# TAKSHASHILA UNIVERSITY

**(Tamil Nadu State Private University)**

ONGUR, TINDIVANAM TK, VILLUPURAM DT

## FACULTY OF SCIENCES
## SCHOOL OF AGRICULTURAL SCIENCES

Department of Agriculture

**REGULATION 2025NEP**

**CURRICULUM & SYLLABI**

**B.Sc. (Hons.) Agriculture**

**Semester – III**

## VISION AND MISSION OF UNIVERSITY

**VISION:**

To create change makers and world leaders similar to the ancient Takshashila University

**MISSION:**

The brightest minds and the best resources are used to nurture and develop the leaders of tomorrow, where they are encouraged to be eternally curious and ethically sound.

## DEPARTMENT VISION AND MISSION

**VISION:**

Focusing on Agricultural research, teaching, and extension to use cutting-edge, sustainable technologies to satisfy human needs.

To become a globally recognized university dedicated to educating the next generation in both rural and urban areas about science-based agriculture.

**MISSION:**

| | |
|---|---|
| **M1:** | Empower future generations through quality educational opportunities in agriculture with forefront farming technology to meet the needs of various stakeholders, including farmers, employers, industries, and society. |
| **M2:** | Enhance agricultural higher education to meet worldwide standards for advanced teaching, research, and extension. |
| **M3:** | Promote innovative technologies such as artificial intelligence, high-tech agriculture, digital agriculture, and sustainable farming to assure production and productivity. |
| **M4:** | Successfully transfer technologies from lab to farm land to assure food and water security, enhance farmers' revenues, and raise the standard of living. |
| **M5:** | Stimulating professional behavior and good ethical values to improve the leadership skills and social responsibilities. |

## PROGRAMME OUTCOMES (POs)

**PO 1: Domain Knowledge**: Apply fundamental knowledge from several agricultural disciplines to the fields of animal husbandry, agricultural extension, crop improvement, production, and protection, as well as agri-informatics.

**PO 2: Problem analysis:** To improve agricultural output, identify gaps by examining regular difficulties and challenges in farming.

**PO 3: Formulate solution:** Design and develop solutions to complicated and specialized agricultura l challenges, with an emphasis on cultural, socioeconomic, and environmental considerations.

**PO 4: Conduct surveys and investigations:** Evaluate and evaluate the available agricultural inform ation in order to provide sustainable solutions by using research-based knowledge and methods.

**PO 5: Use of Contemporary Concepts and Tools:** Create, select, and implement suitable methods, materials, and present-day tools to forecast agricultural outcome.

**PO 6: Social Role:** Determine logic and background information to evaluate and advance environmental safety, livelihood security, and nutrition.

**PO 7: Environment and Sustainability:** Recognize the effects of regional and global environmental problems and take appropriate action to produce agricultural products in a sustainable manner.

**PO 8: Ethics:** Put ethical concepts into practice and follow obligations and standards in the field.

**PO 9: Teamwork:** Contribute well as a leader or an individual in a variety of multidisciplinary, cross-cultural teams.

**PO 10: Efficient communication:** Understand and compose succinct scientific reports, deliver persuasive speeches, and interact with stakeholders in an efficient manner.

**PO 11: Finance and project management:** Able to exhibit scientific understanding in their roles as financial managers and entrepreneurs.

**PO 12: Life-long learning:** Make an initiative to pursue self-sustaining, continuous learning in order to stay updated with emerging technology and maintain your professional proficiency in agriculture.

## PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

**PEO1: Industry Leadership**

Demonstrate advanced managerial competency and domain expertise to lead teams, drive strategy, and deliver measurable results in dynamic business environments.

**PEO2: Research and Development**

Identify market opportunities, apply data-driven decision-making, and develop scalable solutions as entrepreneurs or intrapreneurs within established organizations

**PEO3: Professional Ethics**

Uphold rigorous ethical standards and corporate governance principles while making decisions that balance profitability with social and environmental responsibility

**PEO4: Global Citizenship**

Operate effectively in multicultural, international business contexts by leveraging global perspectives, cross-cultural intelligence, and awareness of global economic trends.

## PROGRAM SPECIFIC OUTCOMES (PSOs)

**PSO1: Domain Knowledge**

Demonstrate an in-depth understanding of financial management, banking, investment, financial markets, financial technologies, and digital financial services to analyze complex financial problems and develop innovative solutions in dynamic business environments.

