. Academic Year: 2024-25

| Sr. No. | Course No. | Course Title | Credit Hrs. | Remark |
|--|---------------------------------|--|----------------------------------|--------------------|
| 1. | CAC-111 | <i>Deeksharambh</i> (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. | EXTN-111 | Rural Sociology and Educational Psychology | 2(2+0) | |
| 7. | AGRO-111 | Fundamentals of Agronomy | 3(2+1) | |
| 8. | SOIL-111 | Fundamentals of Soil Science | 3(2+1) | |
| 9. | HORT-111 | Fundamentals of Horticulture | 3(2+1) | |
| 10. | SEC-111 | Skill Enhancement Course-I (<i>#To be offered from the bouquet of SEC Courses</i>) | 2(0+2) | |
| 11. | SEC-112 | Skill Enhancement Course-II (<i>#To be offered from the bouquet of SEC Courses</i>) | 2(0+2) | |
| Total Credits Hrs. | | | 21(11+10) G 3(1+2) NG | |
| <p>CAC: Common Academic Course, AEC: Ability Enhancement Course, MDC: Multidisciplinary Course, SEC: Skill Enhancement Course, G: Gradual, NG: Non-Gradual</p> | | | | |
| <p>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.</p> | | | | |

List/ Bouquet of Skill Enhancement Courses (SECs):

| Sr. No. | Course No. | Course Title | Credit Hrs. |
|---------|------------|--|-------------|
| 1. | SEC-xxx | Biofertilizer and Biopesticide Production | 2(0+2) |
| 2. | SEC-xxx | Mushroom Production Technology | 2(0+2) |
| 3. | SEC-xxx | Seed Production Technology | 2(0+2) |
| 4. | SEC-xxx | Post-harvest Processing Technology | 2(0+2) |
| 5. | SEC-xxx | Beneficial Insect Farming | 2(0+2) |
| 6. | SEC-xxx | Horticulture Nursery Management | 2(0+2) |
| 7. | SEC-xxx | Plantation Crops Production and Management | 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.

The detailed course-wise syllabus of above SEC courses 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]

Course-wise Syllabus with Teaching Schedules

| | |
|--|------------------------------|
| Semester : I | |
| Course No. : AEC-111 | Credit Hrs. : 1 (0+1) |
| Course Title : National Service Scheme (NSS-I) / National Cadet Corps (NCC-I) | |
| Gradual 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

| 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, Firefighting, 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 [AEC-111]

| 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 | | |
| Gradual 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; Precis 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, Visualise 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 | | Precis 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

| Exercise No. | Exercise Topic |
|--------------|--|
| 1 | Listening and Note taking |
| 2 | Writing skills- Précis 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 | Organisation of events |

Suggested Readings:

1. Allport, G W, 1937. Personality: A Psychological Interpretation. Holt, New York.
2. Brown Michele & Gyles Brandreth, 1994, How to Interview and be Interviewed. Sheldon Press, London.
3. Carnegie Dale, 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 Lata, 2011. Communication Skills. Oxford University Press.
6. Neuliep James W, 2003. Intercultural Communication- A Contextual Approach. Houghton Mifflin Co Boston.
7. Pease, Allan, 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. Land Mondal Sagar 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 | |
| Gradual 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 |

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| | | | |
|----------------|---|--|------------|
| 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 21 st 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 |
|--------------|---|---|
| 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., & 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., & 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., & 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, B.P., 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, J.P. 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., & 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. : EXTN-111 | Credit Hrs : 2(2+0) |
| Course Title : Rural Sociology and Educational Psychology | |

SYLLABUS

Objective: To provide knowledge on concept and importance of Sociology and Rural Sociology as well as the relationship with Extension Education.

