

## B.Sc. (Hons) Agriculture – 2025 Syllabus

| First Year – First Semester                                                  |                               |                                                                                                             |                   |
|------------------------------------------------------------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------|-------------------|
| S. No                                                                        | Course Code                   | Course Title                                                                                                | Credit Hours      |
| 1                                                                            | IFP 101                       | Induction cum Foundation Programme                                                                          | 2 (0+2) (NG) *    |
| 2                                                                            | SEC I<br>TAM 121 /<br>ENG 121 | Skill Enhancement Course – I<br>வேளாண் அறிவியல் தமிழ்த் திறன் மேம்பாடு /<br>English for Professional Skills | 2 (0+2)           |
| 3                                                                            | SEC II                        | Skill Enhancement Course – II                                                                               | 2 (0+2)           |
| 4                                                                            | AEX 101                       | Communication Skills                                                                                        | 2 (1+1)           |
| 5                                                                            | AEX 102                       | Rural Sociology and Educational Psychology                                                                  | 2 (2+0)           |
| 6                                                                            | AGR 101                       | Farming Based Livelihood Systems                                                                            | 3 (2+1)           |
| 7                                                                            | AGM 101                       | Fundamentals of Microbiology                                                                                | 3 (2+1)           |
| 8                                                                            | AEC 101                       | Principles of Agricultural Economics                                                                        | 1 (1+0)           |
| 9                                                                            | SAC 101                       | Fundamentals of Soil Science                                                                                | 3 (2+1)           |
| 10                                                                           | HOR 111                       | Fundamentals of Horticulture                                                                                | 3 (2+1)           |
| 11                                                                           | MAT 101                       | Introductory Mathematics                                                                                    | 1 (0+1)           |
| 12                                                                           | NSS 101/<br>NCC 101           | National Service Scheme I / National Cadet Corps I                                                          | 1 (0+1) #         |
| 13                                                                           | PED 101                       | Physical Education, First Aid, Yoga Practice and Meditation                                                 | 1 (0+1)**         |
|                                                                              |                               | <b>Total</b>                                                                                                | <b>24 (12+12)</b> |
| <b>Class Duration:</b><br><b>Practical: 2 hours</b><br><b>Theory: 1 hour</b> |                               |                                                                                                             |                   |

## **IFP 101 Induction cum Foundation Programme (0+2) (Non - Grdial) \***

### **Objective**

- To give a broad view and application areas of the subject of study
- Helping students from different backgrounds for cultural Integration
- Knowing about the operational framework of academic process in university
- Instilling life and social skills, leadership qualities, team working spirit
- Developing social awareness, ethics and values, creativity
- Helping students to identify the traditional values and indigenous cultures along with
- Diverse potentialities both in indigenous and developed scenario

### **Activities**

The details of activities/ schedules will be decided by the parent universities. The structure shall include, but not restricted to:

- i. Discussions on operational framework of academic process in university, as well as interactions with academic and research managers of the University
- ii. Creating awareness on the subject of study, and the traditional values and indigenous cultures along with diverse potentialities both in indigenous and developed scenario
- iii. Interaction with alumni, business leaders, perspective employers, outstanding achievers in related fields, and people with inspiring life experiences
- iv. Group activities to identify the strength and weakness of students (with expert advice for their improvement) as well as to create a platform for students to learn from each other's life experiences
- v. Field visits to related fields/ establishments
- vi. Sessions on personality development (instilling life and social skills, social awareness, ethics and values, teamwork, leadership, etc.) and communication skills.

## **AEX 101 Communication Skills (1+1)**

### **Theory**

#### **Unit I: Communication Process**

The magic of effective communication; Building self-esteem and overcoming fears; Concept, nature and significance of communication process; Meaning and types

#### **Unit II: Models and Barriers of Communication**

Models of communication; Verbal and non-verbal communication; Linguistic and non-linguistic barriers to communication and reasons behind communication gap/ miscommunication.

#### **Unit III: Basic Communication Skills**

Listening, Speaking, Reading and Writing Skills; Precis writing/ Abstracting/ Summarizing; Style of technical communication

#### **Unit IV: Writing and Questioning**

Curriculum vitae/resume writing; Innovative methods to enhance vocabulary, analogy questions.

#### **Unit V: 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.

### **Practicals**

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 Schedule**

1. The magic of effective communication: Definition of communication- Principles- Functions-Information Function-Command and instructive Function-Influence or persuasive function and Integrative function -Concepts related to communication (Fidelity Noise, Empathy, Homophily, Heterophily, Propaganda, Publicity and Persuasion.)

2. Building self-esteem and overcoming fears: Understanding Confidence and Fear Strategies to build self-esteem and overcome fears-Techniques for Building Confidence- (positive self-talk, practice self-care, build positive relationship, learn from mistakes, practice assertiveness etc.,).
3. Techniques for overcoming fears (focus on preparation, gradual exposure to different communication situations, consistent practice, rehearse out loud etc.,).
4. Communication Process-Meaning, Concept, nature (dynamic, social, reciprocal and interdependent) and Significance-Elements of communication process.
5. Communication Types: Verbal - Written communication –oral communication- interpersonal and intrapersonal communication-mass Communication-Components of Non-Verbal Communication-Proxemics, Haptics, Gestures, Paralinguistic, Facial expressions, Chronemics Oculesics, Posture, Appearance and Artifacts.
6. Models of communication –Linear Model-Aristotle, Lasswells model, Shanon-Weaver, Berlo, Leagans, Rogers & Shoemaker. Interactive Model-Schramm, Westley& Maclean. Transactional Model-Dance Helical model.
7. Linguistic and non-linguistic barriers to communication- communication gap- Types of communication gap (Vertical gaps, Horizontal gaps, Internal gaps, External gaps, Knowledge gaps, Delivery gaps, Generation gaps) Miscommunication- concept and disadvantages
8. Listening and Speaking: Definitions: Hearing Vs Listening. Stages of listening process- Types of listening (Active listening, passive listening, appreciative, critical, Discriminative Listening, Comprehension listening -Selective Listening). Speaking skills (motor perceptive skills and interaction skills) and types (imitative, intensive, responsive, transactional, interpersonal and extensive).
9. **Mid Semester Examination**
10. Reading Skills -Types of reading (Intensive, extensive, selective, loud, silent, skimming, scanning, - Comprehension -Reading comprehension- comprehension skills- Readability index- Guidelines for effective reading.
11. Writing Skills-Graham's Flow Chart on Writing-Types - writing skills for easy reading- Points to be considered in technical writing.
12. Precis writing - Rules for making a precis-guidelines - Abstracting and Summarizing - Styles of technical communication: Assertive Style- Aggressive Style- Passive- Aggressive Style- Submissive Style- Manipulative Style.

13. Tips for writing resume and curriculum vitae and difference between them.
14. Innovative methods to enhance vocabulary (reading extensively, playing word game, listening to podcast, use of mnemonics, practice using new words).
15. Analogy questions: (power of reasoning and ability to think concisely and accurately) for writing farm related contents, Sentence structure Modifiers, connecting words and verbals for effective literature writing.
16. Phrases and clauses: Use of phrases and clauses. Case: subjective case, possessive case; objective case; Correct usage of nouns, pronouns and antecedents, adjectives, adverbs and articles.
17. Agreement of verb with the subject: tense, mood, voice in communication. Writing effective sentences- Basic sentence faults to be avoided while writing for farmers.