**PSO2: Digital Finance and Technology Integration**

Apply financial technologies, artificial intelligence, blockchain, data analytics, enterprise resource planning (ERP), digital payment systems, cloud computing, and emerging FinTech solutions to optimize financial operations, support data-driven decision-making, enhance customer experience, and manage financial risks.

**PSO3: Professional Competency**

Exhibit a high level of professional competence through financial analysis, strategic thinking, ethical decision-making, regulatory compliance, leadership, communication, teamwork, and lifelong learning, enabling successful careers in banking, financial services, FinTech organizations, consulting, entrepreneurship, and global financial ecosystems.

## CURRICULUM

**School** : School of Agricultural Science **Batch** : 2025-2029

**Program:** B.Sc. (Hons.) Agriculture **Regulation** : R25

| SEMESTER III | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Course code** | **Course title** | **Category** | **Credit hours** | **Maximum marks** | | |
| | | | | | **CAM** | **ESM** | **Total** |
| **Program Core** | | | | | | | |
| 1. | U25AG20B | Principles of Genetics | PC | 3 (2+1) | 60 | 40 | 100 |
| 2. | U25AG21B | Crop Production Technology-I (*Kharif crops*) | PC | 3 (1+2) | 60 | 40 | 100 |
| 3. | U25AG22B | Production Technology of Fruit and Plantation Crops | PC | 2 (1+1) | 60 | 40 | 100 |
| 4. | U25AG23B | Fundamentals of Extension Education | PC | 2 (1+1) | 60 | 40 | 100 |
| 5. | U25AG24B | Fundamentals of Nematology | PC | 2 (1+1) | 60 | 40 | 100 |
| **Multi- Disciplinary Course** | | | | | | | |
| 6. | U25AG25B | Entrepreneurship Development and Business Communication | MDC | 3 (2+1) | 60 | 40 | 100 |
| **Ability Enhancement Course** | | | | | | | |
| 7. | U25AG26P | Physical Education, First Aid, Yoga Practices and Meditation | AEC | 2 (0+2) | 100 | - | 100 |
| **Skill Enhancement Course** | | | | | | | |
| 8. | U25AG27P | Beneficial Insect Farming | SEC | 2 (0+2) | 100 | - | 100 |
| **Value Added Course** | | | | | | | |
| 9. | U25VA06T | Constitution of India* | VAC | 1 (1+0)* | 100 | - | 100 |
| 10. | U25VA13B | Principles and Practices of Natural Farming | VAC | 2 (1+1) | 60 | 40 | 100 |
| **Total** | | | | **21 (9+12)** | **720** | **280** | **1000** |

PC – Program Core
SEC – Skill Enhancement Course
DSE – Discipline Elective
GE – Generic Elective
AEC – Ability Enhancement Course
MDC – Multi- Disciplinary Course
VAC – Value Added Course
UM – University Mandatory Course
* - Non Gradial course

(BOS chairman)

| U25AG20B | Principles of Genetics | (2+1) |
|---|---|---|

**COURSE OBJECTIVES:**

- To learn the principles of heredity, Mendelian genetics and chromosomal basis of heredity
- To understand the use of probability in genetic experiments and exceptions to mendelian theory like epistacy and linkage.
- To study mechanisms of sex determination and concept of linkage and chromosome mapping
- To know different types of chromosomal aberrations (structural and numerical) and its importance in humans and plants, mutagenesis, polygenic inheritance and cytoplasmic inheritance.
- To understand the structure of DNA and its relevance in DNA replication, transcription and translation.

**COURSE OUTCOMES:**

*After completion of the course, the students will be able to*

| | |
|---|---|
| **CO1 :** | Explain the Pre- and Post- Mendelian concepts of inheritance, chromosome organization, cell division and its types |
| **CO2 :** | To solve problems in genetics using $\chi^2$ test and other statistical tools |
| **CO3 :** | Detect the patterns of sex determination, linkage, chromosome mapping and inheritance of quantitative traits |
| **CO4 :** | Assess the effects of chromosomal aberrations and its evolutionary significance, mutations, polyploidy, and cytoplasmic inheritance and their significance |
| **CO5 :** | Understand the concept of DNA structure, replication, expression, and regulation |
| **CO6 :** | Apply different laboratory techniques to study cell division and compute the patterns of inheritance, linkage, gene interactions, chromosome behavior using appropriate statistical and genetic tools. |