THEORY

Extension Education and Agricultural Extension: Meaning, Definition, Scope and Importance. Sociology and Rural Sociology: Meaning, Definition, Scope, Importance of Rural Sociology in Agricultural Extension and interrelationship between Rural Sociology and Agricultural Extension. Indian Rural Society: Important characteristics, differences and relationship between Rural and Urban societies. Social Groups: Meaning, Definition, Classification, Factors considered information and organization of groups, Motivation in group formation and Role of social groups in Agricultural Extension. Social Stratification: Meaning, Definition, Functions, Basis for stratification, Forms of social stratification- Characteristics and differences between Class and Caste System. Cultural concepts: Culture, Customs, Folkways, Mores, Taboos, Rituals. Traditions: Meaning, Definition and their Role in Agricultural Extension. Social Values and Attitudes: Meaning, Definition, Types and Role of Social Values and Attitudes in Agricultural Extension. Social Institutions: Meaning, Definition, Major institutions in Rural Society, Functions and their Role in Agricultural Extension. Social Organizations: Meaning, Definition, Types of organizations and role of social organizations in Agricultural Extension. Social control: Meaning, Definition, need of social control and Means of Social control. Social change: Meaning, Definition, Nature of social change, Dimensions of social change and factors of social change. Leadership: Meaning, Definition, Classification, Roles of leader, Different methods of selection of Professional and Lay leaders. Training of Leaders: Meaning, Definition, Methods of training, Advantages and limitations in use of Local leaders in Agricultural Extension, Psychology and Educational Psychology: Meaning, Definition, Scope and Importance of Educational Psychology in Agricultural Extension. Intelligence: Meaning, Definition, Types, Factors affecting intelligence and Importance of intelligence in Agricultural Extension. Personality: Meaning, Definition, Types, Factors influencing the Personality and Role of personality in Agricultural Extension. Teaching - Learning Process: Meaning and Definition of Teaching, Learning, learning experience and Learning situation, Elements of learning situation and its characteristics. Principles of learning and their implication of teaching.

TEACHING SCHEDULE

THEORY [EXTN-111]

| Lecture No. | Topic | Sub-topics/ Key Points | Weightage (%) |
|-------------|--|---|---------------|
| 1-2 | Extension Education and Agricultural Extension | Meaning, Definition, Scope and Importance | 5 |
| 3-4 | Sociology and Rural Sociology | Meaning, Definition, Scope, Importance of Rural Sociology in Agricultural Extension and Interrelationship between Rural Sociology and Agricultural Extension. | 10 |
| 5-6 | Indian Rural Society | Important characteristics, Differences and relationship between Rural and Urban societies. | 5 |
| 7-8 | Social Groups | Meaning, Definition, Classification, Factors considered in formation and organization of groups and Role of social groups in Agricultural Extension. | 10 |
| 9-10 | Social Stratification | Meaning, Definition, Functions, Basis for stratification, forms of social stratification, characteristics and differences between Class and Caste system | 5 |
| 11-12 | Cultural Concepts | Culture, Customs, Folkways, Mores, Taboos, Rituals. Traditions - Meaning, Definition and their role in Agricultural Extension. | 5 |
| 13 | Social Values and Attitudes | Meaning, Definition, Types and Role of social values and attitudes in Agricultural Extension. | 5 |
| 14-15 | Social Institutions | Meaning, Definition, Major institutions in rural society: Marriage, family and religion, functions and their role in Agricultural Extension. | 5 |
| 16-17 | Social Organization | Meaning, Definition and Types of organization, Role of social organization in Agricultural Extension | 5 |
| 18 | Social Control | Meaning, Definition, Need of social control and Means of social control. | 5 |
| 19-20 | Social Change | Meaning, Definition, Nature of social change, Dimensions of social change and Factors of social change. | 5 |
| 21-22 | Leadership | Meaning, Definition, Classification, Roles of leaders, Different methods of selection of Professional and Lay leader types and their role in Agricultural Extension | 5 |
| 23-24 | Training of Leaders | Meaning, Definition, Methods of training, Advantages and Limitations in use of Local Leaders of Agricultural Extension. | 5 |

Continued...

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|---------------|---------------------------------------|--|------------|
| 25-26 | Psychology and Educational Psychology | Meaning, Definition, Scope and Importance of Educational Psychology in Agricultural Extension. | 5 |
| 27-28 | Intelligence | Meaning, Definition, Types, Factors affecting intelligence and Importance of intelligence in Agricultural Extension | 5 |
| 29-30 | Personality | Meaning, Definition, Types, Factors influencing personality and Role of personality in Agricultural Extension. | 5 |
| 31-32 | Teaching-Learning Process | Meaning and Definition of teaching, Learning, Learning experience and Learning situation, Elements of learning situation and its characteristics, Principles of learning and their implication for teaching. | 10 |
| Total= | | | 100 |

Suggested Readings [EXTN-111]:

1. Ray, G.L. (2003). Extension Communication and Management. Kalyani Publishers. Fifth Revised and Enlarged Edition.
2. Dahama, O.P. and Bhatnagar, O.P. (2003). Education and Communication for Development. Oxford and IBH Publishing Co. Pvt. Ltd.
3. Sandhu, A.S. (1993). Textbook on Agricultural Communication: Process and Methods. Oxford and IBH Publishing Co. Pvt. Ltd.
4. Chitambar, J.B. (2008). Introductory Rural Sociology. New Age International (P) Limited.
5. Sachdeva, D.R. and Bhushan, V. (2007). An Introduction to Sociology. Kitab Mahal Agency.
6. Chitambar, J.B. (1973). Introductory Rural Sociology. New York, John Wiley and Sons.
7. Desai, A.R. (1978). Rural Sociology in India. Bombay, Popular Prakashan, 5th Rev. Edn.
8. Doshi, S.L. (2007). Rural Sociology. Delhi Rawat Publishers.
9. Jayapalan, N. (2002). Rural Sociology. New Delhi, Altanic Publishers.
10. Sharma, K.L. (1997). Rural Society in India. Delhi, Rawat Publishers.
11. Velusamy R. Textbook on Rural Sociology and Educational Psychology.
12. Ghorpade M.B. - Essential of Psychology.

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|--|-----------------------------|
| Semester : I | |
| Course No. : AGRO-111 | Credit Hrs. : 3(2+1) |
| Course Title : Fundamentals of Agronomy | |

SYLLABUS

Objective: To impart the basic and fundamental knowledge of Agronomy.

THEORY

Agronomy and its scope: Definition, meaning and scope of Agronomy; Art, science and business of crop production, Relation of Agronomy with other disciplines of Agricultural Science. Field crops: Classification, Importance, Ecology and ecosystem. Seeds and sowing: Definitions of Crop, Variety and Seed. Factors affecting crop stands establishment: good quality seed, proper tillage, time of sowing, seed rate, depth and methods of sowing (broadcasting, drilling, dibbling, sowing behind country plough and transplanting etc.). Tillage and till: Definition, Objectives, types, advantages and disadvantages of tillage including Conservation tillage, Modern Concept of Tillage. Crop density and Geometry: Plant geometry and Planting geometry, its effect on growth and yield. Crop nutrition: Definition of essential nutrients, Criteria of essentiality, Functional elements, Classification of essential nutrients, Role of macro and micro nutrients. Nutrient absorption, Active and Passive absorption of nutrients, forms of plant nutrients absorbed by plants, Combined/ Un-combined forms. Manures and fertilizers, Nutrient use efficiency: Sources of nutrients: Inorganic (fertilizers), organic (manures) and biofertilizers; their classification and characteristics, method of preparation and role of organic manures in crop production. Integrated Nutrient Management (INM): Meaning, different approaches and advantages of INM. Green manures- role in crop production: Definition, objectives, types of green manuring, desirable characteristics, advantages and limitations of green manuring. Water management: Water resources of the World, India and the State; Soil Moisture Constants: gravitational water, capillary water, hygroscopic water. Weeds: Definition, importance and basis of classification of weeds and their control. Agro-climatic zones of India and the State. Cropping systems: Factors affecting cropping systems, major cropping patterns and systems in the country. Sustainable crop production: Definition, importance and practices, natural resources and conservation, pollution and pollutants. Allelopathy: Meaning and importance in crop production. Growth and development of crops: Definition, meaning and factors affecting growth and development.

PRACTICAL

A visit to Instructional Crop Farm and study of field crops, Identification of crops, seeds, fertilizers, pesticides; Crops and cropping systems in different Agro-climatic zones of the state; Study of some preparatory tillage implements; Study of inter-tillage implements, Practice of ploughing/ puddling; Study and practice of inter-cultivation in field crops; Numerical exercises on calculation of seed, plant population and fertilizer requirement; Study of yield contributing characters and yield estimation of crops; Identification of weeds in different crops; Seed germination and viability test of seed; Practice on time and method of application of manures and fertilizers.