### **Practical schedule**

1. Practicing micro presentations - I
2. Practicing micro presentations- II
3. Impromptu presentations
4. Analysing the feedback on presentations
5. Stage manners (grooming, body language, voice modulation and speed: Practicing as individual)
6. Stage manners (grooming, body language, voice modulation and speed: Practicing as Groups)
7. Public speaking Exercise (Practicing)
8. Exercise on organising Training and Demonstration events for Farmers
9. Exercise on Interview Techniques
10. Practicing group discussion
11. Practicing Listening and note taking methods
12. Practicing Writing Skills- Precise writing
13. Practicing Summarizing and Abstracting
14. Practicing Reading and Comprehension (written) of general and technical articles
15. Practicing Reading and Comprehension (oral) of general and technical articles
16. Practising vocabulary building exercise and resume writing

### **17.Final Practical Examination**

## References

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3. Sharma,S.D. 2006. A textbook of Professional communication skills and ESP for Engineers and Professionals, Mehara Offset Press, New Delhi
4. Laxmi Lal Somani, 2020. Textbook of Communication and Soft Skills Development, AGROTEC Publishing Academy. ISBN: 978-81-8321-517-6
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6. Thomson, A. J. and Martinet, A. V. 1977. A Practical English Grammar. Oxford University.
7. Brown Michele and Gyles Brandreth. 1994. How to Interview and be Interviewed. Sheldon Press, London.
8. Carnegie Dale. 1997. The Quick and Easy Way to Effective Speaking. Pocket Books, New York.
9. Pease, Allan. 1998. Body Language. Sudha Publications, Delhi.
10. Raman, M. and Singh, P. 2000. Business Communication. Oxford University Press.
11. Neuliep James, W. 2003. Intercultural Communication - A Contextual Approach. Houghton Mifflin Co Boston
12. Kumar, S. and Pushpalata. 2011. Communication Skills. Oxford University Press.
13. Francis Peter, S. J. 2012. Soft Skills and Professional Communication. Tata McGraw Hill, New Delhi.
14. Seely, J. 2013. Oxford Guide to Effective Writing and Speaking. Oxford University Press.

## e- Resources

1. National Institute of Agricultural Extension Management (MANAGE) Resources.
2. [https://www.studocu.com/in/document/indira-gandhi-agricultural-](https://www.studocu.com/in/document/indira-gandhi-agricultural-university/communication-and-personality-development/extn-123-notes-bs-communication-and-personality-development/30644168)
3. [university/communication-and-personality-development/extn-123-notes-bs-](https://www.studocu.com/in/document/indira-gandhi-agricultural-university/communication-and-personality-development/extn-123-notes-bs-communication-and-personality-development/30644168)
4. [communication-and-personality-development/30644168](https://www.studocu.com/in/document/indira-gandhi-agricultural-university/communication-and-personality-development/extn-123-notes-bs-communication-and-personality-development/30644168)
5. <https://www.srsiat.org/wp-content/uploads/2023/11/AEX-201-material-THEORY.pdf>
6. <https://www.agrimoon.com/wp-content/uploads/COMMUNICATION-SKILLS.pdf>

## **AEX 102 Rural Sociology and Educational Psychology (2+0)**

### **Theory**

#### **Unit I: Rural Sociology, Indian Rural Society, Social Groups, Social Stratification**

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 in formation 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.

#### **Unit II: Culture, Values, Social Institutions and Organisations**

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. Structure of Rural Society and Pattern of Rural settlement. 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.

#### **Unit III: Social Control, Social Change**

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.

#### **Unit IV: Psychology, Intelligence and Personality**

Psychology and educational psychology: Meaning, definition, scope, and importance of educational psychology in Agricultural Extension. Basics of Human behaviour. 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.

## **Unit V: Teaching-Learning Process**

Sensation, Attention and Perception- meaning, definition and factors. Attitude – Concept – Factors influencing the development of attitude of farmers. Teaching: Learning process: Meaning and definition of teaching, learning, learning experience and learning situation, Domains of Learning - Cognitive, Affective and Psychomotor, Elements of learning situation and its characteristics. Principles of learning and their implication of teaching.

### **Theory Schedule**

1. Extension Education and Agricultural Extension: Meaning, definition, scope, and importance.
2. Sociology and Rural Sociology- Meaning, definition, scope and importance- Interrelationship between rural sociology and Agricultural Extension.
3. Indian Rural Society – important characteristics - Differences and relationships between rural and urban societies.
4. Rationale of understanding the traits of rural society for Effective Extension work
5. Social Groups -Meaning, definition, and classification of social groups.
6. Factors considered in formation and organization of groups
7. Motivation in group formation- Role of social groups in Agricultural Extension - Commodity groups, Farmer Interest Groups and Farmer Producer Companies
8. Social Stratification -Meaning, definition, functions, basis and forms.
9. Characteristics and Differences between class and caste systems- Understanding Social Stratification with respect to Agricultural Extension work
10. Cultural Concepts in Rural Society- Culture, Customs, folkways, mores, taboos, rituals, traditions and belief – Meaning, Definition and their role in agricultural Extension.
11. Cultural traditions and their relevance to extension- Barriers due to cultural norms.
12. Social Values and Attitude- Meaning, definition, and types of social values and attitudes- Role in Agricultural Extension
13. Social Institutions in Rural Society- Meaning, definition, and major institutions (family, religion, education, economy, politics) — Functions and Roles of Social Institutions in Agricultural Extension
14. Social Organizations-Meaning, definition, and types of organizations - Role in agricultural development (e.g., cooperatives, SHGs, Voluntary organisations and NGOs)

15. Social Control- Meaning, definition, need for social control- Means of social control: formal and informal

16. Social Change: Meaning, Definition, Nature and Dimensions of social change

17. Factors Influencing Social Change- Technological, cultural, economic, political, and environmental factors- Agricultural Extension as a change agent

**18. Mid Semester Examination**

19. Leadership: Meaning, definition, classification, roles of a leader

20. Different methods of selection of professional and lay leaders

21. Training of Leaders: Meaning, definition, methods of training, Advantages and limitations in use of local leaders in Agricultural Extension.

22. Psychology and Educational Psychology- Meaning, definition, and scope and importance of educational psychology in Agricultural Extension

23. Basics of Human Behavior- Definition and characteristics of human behaviour

24. Factors influencing behavior: biological, psychological, social- Importance of understanding behavior in Agricultural Extension.

25. Intelligence: - Meaning, definitions of Intelligence-Gardner's multiple intelligences- Types of Intelligence

26. Factors affecting Intelligence and importance of intelligence in Agricultural Extension.

27. Personality: Meaning, definition, types, factors influencing the personality and role of personality in agricultural extension.

28. Sensation, Attention and Perception- meaning, definition and factors.

29. Attitude – Concept – Factors influencing the development of attitude of farmers

30. Cognitive, Affective and Psychomotor Domain of Learning - Bloom's Taxonomy - Importance for adults learning

31. Teaching Learning Process- Meaning and Definition of Teaching- Principles of Teaching- Steps in Extension Teaching.

32. Learning process: Meaning and definition of learning, learning experience and learning situation.

33. Elements of learning situation and its characteristics

34. Principles of Learning and their implications of teaching.

## References

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2. Chitambar. (1977). *Introductory Rural Sociology*. New Age International Publishers. ISBN: 9389802288.
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7. Karthikeyan, C., Sendilkumar, R. and Jaganathan, D. 2008. *A Textbook of Agricultural Extension Management*. Atlantic Publisher and Distributors (P) Ltd, New Delhi. ISBN: 978-81-269-0081-3.
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11. Chatterjee, S. 2000. *Advanced Educational Psychology*, Books & Allied (P) Ltd., Calcutta.
12. Chauhan, S.S. 2001. *Advanced Educational Psychology*, Vikas Publishing House Pvt. Ltd., New Delhi.
13. Chitambar, J.B. 1997. *Introductory Rural Sociology*, New Age International (P) Ltd., Publishers, New Delhi.

## e- Resources

1. Food and Agriculture Organization (FAO): *Extension and Rural Development* [www.fao.org](http://www.fao.org)
2. National Institute of Agricultural Extension Management (MANAGE) Resources.
3. National Digital Library of India (NDLI) - Educational Psychology Resources.
4. MIT Open Course Ware - *Introduction to Educational Psychology*
5. <https://bscagriculture.com/rural-sociology-and-educational-psychology-notes/>

## **AGR 101 Farming Based Livelihood Systems (2+1)**

### **Theory**

#### **Unit I: Agriculture and Livelihood Systems**

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.

#### **Unit II: ALS and Farming Typologies**

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. Region-specific farming livelihood. Farming typology analysis.

#### **Unit III: IFS Components and Livelihood Enterprises**

Components of farming system/ farming-based livelihood systems- crops and cropping systems, livestock (dairy, piggery, goatry, poultry, duckry etc.), horticultural crops, agro--forestry systems, aqua culture 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

#### **Unit IV: Farming System Feasibility and Livelihood Models**

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.