| **UNIT I:** | **7 Hrs.** |
|---|---|
| Pre and post Mendelian concepts of heredity- Mendelian principles of heredity- Study of model organisms (Drosophila, Arabidopsis, Garden pea, E. coli, and mice)- Architecture of chromosomes- chromonemata- chromosome matrix- chromomeres- centromere- secondary constriction and telomere- special types of chromosomes- Chromosomal theory of inheritance- cell cycle and cell division-mitosis and meiosis | |

| **UNIT II:** | **7 Hrs.** |
|---|---|
| Probability and Chi-square. Types of DNA and RNA- Dominance relationships- Epistatic interactions with example- Introduction and definition of cytology- genetics and cytogenetics and their interrelation. Multiple alleles- pleiotropism and pseudoalleles | |

| **UNIT III:** | **6 Hrs.** |
|---|---|
| Sex determination and sex linkage- sex limited and sex influenced traits- Blood group genetics- Linkage and its estimation- crossing over mechanism- chromosome mapping | |

| UNIT IV: | 6 Hrs. |
|---|---|
| Structural and numerical variations in chromosomes and their implications- Use of haploids-dihaploids and double haploids in Genetics- Mutation- classification- Methods of inducing mutations-mutagenic agents and induction of mutation. Qualitative and quantitative traits- Polygenes and continuous variations- multiple factor hypothesis- Cytoplasmic inheritance | |

| UNIT V: | 6 Hrs. |
|---|---|
| Nature, structure and replication of genetic material- Protein synthesis- Transcription and translational mechanism of genetic material- Gene concept: Gene structure- function and regulation | |

**Theory Schedule:**

1. Pre and post Mendelian concepts of heredity- Definition of genetics, heredity, inheritance, cytology, cytogenetics; Brief history of developments in genetics and cytogenetics, Ideas of heredity.
2. Mendelian principles of heredity- Mendel's experiments and laws of inheritance. Rediscovery of Mendel's work. Terminologies: gene, allele, locus, homozygous, heterozygous, hemizygous, genotype, phenotype, monohybrid, dihybrid, trihybrid,polyhybrid.
3. Study of model organisms (Drosophila, Arabidopsis, Garden pea, E. coli, and mice),
4. Architecture of chromosomes, chromonemata, chromosome matrix, chromomeres, centromere, secondary constriction and telomere, composition, nucleosome, centromere, telomere, euchromatin, heterochromatin, NOR, satellite chromosome, karyotype, ideogram.
5. Special types of chromosomes.
6. Chromosomal theory of inheritance- Cell cycle and cell division-mitosis. Physical basis of heredity, Structure and function of cell and cell organelles –Differences between Prokaryotes and Eukaryotes.
7. Cell division - meiosis and their significance.
8. Probability and Chi-square.
9. Types of DNA and RNA.
10. Dominance relationships, Allelic interactions – Dominance vs recessive, complete dominance, codominance, incomplete dominance, threshold characters.
11. Epistatic interactions with example- Deviation from Mendelian inheritance – Non allelic interaction without modification in Mendelian ratio – Bateson and Punnett's experiment on fowl comb shape. Non allelic interaction with modification in Mendelian ratio – Dominant epistasis (12:3:1), Recessive epistasis (9:3:4), Duplicate and additive epistasis (9:6:1).
12. Duplicate dominant epistasis (15:1), Duplicate recessive epistasis (9:7), Dominant and recessive epistasis (13:3); Summary of epistatic ratios.
13. Introduction and definition of cytology, genetics and cytogenetics and their interrelation.
14. Multiple alleles- bloodgroup in humans, coat colour in rabbits, self-incompatibility in plants; pseudo alleles, isoalleles, pleiotropism and pseudoalleles, Lethal genes, Penetrance and expressivity.

15. Sex determination- Autosomes and sex chromosomes - chromosomal theory of sex determination - different types – sex determination in human, fowl, butterfly, grasshopper, honey bee, fumea; Sex determination in plants – *Melandrium*, papaya, maize.
16. Sex linkage, sex limited and sex influenced traits- Sex linked inheritance – criss cross inheritance – reciprocal difference; holandric genes; sex influenced and sex limited inheritance - Genetic disorders. Genic balance theory of Bridges – Gynandromorphs. Blood group genetics.