TEACHING SCHEDULE

THEORY [AGRO-111]

| Lecture No. | Topic | Sub-topics/ Key Points | Weightage (%) |
|-------------|---------------------------------|--|---------------|
| 1-2 | Agronomy and its Scope | Definition, Meaning and Scope of Agronomy, Art, science and business of crop production. Relation of Agronomy with other disciplines of Agricultural Science. Role of Agronomist. | 6 |
| 3 | Field crops | Classification and importance of field crops, Ecology and ecosystem. | 6 |
| 4 | Growth and Development of crops | Definition, Meaning, Factors affecting growth and development, Growth curve. | 4 |
| 5-7 | Seeds and Sowing: | Definitions- Crops, Variety and Seed. Factors affecting crop stand and its establishment; good quality seed, proper tillage, sowing time, seed rate, sowing depth, seed treatment; Methods of sowing/planting: (broadcasting, drilling, dibbling and transplanting, sowing behind plough etc.), Advantages, Disadvantages, Crops to be sown. | 10 |
| 8 | Tillage and Tilt | Definition, Objectives, Types, Advantages and Disadvantages of tillage, including Conservation tillage. | 4 |
| 9-10 | Modern Concept of Tillage | Modern Concept of Tillage: Types, Definition, Concept, Advantages and Disadvantages. | 8 |
| 11 | Crop Density and Geometry | Definitions- Crop density, Crop geometry and Plant geometry. Effects of planting geometry on growth and yield. | 5 |
| 12-13 | Crop Nutrition | Definition of Essential nutrients; Criteria of essentiality, Functional elements, Classification of essential nutrients; Role of macro- and micro- nutrients in plant growth and development. | 8 |
| 14 | Nutrient Absorption | Active and Passive absorption of nutrients, Forms of major plant nutrients (NPK) absorbed by plants; Combined/ Un-combined forms. | |

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| 15-17 | Manures and Fertilizers | Classification of manures and fertilizers including biofertilizers with examples; Methods of preparation (FYM and Compost) and Role of organic manures in crop production. | 8 |
| 18 | INM and NUE | Definition, Meaning, Different approaches and Advantages of Integrated Nutrient Management (INM); Concept of Nutrient Use Efficiency (NUE) | 6 |
| 19 | Role of Green Manures in Crop Production | Definition, Objectives and Types of Green manuring; Desirable characteristics, Advantages and Limitations of Green manuring. | 6 |
| 20 | Water Management | Water resources of the World, India and State (Maharashtra) | |
| 21-24 | Soil Moisture Constants and Methods of Irrigation | Soil Moisture Constants- Field capacity, Saturation point and PWP; Soil water: Gravitational water, Capillary water, Hygroscopic water; Methods of irrigation, Scheduling of irrigation, Different approaches of scheduling irrigation | 10 |
| 25-26 | Weed Management | Definition, Importance and classification of weeds on season and life cycle basis; Weed control methods- preventive, curative (cultural, physical, mechanical, biological and chemical) | 8 |
| 27 | Allelopathy | Meaning, its effect on crops and weed; Importance in crop production | |
| 28-29 | Major Cropping Patterns and Systems in India. | Cropping system: Definition, Classification with examples. Factors affecting cropping systems, Major cropping patterns and Systems in the country. | 5 |
| 30-32 | Sustainable Crop Production | Definition, Components, Importance and Limitations; Practices, Natural resources and Conservation, Pollution and pollutants. | 6 |
| Total = | | | 100 |

TEACHING SCHEDULE

PRACTICAL [AGRO-111]

| Exercise No. | Exercise | Practical Sub-topics/ Titles |
|--------------|---|---|
| 1 | Instructional Crop Farm Visit | Visit to Instructional Crop Farm and Study on field crops. |
| 2 | Identification of crops, seeds, fertilizers and pesticides | Identification of crops, seeds, fertilizers and pesticides; Preparation of Seed Album. |
| 3 | Crops and cropping systems in different Agro-climatic state zones | Study of crops and cropping systems in Agro-climatic zones of Maharashtra. |
| 4 | Study of some preparatory tillage implements | Study of implements required for primary tillage and secondary tillage operations. |
| 5 | Study of inter-tillage implements | Study of implements required for inter tillage or after cultivation operations. |
| 6 | Practice of ploughing/ puddling | Study of ploughing/ puddling in rice. |
| 7-8 | Study and practice of inter-cultivation in field crops | Study and Practices of inter-cultivation in field crops with tools and implements. |
| 9-10 | Numerical exercises on calculation of seed, plant population and fertilizer requirement | Numerical problems on seed rate and plant population. |
| | | Calculation of fertilizer doses. |
| 11 | Study of yield contributing characters and yield estimation of crops | Study of yield contributing characters and yield estimation of major crops of region. |
| 12 | Identification of weeds in different crops | Identification and preparation of Weed Herbarium of 20 major weeds in different crops [<i>Parthenium, Lavala, Hariayali, Ekdandi, Kena, Math, Dudhani</i> (small, medium and large), <i>Ghaneri, Kunjru, Reshimkata</i> etc.]. |
| 13 | Seed germination and viability test of seed | Study of seed germination test of major crops; Methods of viability test of seed of major crops. |
| 14 | Practice on time and method of application of manures and fertilizers. | Organic Manure application; Basal application, top dressing and foliar application of fertilizers. |
| 15 | Determination of soil moisture | Determination of soil moisture using gravimetric method |
| 16 | Determination of field capacity | Determination of field capacity by field method |