#### **Unit V: Future Pathways in Farming Based Livelihoods**

Risk and success factors in farming-based livelihood systems, schemes and programs by Central and State government, 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 lifestyle.

### **Practicals**

Survey of farming systems and agriculturally based livelihood enterprises. Agro-climatic zones of India and the components of farming systems prevalent in each zone. Preparation of cropping scheme and IFS model for wetland, irrigated upland and dryland. Working out indices for evaluating the cropping system. Production and profitability analysis of crop-based livelihood models. Study of livestock-based livelihood models. Visit to agro-processing unit. Resource

recycling in integrated farming system models of different eco systems. Visit to integrated farming systems models at colleges / research stations/KVKs. Visit to innovative farming model - organic farming. Functional analysis of a value chain model in agriculture. Developing a project proposal for farming-based livelihood model. Case study of Start-Ups in agri-sectors. Final practical examination

### **Theory Schedule**

1. Status of agriculture in India, different states and Tamil Nadu: Historical significance of agriculture in India, Role of agriculture in India's economy (GDP contribution, employment, etc.). - Major crops and agricultural zones in India, Challenges facing Indian agriculture: Comparative analysis of productivity variations across Indian states.
2. Farmers' income: Current trends in farmers' income across India. Challenges - low profitability, high input costs, and market access. - Role of Minimum Support Price (MSP) and government schemes. Policy initiatives for doubling farmers' income.
3. Challenges and opportunities for enhancing farmers' income: Key challenges - climate change, input costs, fragmented landholdings, and market access. Opportunities - crop diversification, organic farming, digital agriculture and agro-processing industries.
4. Livelihood definition, concept, and patterns in urban and rural areas: resources, assets and activities. Differences in livelihood patterns between urban and rural areas.
5. Livelihood systems indicators for analysis: Key indicators of livelihood systems - Economic (income, employment, productivity), Social (education, health, gender equity), Environmental (resource sustainability, ecological balance). Methods for assessing livelihood systems.
6. Definition of Agricultural Livelihood Systems (ALS). Major components of ALS - land, labour, capital, and knowledge.
7. Approaches to agricultural livelihood systems: Traditional vs. modern approaches to ALS - Integrated farming systems, sustainable agricultural practices and climate-resilient approaches. Sustainable Livelihood Framework (SLF). Application of the SLF in understanding ALS.
8. Challenges and future perspectives in agricultural livelihood systems: Future trends - digital agriculture, agro-ecotourism, and value-chain integration.
9. Introduction to farming systems and farming based livelihood systems: Definition of farming systems. Components of farming systems. Relationship between farming systems and rural livelihoods.

10. Types of farming systems, characteristics and farm type assessment: Classification of farming systems - subsistence farming, commercial farming and mixed farming. Specialized systems - organic farming, agroforestry, integrated farming systems (IFS). Farm type assessment - Farm Typology.
11. Prevalent farming systems in India and their role in livelihoods: Overview of prevalent farming systems in India: Crop based systems (e.g., rice-wheat, millet-pulse), Livestock based systems (e.g., dairy, goat and poultry farming), Horticulture based systems (e.g., fruit and vegetable cultivation).
12. Components of farming systems/farming-based livelihood systems - Cropping systems: Monocropping, mixed cropping, intercropping, crop rotation. Factors influencing cropping patterns, Examples of region-specific cropping systems in India.
13. Components of farming systems / farming-based livelihood systems - Dairy farming: Milk production, breeds, and fodder management. Small livestock farming: Piggery, goat rearing, poultry and duck rearing. Integration of livestock with crop farming for nutrient recycling.
14. Components of farming systems / farming-based livelihood systems - Horticulture as a component of farming-based livelihoods: Importance of horticultural crops (fruits, vegetables, spices) in livelihoods. High-value horticulture: floriculture and medicinal plants.
15. Components of farming systems / farming-based livelihood systems - Agroforestry systems in farming-based livelihoods: Definition and types of agroforestry - silviculture, agri-silviculture, and agri-horticulture. Benefits of agroforestry - income diversification, environmental conservation.
16. Components of farming systems / farming-based livelihood systems - Fish farming. Integrated models - duck/poultry cum fish, dairy cum fish, piggery cum fish. Economic and environmental benefits.
17. Components of farming systems / farming-based livelihood systems: Definition and examples of small, medium, and large farm-based enterprises. Small enterprises - beekeeping, mushroom cultivation, sericulture. Medium enterprises - agro-processing units. Commercial based large enterprises.
18. **Mid Semester Examination**
19. Value chains in farming-based livelihood systems: Definition and importance of agricultural value chains. Steps in value chain creation - production, processing, marketing, distribution.

20. Secondary enterprises and their role in livelihoods: Examples of secondary enterprises - food processing, dairy products, handicrafts. Role in income diversification and rural employment.
21. Challenges and future prospects of farming-based livelihood systems: Challenges: resource constraints, climate change, market access, and policy gaps. Innovations for the future: digital agriculture, agro-tourism, vertical farming.
22. Factors affecting integration of various enterprises in farming for livelihood: Resource availability (land, water, labour, and capital), Agro-climatic conditions (soil type, rainfall, and temperature), Socio-economic factors (education, market access, and traditional practice).
23. Feasibility of farming systems across agro-climatic zones: Wetland IFS model, Garden land IFS model and Dryland IFS model.
24. Future directions in integrated farming systems: Climate smart agriculture and resilient farming systems- Case studies
25. Overview of commercial farming-based livelihood models in India - Definition and scope - Role of organizations – ICAR and NABARD.
26. NABARD's initiatives in rural livelihoods and agriculture: Producer organizations, Self-Help Groups (SHGs) and Agri-clinics and agri-business centers (ACABC).
27. Climate-resilient farming practices under NICRA. NGO-led livelihood enterprises (e.g., BAIF Development Research Foundation). Government programs: Rashtriya Krishi Vikas Yojana (RKVY) and eNAM.
28. Types of risks in farming: economic, environmental, technological, and social. Success factors in farming-based livelihood systems: resource management, innovation, market access, and community support.
29. Central and State Government schemes and programs for promoting farming-based livelihoods.
30. Role of public and private organizations in promoting farming-based livelihoods.
31. Introduction to the circular economy concept - sustainability, reducing waste, and promoting the reuse of resources. Zero-waste farming systems - recycling organic waste, composting, and integrated waste management.
32. Definition and principles of the green economy. Sustainable agriculture practices and Eco-friendly technologies in farming.

33. Digitalization and its impact on farming-based livelihood enterprises: Role of drones, sensors, and data analytics. Digital platforms for market access, e-commerce, and direct-to-consumer sales. Financial technologies - Role of platforms like eNAM, digital seed systems, and mobile apps in India and Tamil Nadu.
34. Changing lifestyles and their impact on farming-based livelihood enterprises. Diversification of income through eco-tourism, agri-tourism, and farm visits.

### **Practical Schedule**

1. Survey of farming systems and agricultural based livelihood enterprises
2. Agro-climatic zones of India and the components of farming systems prevalent in each zone
3. Preparation of cropping scheme and integrated farming system models for wetland
4. Preparation of cropping scheme and integrated farming system models for Irrigated upland
5. Preparation of cropping scheme and integrated farming system models for dryland
6. Working out indices for evaluating the cropping system
7. Production and profitability analysis of crop-based livelihood models
8. Study of livestock-based livelihood models
9. Study of agro-processing unit
10. Resource recycling in integrated farming system models of different eco systems
11. Visit to integrated farming systems models at colleges / research stations/KVKs
12. Visit to innovative farming model - organic farming.
13. Functional analysis of a value chain model in agriculture
14. Interaction with FPOs for knowledge sharing on Value addition
15. Developing a project proposal for farming-based livelihood model
16. Case study of Start-Ups in agri-sectors

### **17.Final Practical Examination**

### **References**

1. Reddy, S.R. 2016. Farming System and Sustainable Agriculture, Kalyani Publishers, New Delhi.
2. Singh, J.P., et al. 2015. Region Specific Integrated Farming System Models, ICAR-Indian Institute of Farming Systems Research, Modipuram.