**Mid Semester Examination.**

17. Genic balance theory of Bridges – Gynandromorphs. Blood group genetics.
18. Linkage and its estimation- Linkage - coupling and repulsion; Experiment of Bateson and Punnet Chromosomal theory of linkage of Morgan – Complete and incomplete linkage, Linkage group.
19. Crossing over mechanism- Crossing over – significance of crossing over; cytological proof for crossing over -Stern's experiment; Factors controlling crossing over, chromosome mapping.
20. Strength of linkage and recombination; Two point and three-point test cross. Doublecross over, interference and coincidence; genetic map, physicalmap.
21. Structural variations in chromosomes- deletion, duplication, inversion and translocation – genetic and cytological implications and their implications.
22. Numerical variations in chromosomes and their implications- euploid, aneuploid, types of aneuploids and their origin.
23. Polyploid - auto and allopolyploids, their characters, Use of haploids, dihaploids and double haploids in Genetics.
24. Mutation, classification, Methods of inducing mutations, mutagenic agents and induction of mutation. characteristics of mutation – micro and macro mutation – *ClB* technique. Molecular basis of mutation- Transition and transversion; major physicaland chemical mutagens.
25. Qualitative and quantitative traits, Polygenes – transgressive segregation, comparison of quantitatively and qualitatively inherited characters; modifiers. Polygenes and continuous variations, multiple factor hypothesis, Nilsson Ehle experiment on wheat kernel colour.
26. Cytoplasmic inheritance inheritance and maternal effects – features of cytoplasmic inheritance, chloroplast, mitochondrial - plastid colour in *Mirabilis jalapa* - cytoplasmic male sterility in maize, kappa particles of paramecium.
27. Nature of genetic material- DNA, the genetic material – Griffith's experiment, experiment of Avery, McCleod and McCarthy. Confirmation by Hershey and Chase; RNA as genetic material – Frankel, Conrat and Singer experiment.
28. Structure of genetic material- Structure of DNA – Watson and Crick model. Central dogma of life. Proof for semi conservative method of DNA replication; Models of DNA replication.
29. Replication of genetic material DNA replication: steps involved in DNA replication. Transcription: RNA types - mRNA, tRNA, Rrna.

30. Translation: Steps involved in protein synthesis Protein synthesis, Transcription and translational mechanism of genetic material.
31. Gene concept: Gene structure and function- Fine structure of gene; rII locus. Benzer experiments, Concept of Cistron, muton and recon.
32. Gene regulation- Regulation of gene expression – Operon model of Jacob and Monad – Lac and Trp-operons.

**Practical Schedule:**

1. Study of microscope & principles of killing and fixing; preparation of stains and preservatives.
2. Study of cell structure, Mitosis and Meiosis cell division. Mitosis in root tip of Onion/Aloe sp. Meiosis in Onion/Aloe sp.
3. Experiments on monohybrid genetic ratio with dominance, incomplete dominance, co-dominance and test cross, back cross and lethal genes.
4. Experiments on Dihybrid, Dihybrid ratio with dominance, with incomplete dominance and test cross.
5. Experiments on trihybrid, test cross and back cross.
6. Experiments on epistatic interactions including test cross and back cross- Simple interaction of genes-comb character in fowls; Dominantepistasis.
7. Recessive epistasis, Duplicate and additive epistasis.
8. Experiments on epistatic interactions- Duplicate dominant epistasis, Duplicate recessive epistasis, Dominant andrecessive epistasis.
9. Multiple alleles and polygenic inheritance.
10. Practice on mitotic and meiotic cell division- Procedure for fixing and observing different meiotic phases in the inflorescence of rice, maize.
11. Experiments on probability and chi-square test.
12. Determination of linkage- Estimation of linkage with F2 and test cross data; Coupling and repulsion.
13. Cross-over analysis through two point test cross data. Problems on three point test cross working out interference, coincidence and drawing genetic maps.
14. Problems in cytoplasmic/ maternal inheritance.
15. Study on sex linked inheritance in Drosophila.
16. Study on models on DNA and RNA structures.
17. **Final Practical Examination.**