Suggested readings:

1. William L Donn. 1965. Meteorology. McGraw-Hill Book Co. New York.
2. Yawalkar K S and Agarwal J P. 1977. Manures and Fertilizers. Agricultural Horticultural Publishing House, Nagpur.
3. Rao V S. 1992. Principles of Weed Science. Oxford and IBH Publishing Co. Ltd., New Delhi.
4. Reddy Yellamanda T and Shankar Reddy G H. 1995. Principles of Agronomy. Kalyani Publishers, Ludhiana.
5. Reddy S R. 2008. Principles of Crop Production, Kalyani Publisher, Ludhiana.

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|---------------------|----------------|-------------------------------------|
| Semester | : | I |
| Course No. | : | SOIL-111 |
| | Credits | : 3(2+1) |
| Course Title | : | Fundamentals of Soil Science |

SYLLABUS

Objective: To impart knowledge on soil genesis, basic soil properties with respect to plant growth.

THEORY

Soil: Pedological and Edaphological Concepts; Rocks and minerals, Weathering; Silicate clays: constitution and properties; Sources of charge, ion exchange, cation and anion exchange capacity and base saturation (after buffering capacity); Soil formation, Soil organic matter, Pedogenic processes; Soil colloids: inorganic and organic, Properties of soil colloids and Ion exchange in soils; Soil profile, Soil texture, Soil structure; Bulk density and Particle density; Soil consistency; Soil temperature, Soil air, Soil water; Soil reaction and Buffering capacity; Soil taxonomy; Keys to soil orders; Soils of India.

PRACTICAL

Study of general properties of minerals; Study of minerals-silicate and non-silicate minerals; Study of rocks-igneous, sedimentary and metamorphic rocks; Study of a soil profile, Collection and processing of soil for analysis; Study of soil texture-feel method, mechanical analysis, determination particle density and soil porosity, Determination of soil colour; Study of soil structure and aggregate analysis; Determination of soil moisture; Determination of soil moisture constants field capacity; water holding capacity; Study of infiltration rate of soil; Determination of pH and Electrical conductivity of soil.

TEACHING SCHEDULE

THEORY [SOIL-111]

| Lecture No. | Topic | Sub-topics/ Key points | Weightage (%) |
|-------------|---|---|---------------|
| 1 & 2 | History and development of Soil Science, its scope and importance. Soil as natural body, Pedological and edaphological concept of soil. | History, Scope and importance of Soil Science, Approaches of Soil Study, Pedological concepts, Edaphological concept of soil. | 6 |
| 3 & 4 | Soil genesis, soil forming rocks and minerals | Definitions, Formation of rocks, Classification of rocks, Classification of minerals, Properties of minerals, Soil forming minerals. | 4 |
| 5 & 6 | Weathering of rocks and minerals | Definitions, Types of weathering, Subtypes of weathering, Examples. | 6 |
| 7 & 8 | Processes and factors of soil formation | Definitions, Types of soil forming processes, Soil forming factors, Equation, Types of soil forming factors. | 6 |
| 9 | Soil profile, Soil horizons and Soil components | Definitions, Development of Soil Profile, Components of soils, Volume composition of mineral soil, Soil horizons. | 4 |
| 10 & 11 | Soil physical properties: Soil texture, Soil structure | Definitions, Types of soil physical properties, Importance of soil texture, Soil textural classes, Soil structure, Formation of soil structure, Types and Classes of structure, Factors affecting soil structure, Importance of structure | 4 |
| 12 | Soil bulk density and Particle density | Definitions, Importance of soil density, Porosity of soil, Factors affecting soil density. | 4 |