3. Walia, S. S. and Walia, U. S. 2020. Farming System and Sustainable Agriculture, Scientific Publishers, Jodhpur, Rajasthan.
4. Raghuveer Singh, N. Ravisankar, V. Ramamurthy, Meraj Alam Ansari, Raghavendra, KJ, M. Shamim, A. S. Panwar, A.K. Prusty, S. Bhaskar, N. Subash, Sunil Kumar, Rajbir Singh and Meenu Rani.2023. Atlas of Cropping Systems in India, ICAR-Indian Institute of Farming Systems Research, Modipuram p. 320
5. Palaniappan, SP and K. Sivaraman.1996. Cropping systems in the tropics Principles and management. New Age International (P) Ltd., New Delhi.
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8. Ashley, C. and Carney, D. 1999. Sustainable Livelihoods: Lessons from Early Experience; Department for International Development: London, UK; Volume 7. [Google Scholar].
9. Carloni, A. 2001. Global Farming Systems Study: Challenges and Priorities to 2030 – Regional Analysis: Sub-Saharan Africa, Consultation Document, FAO, Rome, Italy.
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2. <https://www.fao.org/home/en>
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4. <https://www.scribd.com/document/834694571/Farming-based-livelihood-systems-241111-114957>
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# **AGM 101 Fundamentals of Microbiology (2+1)**

## **Theory**

### **Unit I: Introduction**

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

### **Unit II: Microbiological Techniques**

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

### **Unit III: Microbial World**

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

### **Unit IV: Microbial Growth and Metabolism**

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

### **Unit V: Microbial Genetics and Immunology**

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

## **Practicals**

Microbiological safety in the laboratory; Introduction to microbiology laboratory and its equipment's. Microscopes- handling with microscope. Micrometry. Methods of sterilization and equipment's used for sterilization. Nutritional media and their preparations. Enumeration of microbial population - bacteria, fungi and actinobacteria. Methods of purification and preservation of microbial cultures. Staining and microscopic observations; simple and differential staining – spore staining. Measurement of bacterial growth. Identification of microorganisms – morphological identification of yeasts, molds and algae. Identification- cultural, physiological and biochemical tests for bacteria and actinobacteria. Isolation of bacteriophages. Isolation of mutants employing physical or chemical mutagens. Determination of Antigen- antibody reaction.

## **Theory schedule**

1. Definition and scope of microbiology
2. Biogenesis and a biogenesis theory. Contributions by Antonie Van Leeuwenhoek and Louis Pasteur
3. Contributions of John Tyndall, Joseph Lister, Edward Jenner, Robert Koch, Alexander Fleming and Waksman, John Franklin Enders, Maurice Hilleman. Germ theory of diseases, Fermentation and Origin of life
4. Microscopy; principles – resolving power and magnification. Light microscopy
5. Different types of microscopes - UV, dark field, phase contrast and fluorescence
6. Electron microscopes; atomic and confocal scanning laser microscopy
7. Staining techniques - principle and types of stains - staining techniques- simple, negative, differential and structural staining methods
8. Sterilization – principle – physical agents and chemical methods
9. Isolation and enrichment culture techniques; preservation techniques
10. Evolutionary relationship - position of microbes in living world – concepts and developments in classification of microorganisms.
11. Groups of microorganisms - prokaryotes and eukaryotes. Archaea – ecology; differences among archaea, eubacteria and eukaryotes. Rickettsia and Chlamydia similarities and differences.
12. Bergey's manual of systematic bacteriology – outline only. Economic importance of bacteria
13. Bacteria- size, shape, structure and arrangement of cells

14. Bacteria - external and internal structures in bacteria and their functionality
15. Morphology and classification of fungi and economic importance
16. Morphology and classification of algae and economic importance
17. Viruses and their properties; bacteriophages – lytic and lysogenic cycles- Virulent and temperate phages

**18. Mid Semester Examination**

19. Reproduction in bacteria - population growth and growth phases – generation time and specific growth rate
20. Batch and continuous culture – chemostat and turbidostat; synchronous culture. Diauxic growth curve.
21. Conditions for growth - temperature requirements - aerobes and anaerobes – other factors influencing growth; methods of assessment of growth.
22. Nutritional types of bacteria. Metabolic diversity in microbes.
23. Aerobic respiration and anaerobic respiration
24. Fermentative mode of respiration
25. Oxygenic and anoxygenic mode of photosynthesis
26. Energy generation by substrate level phosphorylation, oxidative and photophosphorylation
27. Central dogma of life - Genetic elements in bacteria – structure and functions of bacterial chromosome and plasmid and transposons
28. Mutation in bacteria – principles and types. Mutagens – physical, chemical and biological
29. Genetic recombination – competency - transformation
30. Genetic recombination by Conjugation – concept of Hfr
31. Genetic recombination by Transduction – generalized and specialized
32. Microorganisms as tools in genetic engineering
33. Immunology – principles – specific and non-specific defense
34. Antigen – antibody reactions – vaccines - applications

**Practical schedule**

1. Safety in Microbiology laboratory. Microscopes – handling light microscope
2. Micrometry-measurement of microorganisms

3. Aseptic techniques – working with equipment and apparatus
4. Preparation of growth media for bacteria, yeast, molds and actinobacteria
5. Isolation of microorganisms by serial dilution and plating technique
6. Purification of bacteria and actinobacteria
7. Purification of yeasts and molds
8. Preservation of bacteria, fungi and actinobacteria
9. Staining techniques - Direct and Indirect staining
10. Differential staining - Gram staining
11. Turbidometric assessment of growth of bacteria
12. Morphology and Biochemical characteristics of bacteria and actinobacteria
13. Identification of yeasts, molds and algae - morphological characterization
14. Isolation of bacteriophages
15. Isolation of bacterial mutants by UV irradiation / chemical mutagenesis
16. Determination of Antigen- antibody reactions

### **17. Final Practical Examination**

### **References**

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3. Joanne M. Willey, Kathleen M. Sandman and Dorothy H. Wood. 2022. Prescott's Microbiology, 12th edition. McGraw-Hill exclusive, UK.
4. Hans G. Schlegel, 2012. General Microbiology, 7 th edition
5. Ronald M. Atlas, 1997. Principles of Microbiology, Second edition
6. Tortora, G.J., B.R. Funke and C.L. Case, 2009. Microbiology- An Introduction, 9 th edition
7. Stanier, R.Y., Adelberg, E.A. and Ingram, J.L. (1991). General Microbiology, 5th Ed., Prentice Hall of India Pvt. Ltd., New Delhi.

### **e- Resources**

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

## **AEC 101 Principles of Agricultural Economics (1+0)**

### **Theory**

#### **Unit I: Nature and Scope of Economics**

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

#### **Unit II: Theory of Consumption**

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

#### **Unit III: Theory of Production**

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

#### **Unit IV: Exchange and Distribution**

Market structure: meaning and types of market, basic features of perfectly competitive and imperfect markets. Digital Marketing – Meaning, scope and role in agricultural markets. Distribution theory: meaning, factor market and pricing of factors of production - Concepts of Rent and Quasi rent - Wages: Real wage and money wage - Population: Importance, Malthusian and Optimum population theories, natural and socio-economic determinants, current policies and programs on population control. Interest: Pure interest and gross interest – Profit: Meaning of economic profit -Forms of business organizations.

## **Unit V: Macroeconomic Concepts**

National income: Meaning and importance, circular flow, concepts of national income – accounting and approaches to measurement, difficulties in measurement. Money: Barter system of exchange and its problems, evolution, meaning and functions of money, classification of money, money supply, general price index, inflation and deflation. Agricultural and public finance: meaning, micro versus macro finance, need for agricultural finance, public revenue and public expenditure. Tax: meaning, direct and indirect taxes, agricultural taxation. Economic systems: Concepts of economy and its functions, important features of capitalistic, socialistic and mixed economies, elements of economic planning. International trade and balance of payments. GST and its implication on Indian economy.