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| 13 & 14 | Soil consistency, Plasticity and Soil colour | Definitions, Soil consistency, Soil stickiness and plasticity. | 4 |
| 15 | Soil Temperature: Source, effect on plant growth and nutrient availability | Definition, Importance of soil temperature, Source of soil temperature, Factors affecting absorption of heat, Factors affecting soil temperature, Role of soil temperature in nutrient availability | 4 |
| 16 | Soil Air- Composition of gases, exchange in soil, its impact on plant growth | Definition, Soil air and its composition of gases, Gases exchange in soil, Impact on plant growth, Effect on plant growth, | 4 |
| 17 & 18 | Soil Water: Soil water classification, Soil water retention, Soil water potential, Soil moisture constants, Hydraulic conductivity, Permeability, Percolation, Movement and availability in soil. | Importance of Soil Water, Classification of Soil water, Factors affecting soil water, Soil water potential, Measuring soil moisture, Soil Moisture Constants, Soil water movement, Hydraulic conductivity, Water permeability, Percolation, Water movement and availability in soil. | 6 |
| 19 & 20 | Soil Organic Matter: Sources, composition, Properties, Factors affecting SOM, its importance and influence on soil properties | Definitions, Sources of soil organic matter, Decomposition of soil organic matter, Role of Organic matter, Properties of soil organic matter, Factors affecting Soil organic matter, Influence on Soil properties. | 6 |
| 21 & 22 | Silicate Clays: Constitution and Properties | Definition, Layer silicate clays, Types of silicate clay minerals; Properties of silicate minerals | 6 |
| 23 & 24 | Sources of charge, ion exchange, cation and anion exchange capacity and base saturation (after buffering capacity) | Definitions, Sources of charge, Ion exchange, Cation and anion adsorption, Mechanism of Cation Exchange, Cation Exchange Capacity, Importance of Cation Exchange, Source of positive charge, Importance of anion exchange | 6 |

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| 25 & 26 | Humic substances: Nature and Properties | Definition, Importance of humic substances, Nature and properties of humic substances | 6 |
| 27 | Soil Colloids: Inorganic and Organic, Properties of Soil colloids and Ion exchange in soils | Definitions, General Properties of Soil colloids, Types of Soil colloids, Ion exchange in soil. | 5 |
| 28 | Soil reaction and Buffering capacity: Soil pH, Buffering capacity, Effect of soil pH on nutrient availability. | Definition of pH, Buffering capacity, Buffer action, Importance of buffering, Significance of soil reaction in plant nutrition. | 4 |
| 29 & 30 | Soil Taxonomy: Soil Survey, Soil Taxonomy, Classification, Land Capability Classification, Land Irrigability Classification. | Definition, Salient features of Soil Taxonomy, Importance of Soil survey, Types of Soils survey, Diagnostic Horizons of Mineral Soils, Land Capability Classification, Land Irrigability Classification. | 5 |
| 31 | Keys to Soil Orders | Definition, Importance of soil orders, Classification of soil orders, Characteristics of soil orders. | 6 |
| 32 | Soils of India and Maharashtra | Soils of India, Classification of soils of India, Soils of Maharashtra, Distribution and classification of soils of Maharashtra. | 4 |
| Total= | | | 100 |

Suggested Readings (Theory- SOIL-111):

1. ISSS. 2009. Fundamentals of Soil Science. 2nd Edn. Indian Society of Soil Science, New Delhi- 110 012. pp. 728.
2. Das D.K. 2011. Introductory Soil Science, 3rd revised and Enlarged Edn, Kalyani Publisher, Ludhiana. pp. 645.
3. Patil, V.D. and Mali C.V. 2007. Fundamentals of Soil Science, Aman Publication, Meerut.
4. Brady, N.C. 2016. The Nature and Properties of Soils. 15th Edn. Publisher: Pearson Education.
5. Biswas, T.D. and Mukherjee, S.K. 1995. Text Book of Soil Science 2nd Edn. Tata McGraw Hill Publisher, Delhi. pp. 433.
6. Daji J.A., Kadam J.R. and Patil N.D. 1996. Textbook of Soil Science, Bombay Media Promoters and Publishers Pvt. Ltd.