### **Theory Schedule**

1. Economics: Meaning, scope and subject matter, definitions, activities, approaches to economic analysis; micro and macroeconomics, positive and normative analysis
2. Nature of economic theory; rationality assumption, concept of equilibrium, economic laws as generalization of human behavior. Basic concepts: Goods and services - classification and characteristics, desire, want –meaning and characteristics, demand, utility, cost and price, wealth, capital, income and welfare.
3. Agricultural economics: meaning, definition, characteristics of agriculture, importance and its role in economic development. Agricultural planning and development in the country. Role of Economics in Agricultural development policies
4. Utility theory - cardinal and ordinal utility; law of diminishing marginal utility, equi-marginal utility principle, Indifference curve analysis and properties - budget line - definition, assumptions, limitations and applications.
5. Consumer's equilibrium and derivation of demand curve, Demand: meaning, kinds of demand, law of demand, demand schedule and demand curve, determinants. Concept of consumer surplus and its importance.
6. Elasticity of demand: concept and measurement of price elasticity, income elasticity and cross elasticity. Factors influencing elasticity of demand, Importance of elasticity of demand. Standard of Living: Definition, Engel's Law of Family Expenditure.
7. Production: process, creation of utility, factors of production definition and characteristics- Input Output Relationship.
8. Laws of returns: Law of variable proportions and law of returns to scale. Cost: Cost concepts, short run and long run cost curves. Revenue concepts: Total, Average and Marginal revenue.

## **9. Mid Semester Examination**

10. Supply: Stock versus supply, law of supply, supply schedule, supply curve, determinants of supply, elasticity of supply.
11. Market structure: meaning and types of market, basic features of perfectly competitive and imperfect markets. Digital Marketing – Meaning, scope and role in agricultural markets.
12. Distribution theory: meaning, factor market and pricing of factors of production. - Concepts of Rent and Quasi rent - Wages: Real wage and money wage - Population: Importance, Malthusian and Optimum population theories, natural and socio-economic determinants, current policies and programmes on population control.
13. Interest: Pure interest and gross interest – Profit: Meaning of economic profit Forms of business organizations.
14. National income: Meaning and importance, circular flow, concepts of national income - accounting and approaches to measurement, difficulties in measurement.
15. Money: Barter system of exchange and its problems, evolution, meaning and functions of money, classification of money, money supply, general price index, inflation and deflation.
16. Agricultural and public finance: meaning, micro versus macro finance, need for agricultural finance, Public revenue and public expenditure. Tax: meaning, direct and indirect taxes, agricultural taxation.
17. Economic systems: Concepts of economy and its functions, important features of capitalistic, socialistic and mixed economies, elements of economic planning. international trade and balance of payments. GST and its implication on Indian economy

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2. S. Subha Reddy, P. Raghu Ram, T.V. Neelakanta and I. Bhvani Devi .2004. Agricultural Economics. Oxford & IBH publishing Co. Pvt. Ltd
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## **e- Resources**

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2. [https://www.rvskvv.net/images/Principles-of-Agricultural-Economics\\_17.04.2020.pdf](https://www.rvskvv.net/images/Principles-of-Agricultural-Economics_17.04.2020.pdf)
3. [https://zalamsyah.wordpress.com/wp-content/uploads/2018/02/2-principles-of-agricultural-economics\\_andrew-barkley-paul-w-barkley.pdf](https://zalamsyah.wordpress.com/wp-content/uploads/2018/02/2-principles-of-agricultural-economics_andrew-barkley-paul-w-barkley.pdf)

## **SAC 101 Fundamentals of Soil Science (2+1)**

### **Theory**

#### **Unit I: Basics of Soil & Formation**

Soil: Pedological and edaphological concepts. Rocks and minerals, Weathering, Soil formation: Pedogenic processes.

#### **Unit II: Soil Profile & Physical Properties**

Soil profile, soil texture, soil structure, bulk density and particle density, soil consistency, soil temperature, soil air, soil water.

#### **Unit III: Soil Chemical Properties & Soil Colloids**

Soil reaction and buffering capacity. Soil colloids: inorganic and organic, Properties of soil colloids

#### **Unit IV: Silicate Clays**

Silicate clays: constitution and properties, sources of charge, ion exchange, cation and anion exchange capacity and base saturation.

#### **Unit V: Soil Organic Matter & Soil Taxonomy**

Soil organic matter. Soil taxonomy, keys to soil orders. Soils of India and Tamil Nadu.

### **Practicals**

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 & Bouyoucos Hydrometer method, mechanical analysis, determination of bulk density and particle density and soil porosity, determination of soil colour, study of soil structure, determination of soil moisture, determination of soil moisture constants – field capacity; water holding capacity. Study of infiltration rate of soil, determination of hydraulic conductivity, determination of pH and Electrical conductivity of soil.

### **Lecture Schedule**

1. Soil definition - Soil as a three-dimensional natural body, Pedological and edaphological concepts of soil
2. Components of soil – soil a three-phase system- Composition of Earth's crust.
3. Soil genesis: soil forming rocks-definition, formation, Classification of rocks- igneous, sedimentary and metamorphic rocks
4. Brief description of important rocks - mineralogical composition

5. Minerals- definition, occurrence, classification of important soil forming primary minerals  
- silicate and non- silicate minerals, ferro and non-ferro magnesium minerals
6. Formation of secondary minerals - clay minerals and amorphous minerals
7. Weathering - Rocks and minerals - Physical, chemical and biological weathering
8. Factors of soil formation- Passive and active soil forming factors
9. Soil forming process- Fundamental - Simenson's four fold soil forming process -  
eluviation, illuviation, translocation and humification
10. Specific Soil forming processes - podzolization, laterization, salinization, alkalization,  
calcification, decalcification and pedoturbation
11. Soil Profile – Horizons, Master horizons and subordinate horizons, subdivisions,  
Lithological discontinuity.
12. Soil physical properties: Soil texture - particle size distribution - textural classes - textural  
triangular diagram - significance of soil texture
13. Soil structure - classification - genesis - factors influencing structural stability -  
significance of soil structure
14. Soil bulk density, particle density and porosity - factors influencing – significance
15. Soil colour - Significance –measurement(Munsell colour chart) - factors influencing soil  
colour
16. Soil consistency - cohesion, adhesion, plasticity, Atterberg's constants - upper and lower  
plastic limits, plasticity number- significance of soil consistency
17. Soil water- classification, units of expression and pF scale
18. **Mid semester Examination**
19. Soil water potentials - gravitational, matric, osmotic- Soil moisture constants
20. Movement of soil water - Saturated and unsaturated flow - infiltration, hydraulic  
conductivity, percolation, permeability and drainage
21. Soil air, composition, gaseous exchange –effect on crop growth.
22. Soil temperature -Source, amount and flow of heat in soil and effect on crop growth.
23. Soil reaction (pH) - definition, pH scale, classification-soil acidity and alkalinity, buffering,  
factors affecting soil pH, effect on nutrient availability
24. Soil Electrical Conductivity – Definition-Factors affecting EC –Salinity limits- it's  
significance
25. Soil colloids –definition, properties, classification: inorganic and organic colloids

26. Silicate clays: structure and classification - 1:1, 2:1, 2:2 clay minerals, amorphous clay minerals and their properties
27. Sources of charge- positive and negative charge – pH dependant charge, isomorphous substitution
28. Ion exchange - Cation and anion exchange capacity and base saturation
29. Soil organic matter: properties and it's influence on soil health
30. Soil Taxonomy- Structure, differentiating characters and limitations
31. Soil Orders – keys to soil order
32. Different soil orders and distribution in the world
33. Soils of TamilNadu
34. Soils of India

### **Practical Schedule**

1. Study of soil forming rocks and minerals.
2. Study of soil profile
3. Study of soil sampling tools, collection of representative soil sample, its processing and storage.
4. Determination of soil texture by feel method&Bouyoucos Hydrometer method
5. Determination of soil texture by mechanical analysis-International pipette method
6. Determination of soil bulk density by wax coating method
7. Determination of soil bulk density, particle density and soil porosity by cylinder method.
8. Determination of soil colour
9. Determination of soil moisture content (gravimetric method).
10. Determination of soil aggregates
11. Determination of soil moisture constants - field capacity and water holding capacity.
12. Determination of infiltration rate of soil
13. Determination of hydraulic conductivity of soil
14. Determination of soil temperature
15. Determination of soil pH and Electrical conductivity.
16. Study of soil map (India and Tamil Nadu)

### **17.Final Practical Examination**

## References

1. Thiyageshwari,S., D.Selvi, S.Meena and P.Janaki.2024. Beginner's guide to Fundamentals of Soil Science. AE Publications, Coimbatore. (ISBN:9392583753)
2. Fundamentals of Soil Science.2009 .ISSS Publication, New Delhi
3. Dilip Kumar Das. 2015. Introductory Soil Science, Kalyani Publishers, New Delhi
4. Brady, N.C.2002. The Nature and Properties of Soils (13<sup>th</sup> Edition) McMillan Co., New York. Indian Publisher – Eurasia Publishing House (P) Ltd., Ramnagar, New Delhi – 55
5. Daji A.J., (1970) A Text Book of Soil Science - Asia Publishing House, Madras
6. Biswas T.D. and Mukherjee S.K., 1987. Text Book of Soil Science–Tata McGraw Hill Publishing Co. Ltd., New Delhi

## e- Resources

1. <http://www.sciencedirect.com/science/books>
2. <http://202.200.144.17/sykc/hjx/content/ckzl/6/2.pdf>
3. [http://www.pedosphere.com/volume01/pdf/Section.\\_01.pdf](http://www.pedosphere.com/volume01/pdf/Section._01.pdf)
4. [http://waterquality.montana.edu/docs/homeowners/Septic Drain field Soil Suitability, Presentations /6 \\_Soil Texture and \\_Structure.pdf](http://waterquality.montana.edu/docs/homeowners/Septic%20Drain%20field%20Soil%20Suitability%20Presentations/6_Soil%20Texture%20and%20Structure.pdf)
5. [http://wfrec.ifas.ufl.edu/landscape\\_horticulture/PDFdocuments/SoilProp.pdf](http://wfrec.ifas.ufl.edu/landscape_horticulture/PDFdocuments/SoilProp.pdf)
6. [http://www.rootsofpeace.org/assets/Soil%Testing%Manual%20V6%20\(Feb%208\).pdf](http://www.rootsofpeace.org/assets/Soil%20Testing%20Manual%20V6%20(Feb%202008).pdf)
7. <http://www.soils.wisc.edu/courses/SS325/morphology.htm>
8. <http://www.soils.wis.edu/courses/SS325/morphology.htm>
9. <http://landresources.montana.edu/>
10. [http://ftp.wcc.nrcs.usda.gov/H....soil Other/soil-USA-textural-class.pdf](http://ftp.wcc.nrcs.usda.gov/H...soil%20Other/soil-USA-textural-class.pdf)

## **HOR 111 Fundamentals of Horticulture (2+1)**

### **Theory**

#### **Unit I: History, evolution and scope of horticulture**

Horticulture: History, Scope and importance, Its different branches, Botanical classification of horticultural crops and nutritive value, Area and production, exports and imports, Horticultural zones of India and Tamil Nadu, soil and climate for horticultural crops.

#### **Unit II: Plant propagation and Nursery techniques**

Plant propagation: Definition, methods and propagation structures, Seed Dormancy, Seed vigor, seed treatments and seed germination, Merits and demerits of Sexual propagation and Asexual propagation, Asexual propagation types viz., cutting, layering, grafting and budding. Use of specialized plant parts in propagation. Micropropagation - Rootstock influence - stock / scion relationship in fruit crops.

#### **Unit III: Orchard Establishment, Layout, planting systems and canopy management**

Principles of orchard establishment, vegetable gardens, nutrition and kitchen garden and other types of gardens, planning and layout of orchards, planting systems and planting densities. Canopy management, training and pruning of horticultural crops

#### **Unit IV: Management practices and cropping systems**

Types and use of growth regulators in horticulture, water management– irrigation methods, weed management - manures and fertilizers, methods of application of fertilizers, Cropping systems, intercropping, multi-tier cropping, mulching– objectives, types merits and demerits.

#### **Unit V: Bearing habits, Fruitfulness and Rejuvenation**

Fruitfulness and unfruitfulness - Classification of bearing habits of fruit trees, pollination, pollinizers and pollinators, fertilization and parthenocarpy, Rejuvenation of old orchards, Harvesting and post-harvest handling of horticulture crops

### **Practicals**

Identification and nomenclature of fruit, Layout of an orchard, peg marking, pit making and system of planting, Nursery raising techniques of fruit crops, Understanding of plant propagation structures, Propagation through sexual, asexual and specialized 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, harvesting, grading, packaging, and storage.

## **Theory Schedule**

1. Definition, history, scope and importance, branches of horticulture and nutritive value of horticultural crops
2. Classification of horticultural crops
3. Horticultural zones of India and of Tamil Nadu, area and production statistics,
4. Exports and imports of horticultural crops in India and Central and State agencies involved in Horticultural research and development
5. Soil and climate requirements of horticultural crops
6. Types of plant propagation and plant propagation structures
7. Sexual/Seed propagation - importance, advantages and disadvantages
8. Types of dormancies- seed invigoration - seed treatments
9. Asexual/Vegetative propagation, importance, advantages and disadvantages
10. Vegetative propagation- cutting and layering methods
11. Vegetative propagation- grafting and budding methods
12. Use of specialized plant parts in propagation
13. Rootstock influence - stock scion relationship in fruit crops
14. Micropropagation of horticultural crops
15. Vegetable gardens, nutrition and kitchen garden, truck garden, riverbed cultivation, vegetable forcing, market garden and floating garden
16. Principles, planning and layout of Orchards, Planting systems i.e square, rectangular, quincunx, hexagonal, contour terracing
17. High density and ultra-high density planting systems and calculation of planting densities

## **18. Mid Semester Examination**

19. Principles, objectives, methods of training in fruit crops and their merits and demerits
20. Principles, objectives, types and methods of pruning and canopy management in fruit crops
21. Types and use of growth regulators in horticulture
22. Water management– Types of Irrigation methods for horticultural crops and their merits and demerits
23. Weed management - types of weeds and their management in horticulture crops
24. Fertility management, manures and fertilizers and methods of application for horticultural crops

25. Cropping systems, intercropping, multi-tier cropping in horticultural crops
26. Mulching– objectives, types of merits and demerits
27. Fruitfulness and unfruitfulness- Factors influencing the fruitfulness and unfruitfulness
28. Bearing habits of fruit trees with examples
29. Pollination, pollinizers and pollinators in Horticulture
30. Fertilization and Parthenocarpy in horticulture
31. Rejuvenation of old orchards
32. Maturity; Methods for judging the maturity in horticulture crops
33. Post harvest operations - harvesting, grading, and packing in horticulture crops
34. Transport and storage methods for horticulture crops

### **Practical Schedule**

1. Study of different features, planning and layout of orchard
2. Identification and nomenclature of various horticultural crops
3. Study of tools and implements in horticulture
4. Study of plant growing structures
5. Preparation of nursery beds for sowing of vegetable seeds/root stock raising and Layout of nutrition garden
6. Preparation of potting mixture, Identification of containers, Potting and repotting of rootstocks and container grown plants
7. Techniques and methods of propagation through leaf, stem, root cuttings and layering
8. Techniques and methods of propagation through grafting and budding
9. Propagation through specialized plant parts
10. Layouts of different planting systems and digging of pits for fruit plants
11. Study of different methods of training and methods of pruning of orchard trees
12. Calculation of fertilizer doses, Preparation of fertilizer mixtures and field application
13. Calculation, preparation and application of growth regulators
14. Layout of different irrigation systems
15. Study of bearing habits in horticulture crops
16. Study of maturity standards, harvesting, grading, packaging and storage.
17. **Final Practical Examination**

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## e- Resources

1. <https://www.agricolbikaner.org/wp-content/uploads/2020/10/Hort-111-.pdf>
2. <https://www.agrimoon.com/wp-content/uploads/Fundamentals-of-Horticulture.pdf>
3. <https://k8449r.weebly.com/uploads/3/0/7/3/30731055/fundamentals-of-horticulture-and-production-technology-of-fruit-crops-signed.pdf>
4. <https://www.tnu.in/wp-content/uploads/2021/09/fundamentals-of-horticulture.pdf>

## **MAT 101    Introductory Mathematics (0+1)**

### **Practicals**

#### **Unit I: Algebra**

Progressions- Arithmetic, Geometric and Harmonic Progressions. Matrices-Definition of Matrices-Types of Matrices- Addition, Subtraction, Multiplication, Transpose. Determinants- Properties of determinants up to 3rd order and their evaluation and inverse up to 3rd order by adjoint method- Solution of linear equations by Crammer's rule.