PRACTICAL [SOIL-111]

| Exp. No. | Title of Experiment |
|----------|--|
| 1 | Study of general properties of minerals. |
| 2 | Study of silicate and non-silicate minerals. |
| 3 | Study of rocks- Igneous, sedimentary and metamorphic. |
| 4 | Study of soil profile. |
| 5 | Study of soil sampling tools, collection and processing of soil for analysis. |
| 6 | Determination of soil texture by feel method. |
| 7 | Determination of soil texture by mechanical analysis. |
| 8 | Determination of bulk density by clod coating method. |
| 9 | Determination of particle density by pycnometer method and porosity of soil. |
| 10 | Determination of soil colour by Munsell soil colour chart. |
| 11 | Study of soil structure and aggregate analysis. |
| 12 | Determination of moisture content in soil by gravimetric method. |
| 13 | Determination of soil moisture constants- Field capacity. |
| 14 | Determination of water holding capacity. |
| 15 | Study of infiltration rate of soil. |
| 16 | Determination of pH and electrical conductivity of soil. |
| 17 | Determination of hydraulic conductivity of soil by constant head method. |
| 18 | Estimation of organic carbon and organic matter content in soil by Walkely and Black method. |

Suggested Readings (Practical- SOIL-111):

1. Somawanshi, *et al.* 2012. Laboratory Methods for Analysis of Soil, Irrigation Water and Plants, Department of Soil Science and Agricultural Chemistry, MPKV, Rahuri. Revised Ed. pp. 307.
2. Jackson, M.L. 1973. Soil Chemical Analysis. Printice Hall, India, Pvt. Ltd. New Delhi. pp 498.
3. Page, *et al.* 1982. Methods of Soil Analysis, Part 1 and 2. Chemical and Microbiological Properties. 2nd Ed. Soil Science Soc. of America Am. Soc. Agron., Madison, Wisconsin, USA.
4. Klute, A. 1986. Methods of Chemical Analysis, 2nd Ed. American Soc. Agron. Inc. and Soil Science Society of America. Madison, Wisconsin, USA.
5. Piper, C.S. 1966. Soil and Plant Analysis. Inters Science. Hans Publisher, Mumbai.
6. Black, C.A. 1965. Soil Chemical Analysis, Part I and Part II. American Soc. Agron, Inc. and Soil Science Society of America. Madison, Wisconsin, USA.
7. Hesse, P.R. 1971. A Text Book of Soil Chemical Analysis. John Murray, London.
8. Richards, L.A. 1968. Diagnosis and Improvement of Saline Alkali Soils. Oxford and IBH Publication Co. Calcutta.
9. Chopra, S.L. and Kanwar, J.S. 1991. Analytical Agricultural Chemistry, Kalyani Publisher New Delhi.
10. Chapman, H.D., and P.F. Pratt. 1961. Methods of Analysis for Soils, Plants and Waters. Division of Agricultural Sciences, University of California.

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

SYLLABUS

Objectives:

- (i) To provide knowledge on different branches of Horticulture *viz.*, Pomology, Olericulture, Floriculture and Landscaping, Spices and Medicinal plants,
- (ii) To provide knowledge on orchard management, propagation methods, cultural operations and nutrient management of horticultural crops,
- (iii) To provide knowledge on different physiological aspects of horticultural crops.

THEORY

Horticulture: Its different branches, importance and scope; Horticultural and Botanical classification; Soil and Climate for horticultural crops; Plant propagation: Methods and propagating structures; Seed dormancy and seed germination; Merits and demerits of sexual and asexual propagation; Stock-Scion relationship. Principles of orchard establishment; Principles and methods of training and pruning of fruit crops; Juvenility and flower bud differentiation; Unfruitfulness in horticultural crops; Pollination, pollinizers and pollinators; Fertilization and parthenocarpy; Medicinal and aromatic plants; Spices and condiments; Importance of plant bio-regulators in horticultural crops; Irrigation and its methods; Fertilizers application in horticultural crops; Principles, features and styles and types of garden; Types of vegetable gardening; Kitchen gardening.

PRACTICAL

Identification of garden tools; Identification and nomenclature of fruits; Layout of an orchard; Pit making and system of planting; Nursery raising techniques of fruit crops; Understanding of plant propagation structures; Propagation through seeds and plant parts, Propagation techniques for horticultural crops, Container, potting mixture, potting and repotting; Training and pruning methods on fruit crops; Preparation of fertilizer mixture and application, Preparation and application of PGR; Layout of different irrigation systems; Maturity studies and harvesting; Grading, packaging and storage.