#### **Unit II: Functions & Differential Calculus**

Functions: Limit: Definition, left-handed and right-handed limits, general rules for the calculation of limits Standard limits, Some Important limits (without proof).

Differential Calculus: Definition - Differentiation of function using first principle, Derivatives of sum, difference, product and quotient of two functions, differentiation using the chain rule, differentiation of functions in parametric and implicit form, logarithmic differentiation. Geometrical interpretation of derivatives. Successive differentiation.

#### **Unit III: Application of Differentiation**

Growth rate, Average Cost, Marginal cost and Marginal Revenue. Partial differentiation: Homogeneous function, Euler's theorem, Maxima and Minima of the functions of the form  $y = f(x)$  and  $y = f(x_1, x_2)$ .

#### **Unit IV: Integral Calculus**

Integration -Definite and Indefinite Integrals-Methods- Integration by substitution, Integration by parts. Area under simple well-known curves.

#### **Unit V: Mathematical Models**

Agricultural systems - Mathematical models - classification of mathematical models- Fitting of Linear, quadratic and exponential models to experimental data.

### **Practical Schedule**

1. Progressions- Arithmetic, Geometric and Harmonic Progressions.
2. Matrices-Definition of Matrices-Types of Matrices- Addition, Subtraction, Multiplication, Transpose.
3. Determinants-Properties of determinants up to 3rd order and their evaluation.
4. Inverse up to 3rd order by adjoint method- Solution of linear equations by Crammer's rule.

5. Limit: Definition, left-handed and right-handed limits, general rules for the calculation of limits Standard limits, Some important limits (without proof)
6. Definition - Differentiation of functions using first principle, Derivatives of sum, difference, product and quotient of two functions.
7. Differentiation using the chain rule, differentiation of functions in parametric and implicit form, logarithmic differentiation. Geometrical interpretation of derivative.
8. Successive differentiation. Application of Differentiation- Growth rate, Average Cost, Marginal cost and Marginal Revenue.
9. **Mid Semester Examination**
10. Partial differentiation: Homogeneous function, Euler's theorem.
11. Maxima and Minima of the functions of the form  $y = f(x)$
12. Maxima and Minima of the functions of the form  $y = f(x_1, x_2)$ .
13. Integration -Definite and Indefinite Integrals-Methods- Integration by substitution
14. Integration by parts. Area under simple well-known curves
15. Agricultural systems - Mathematical models - classification of mathematical models. Fitting Linear model to experimental data.
16. Fitting quadratic model and exponential models to experimental data.
17. **Final Practical Examination**

## References

1. Kailasam.C, Pangayar Selvi. R and Vasanthi. R, 2021, Applied Mathematics, Agrobios (India), Jodhpur
2. R. Pangayar Selvi, B. Sivasankari, R. Vasanthi, 2020, A Textbook of Elementary Mathematics, AkiNik Publications, New Delhi.
3. Mehta, B. C. and G. M. K. Madnani, 2014, Mathematics for Economists, Sultan Chand & Sons, New Delhi.
4. Ranganathan.C.R. 2006, A First Course in Mathematical Models of Population Growth (with MATLAB programs), Associated publishing company, New Delhi
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1. <http://eagri.org/eagri50/MATH/index.html>
2. <https://byjus.com/maths/determinants-and-matrices/>
3. <https://www.rit.edu/academicsuccesscenter/sites/rit.edu.academicsuccesscenter/files/documents/mat>
4. [h-handouts/C1\\_Limits\\_BP\\_9\\_22\\_14.pdf](#)
5. [https://www.whitman.edu/mathematics/calculus/calculus\\_08\\_Techniques\\_of\\_Integration.pdf](https://www.whitman.edu/mathematics/calculus/calculus_08_Techniques_of_Integration.pdf)

## **NSS 101 National Service Scheme I (0+1)**

### **Practicals**

#### **Unit I : Basics of NSS and its structure**

Introduction and Basic Components of NSS - Organizational structure of NSS - Code of conduct for NSS volunteers -NSS program activities like Concept of regular activities, special camps

#### **Unit II : Financial patterns, Youth and Community**

Financial patterns of scheme - Understanding youth - Community mobilization- Mapping of community stakeholders

#### **Unit III : Social harmony and Indian history and culture**

Social harmony and national integration - Indian history and culture - role of youth in nation building- Conflict resolution and peace building

#### **Unit IV : Volunteerism, constitution, and human rights**

Volunteerism and *shramdaan* - motivation, and constraints; shaman as part of volunteerism- Citizenship, constitution, and human rights

#### **Unit V : constitution of India, Human rights and Family and society**

Basic features of constitution of India - Human rights, Consumer awareness and Rights to information - Family and society

### **Practical Schedule**

1. Introduction and Basic Components of NSS. Orientation: history, objectives, principles, symbol, badge; regular programs under NSS.
2. Organizational structure of NSS, Code of conduct for NSS volunteers, points to be considered by NSS volunteers' awareness about health.
3. NSS program activities: Concept of regular activities, special camping, day camps, basis of adoption of village/slums, conducting survey, analyzing guiding.
4. Financial patterns of scheme, youth program/ schemes of GOI, coordination with different agencies and maintenance of diary.
5. Understanding youth. Definition, profile, categories, issues and challenges of youth; and opportunities for youth who is agent of the social change.
6. Community mobilization: Mapping of community stakeholders, designing the message as per problems and their culture
7. Identifying methods of mobilization involving youth-adult partnership.
8. Social harmony and national integration.

## **9. Mid Semester Examination**

10. Indian history and culture, role of youth in nation building,
11. Conflict resolution and peace building.
12. Volunteerism and *shramdaan*. Indian tradition of volunteerism, its need, importance, motivation, and constraints; shaman as part of volunteerism
13. Citizenship, constitution, and human rights
14. Basic features of constitution of India, fundamental rights and duties
15. Human rights, Consumer awareness and rights, Rights to information.
16. Family and society. Concept of family, community (PRIs and other community-based organizations) and society

## **17.Final Practical Examination**

### **References**

1. National Service Scheme:2020. A Youth Volunteers Programme for Under Graduate Students as Per UGC Guidelines
2. National Service Scheme Manual (Revised) 2006. Government of India, Ministry of Youth Affairs & Sports, New Delhi
3. Nirmalya Kumar Sinha and Surajit Majumder, 2021. Textbook of National Service Scheme and Youth, New Delhi

### **e- Resources**

1. <https://nss.gov.in/>

## **NCC 101 National Cadet Corps I (0+1)**

### **Practicals**

#### **Unit I: NCC General and drill**

Introduction of NCC, History, 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.

#### **Unit II: Drill and Marching**

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.

#### **Unit III: National Integration, Personality Development, leadership development**

Command and control, organization, badges of rank, honors, 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.

#### **Unit IV: General Awareness and involvement in social activities, Armed Forces**

Civil defense organization, types of emergencies, firefighting, protection. Maintenance of essential services, disaster management, aid during development projects.

#### **Unit V: Social Service and Community Development**

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 Schedule**

1. Aims, objectives, organization of NCC and NCC song. DG's cardinals of discipline.
2. Drill – aim, general words of command, attention, stand at ease, stand easy and turning.
3. Sizing, numbering, forming in three ranks, open and close order march, and dressing.
4. Saluting at the halt, getting on parade, dismissing, and falling out.
5. Marching, length of pace, and time of marching in quick/slow time and halt.
6. Side pace, pace forward and to the rear.

7. Turning on the march and wheeling.

8. Saluting on the march.

**9. Mid Semester Examination**

10. Marking time, forward march, and halt.

11. Changing step, formation of squad and squad drill.

12. Command and control, organization, badges of rank, honors, and awards.

13. Nation Building – cultural heritage, religions, traditions, and customs of India. National integration.

14. Values and ethics, perception, communication, motivation, decision making, discipline and duties of good citizens.

15. Leadership traits, types of leadership, character/personality development.- Civil defense organization, types of emergencies, firefighting, protection, maintenance of essential services, disaster management, aid during development projects.

16. Basics of social service, weaker sections of society and their needs, NGOs 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

**17. Final Practical Examination**

**References**

1. Handbook of NCC Cadets for 'A', 'B' and 'C' Certificate Examinations,

2. Cadet's Handbook (Army Wing),

3. Gupta, R. K. (2020). *Handbook of NCC Cadets for 'A', 'B' and 'C' Certificate Examinations*. Ramesh Publishing House. ISBN: 978-9387918573.

4. St. Joseph's College of Engineering and Technology. (2022). *Cadet's Handbook (Common Subjects for All Wings)*. SJBIT Publication.

**e- Resources**

1. [https://en.wikipedia.org/wiki/National\\_Cadet\\_Corps\\_\(India\)](https://en.wikipedia.org/wiki/National_Cadet_Corps_(India))

2. <https://indiancc.mygov.in/>

3. <https://mybharat.gov.in/Gov/Department/national-cadet-corps>

## **PED 101 - Physical Education, First Aid, Yoga Practice and Meditation (0+1)**

### **Practicals**

#### **Unit I: Asanas, Pranayama & Yogic Kriyas**

Yoga; History of Yoga, Types of Yoga, Introduction to Yoga, Asanas (Definition and Importance) Padmasana, Gaumukhasana, Bhadrasana and Vajrasana; Shashankasana, Pashchimotana, Ushtrasana, Tadasana, Padhasana, Ardha Chandrasana, Bhujangasana, Utanpadasana, Sarvangasana, Parvatasana, Patangasana, Shishupalasana – left leg-right leg, Pawanmuktasana, Halasana, Sarpaasana, Ardha Hanurasana and Sawasana. Suryanamskara Pranayama (Definition and Importance) Omkar, Surya Bheda, Chandra Bheda, Anulom Vilom, Shitali, Shitkari, Bhastrika and Bhramari; Teaching of Asanas – demonstration, practice, correction and practice. Meditation (Definition and Importance), Yogic Kriyas (Kapalbhati), Tratak, Jalneti and Tribandha.

#### **Unit II: Mudras and Role of Yoga in Sports**

Mudras (Definition and Importance) Gyanmudra, Dhyana mudra and Vajrasana. Akash mudra, Pruthvi mudra, Shunya mudra, Surya mudra, Varuna mudra and Pran mudra. Apan mudra, Vyan mudra, Uddana mudra and Role of yoga in sports.

#### **Unit III: First Aid**

Need and requirement of first aid. First Aid equipment and upkeep. First aid Techniques, First aid related with Respiratory system. First aid related with Heart, Blood and Circulation. First aid related with Wounds and Injuries. First aid related with Bones, Joints Muscle related injuries. First aid related with Nervous system and Unconsciousness. First aid related with Gastrointestinal Tract. First aid related with Skin, Burns. First aid related with Poisoning. First aid related with Bites and Stings. First aid related with Sense organs, Handling and transport of injured traumatized persons. Sports injuries and their treatments.

#### **Unit IV: History, Awards and Cricket**

History of sports and ancient games, Governance of sports in India; Important national Sporting events. Awards in Sports. History, latest rules, measurements of playfield, specifications of equipment. Cricket - Latest rules, measurements of playfield, specifications of equipment and teaching of skills and techniques.

#### **Unit V: Football, Table Tennis and Badminton**

Football, Table Tennis and Badminton - Latest rules, measurements of playfield, specifications of equipment and teaching of skills and techniques.

### **Practical Schedule**

Class 1 : Yoga; History of Yoga, Types of Yoga, Introduction to Yoga, Asanas (Definition and Importance) Padmasana, Gaumukhasana, Bhadrasana and Vajrasana.

- Class 2 : Shashankasan, Pashchimotasan, Ushtrasan, Tadasan, Padhastasan, Ardhchandrasan, Bhujangasan, Utanpadasan, Sarvangasan, Parvatasan, Patangasan, Shishupalanasan – left leg-right leg, Pavanmuktasan, Halasan, Sarpasan, Ardhhanurasan and Sawasan.
- Class 3 : Suryanamskar Pranayama (Definition and Importance) Omkar, Suryabhedan, Chandrabhedan, AnulomVilom, Shitali, Shitkari, Bhastrika and Bhramari;
- Class 4 : Teaching of Asanas – demonstration, practice, correction and practice.
- Class 5 : Meditation (Definition and Importance), Yogic Kriyas (Kapalbhati), Tratak, Jalneti and Tribandh.
- Class 6 : Mudras (Definition and Importance) Gyanmudra, Dhyamudra and Vayumudra.
- Class 7 : Akashmudra, Pruthvimudra, Shunyamudra, Suryamudra, Varunmudra and Pranmudra.
- Class 8 : Apanmudra, Vyanmudra, Uddanmudra and Role of yoga in sports.
- Class 9 : Need and requirement of first aid. First Aid equipment and upkeep. First aid Techniques, First aid related with Respiratory system. First aid related with Heart, Blood and Circulation. First aid related with Wounds and Injuries. First aid related with Bones, Joints Muscle related injuries. First aid related with Nervous system and Unconsciousness.
- Class 10 : First aid related with Gastrointestinal Tract. First aid related with Skin, Burns. First aid related with Poisoning. First aid related with Bites and Stings. First aid related with Sense organs, Handling and transport of injured traumatized persons. Sports injuries and their treatments.
- Class 11 : History of sports and ancient games, Governance of sports in India; Important national Sporting events. Awards in Sports; History, latest rules, measurements of playfield, specifications of equipment.
- Class 12 : Skill, technique, style and coaching of major games cricket.
- Class 13 : Skill, technique, style and coaching of major games cricket.
- Class 14 : Skill, technique, style and coaching of major games football.
- Class 15 : Skill, technique, style and coaching of major games football.
- Class 16 : Skill, technique, style and coaching of major games table tennis and Badminton.

**Class 17 : Final Practical Examination**

**Learning Outcome:**

**At the end of the course, the students will be able to:**

1. Explain the basic principles, types and importance of Yoga for physical and mental well-being.
2. Demonstrate selected Asanas, Suryanamaskar, Pranayama, Meditation, Yogic Kriyas and Mudras with proper technique.
3. Apply appropriate First Aid techniques for common injuries, emergencies and sports-related injuries.
4. Explain the history, major events, awards, rules and regulations of sports.
5. Demonstrate fundamental skills and techniques of Cricket, Football, Table Tennis and Badminton.
6. Demonstrate sportsmanship, teamwork, discipline, safety awareness and responsible participation in sports.

### Reference:

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2. Smith, M. J. N. 2019. *An illustrated guide to asanas and pranayama*. Krishnamacharya Yoga Mandiram. Pages 205.
3. Vishnudevananda, S. 1960. *The complete illustrated book of yoga*. Bell Publishing / Julian Press. Pages 359.
4. Nagarathana, R., & Nagendra, H. R. 2018. *Yoga – breathing practices: Asana and pranayama, mudras, bandhas and kriya, meditation*. Swami Vivekananda Yoga Prakashana. Pages 134.
5. Rehberg, R. S. 2026. *Sport first aid*. Human Kinetics. Pages 344.
6. Pfeiffer, R. P. 2008. *Sports first aid and injury prevention*. Jones & Bartlett Publishers. Pages 122.
7. Stubbs, R. (Ed.). 2024. *The Sports Book: The Games, the Rules, the Tactics, the Techniques*. DK Publishing. Pages 456.
8. Singh, H. 1984. *Sports training: General theory & methods*. Netaji Subhas National Institute of Sports. Pages 486.