TEACHING SCHEDULE

THEORY [HORT-111]

| Lecture No. | Topic | Subtopics/ Key Points | Weightage (%) |
|-------------|--|--|---------------|
| 1-2 | Scope and Importance of Horticulture | Definitions and Branches of Horticulture, Meaning; Role, Scope, Importance, - Areas with examples. | 10 |
| 3-4 | Classification of Horticultural crops | Basis of Classification, Horticultural and Botanical Classification, Types with suitable examples. | 10 |
| 5-6 | Soil and Climate for Horticultural crops | Meaning, Soil and Climatic requirement for Horticultural crops, Suitable examples. | |
| 7-11 | Plant Propagation - Methods and Propagating Structures | Sexual and Asexual methods of Propagation, Its merits and demerits; Propagation by propagules, Propagating structures, Stock-Scion relationship. | 15 |
| 12-13 | Seed Dormancy and Seed Germination | Definitions, Types of Seed dormancy, Causes of seed dormancy and methods to break seed dormancy; Seed germination and changes in seed during germination. | 10 |
| 14-15 | Principles of Orchard Establishment | Site selection criteria, Principles, Preparation of land and layout, Planting systems. | |
| 16-17 | Training and Pruning of Fruit crops | Principles and methods of training and pruning of fruit crops and Canopy management. | 10 |
| 18-19 | Juvenility and Flower Bud Differentiation | Definitions, Maturation phase, Techniques to reduce juvenile phase, Ways for rejuvenation or reversion to juvenile stage. | 10 |
| 20 | Unfruitfulness in Horticultural crops | Definitions, Fruitfulness, Fruit setting, Unfruitfulness and factors responsible for it, Steps to overcome it, Suitable examples. | |
| 21-22 | Pollination, Pollinizers and Pollinators | Definitions, Types of pollinations, Mechanisms to promote self and cross-pollination, Advantages and disadvantages, Important pollinators and pollinizers with examples. | 05 |
| 23 | Fertilization and Parthenocarpy | Definitions, Types of Parthenocarpy with examples. | |

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| 24 | Medicinal and Aromatic Plants | Scope, Importance and its Classification | 05 |
| 25 | Spices and Condiments | Scope, Importance and its Classification | |
| 26 | Importance of Plant Bio-regulators in Horticultural crops | Definition, Role of Bio-regulators and its uses in Horticulture with examples | 05 |
| 27 | Irrigation Methods in Horticultural crops | Irrigation methods and its advantages and disadvantages. | 10 |
| 28 | Fertilizers Application in Horticultural crops | Types of fertilizers; Methods of fertilizers application, their advantages and disadvantages | |
| 29-30 | Principles, Features and Styles and Types of Garden | Principles, Features and Styles and Types of Garden. | 05 |
| 31 | Types of Vegetable Gardening | Different types of Vegetable gardening | 05 |
| 32 | Kitchen Gardening | Explanation and Components of Kitchen gardening. | |
| Total = | | | 100 |

TEACHING SCHEDULE

PRACTICAL [HORT-111]

| Exercise No. | Title |
|--------------|---|
| 1 | Identification of garden tools |
| 2-3 | Identification and Nomenclature of fruits |
| 4 | Layout of an orchard |
| 5 | Pit making and system of planting |
| 6 | Nursery raising techniques of fruit crops |
| 7 | Understanding of plant propagation structures |
| 8 | Propagation through seeds and plant parts |
| 9 | Propagation techniques for horticultural crops |
| 10 | Container, potting mixture, potting and repotting |
| 11 | Training and pruning methods on fruit crops |
| 12 | Preparation of fertilizer mixture and application |
| 13 | Preparation and application of PGR |
| 14 | Layout of different irrigation systems |
| 15 | Maturity studies and harvesting |
| 16 | Grading, packaging and storage |

Suggested Readings:

1. Basics of Horticulture by Jitendra Singh
2. Introduction to Horticulture by N. Kumar
3. Handbook of Horticulture by K.L. Chadda
4. Jain, S.K. 1968. Medicinal Plants. National Book Trust New Delhi. Oxford & IBH, New Delhi.
5. Atal, E.K. and Kapur, B. 1982. Cultivation and Utilization of Medicinal and Aromatic Plants. CSIR, New Delhi.

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|---|----------------------------|--|
| Semester | : I | |
| Course No. | : MATH-111* | Credit Hrs. : 1(1+0) NG; Need-based |
| Course Title | : Introductory Mathematics | |
| *Need-based, Non-Gradual 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 $1/3^{\text{rd}}$ 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 3 rd order, Examples | 10 |
| | | Properties of determinants up to 3 rd 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 | Definition 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 1/3 rd 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-Gradual 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 flowering 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 James 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.