**Total Hours: 64**

| TEXT BOOKS : | |
|---|---|
| 1. | Singh, B D., "Fundamentals of Genetics", (6th Edn.).Medtech Science Press, 2022. |
| 2. | Singh, P. "Elements of Genetics", 6th ed., Kalyani Publishers, 2024. |
| 3. | Verma,P.S. and V.K.Agarwal, "Genetics", S.Chand and Company Ltd., New Delhi. 2007. |
| 4. | Gupta P.K., "Cytogenetics", 2nd ed., Rastogi Publications, Meerut, 2022. |

| REFERENCE BOOKS : | |
|---|---|
| 1. | Stansfield, W.D. "Theory and problems of genetics", Mc-Graw Hill Book Co.,NewYork, 1990 |
| 2. | Lewin, B., "Lewin's Genes XII", Jones & Bartlett Learning, 2017. |
| 3. | Gardner, E. J., Simmons, M. J., & Snustad, D. P. "Principles of genetics", (8th ed.). Wiley India, 2006. |
| 4. | Strickberger M W., "Genetics", (3rd Edn.). Pearson Education India, 2015. |
| 5. | Snustad, D.P. and Simmons, M.J. "Principles of Genetics", (7th Edition), John Wiley & Sons, USA, 2019. |

| WEB REFERENCES : | |
|---|---|
| 1. | http://www.esp.org/foundations/genetics/classical/gm-65-a.pdf |
| 2. | https://www.cambridge.org/core/services/aop-cambridge-core/content/view/7C664FFE1C0BEAE362EE2C7D8C24BC0B/S0022172400031879a.pdf/the-significance-of-pneumococcal-types.pdf |
| 3. | https://www.bx.psu.edu/~anton/bioinf1-2014/jacob-monod-1961.pdf |

| U25AG21B | Crop Production Technology – I (*Kharif crops*) | (1+2) |
|---|---|---|

**COURSE OBJECTIVES:**

- To impart knowledge on the origin, geographical distribution, and economic importance of major field crops.
- To provide an understanding of the soil and climatic requirements of cereals, millets, pulses, oilseeds, fibre, forage, and fodder crops.
- To familiarize students with improved varieties and appropriate production technologies of major field crops.
- To develop knowledge and skills in scientific crop management practices for enhancing crop productivity and profitability.
- To enable students to select and apply suitable crop production practices under different agro-climatic conditions.

**COURSE OUTCOMES:**

*After completion of the course, the students will be able to*

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|---|---|
| **CO1 :** | Explain the origin, geographical distribution, economic importance, and production requirements of major cereals, millets, pulses, oilseeds, fibre, forage, and fodder crops. |
| **CO2 :** | Describe the soil and climatic requirements, improved varieties, cultural practices, and yield potential of major field crops. |
| **CO3 :** | Apply appropriate production technologies for the cultivation and management of cereals, millets, pulses, oilseeds, and fibre crops under different agro-climatic conditions. |
| **CO4 :** | Analyze the factors influencing the growth, productivity, and yield of major field crops and select suitable varieties and crop management practices. |
| **CO5 :** | Evaluate appropriate production and management practices for forage and fodder crops to achieve higher productivity and ensure sustainable livestock feed production. |
| **CO6** | Develop suitable crop production strategies by integrating improved varieties, soil and climatic requirements, and scientific cultural practices for enhancing productivity, profitability, and sustainability of field crops. |

| **UNIT I : Production technology of cereals and millets** | **3 Hrs.** |
|---|---|
| Cereals and Millets Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Rice, Maize, Sorghum, Pearl millet, Finger millet and other minor millets. | |

| **UNIT II : Production technology of pulses** | **3 Hrs.** |
|---|---|
| Pulses Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Pigeon pea, Mung bean and Urd bean. | |

| **UNIT III : Production technology of oilseeds** | **3 Hrs.** |
|---|---|
| Oilseeds Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Groundnut, Soybean, Sesame and Castor. | |

| UNIT IV: Production technology of fibre crops | 3 Hrs. |
|---|---|
| Fibre crops Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Cotton and Jute. | |

| UNIT V - Production technology of forage and fodder crops | 4 Hrs. |
|---|---|
| Forage crops Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Fodder Sorghum, Fodder Maize, Fodder Cowpea, Fodder Cluster bean, Guinea grass and Napier grass. | |

**Lecture Schedule**

1. Importance, area, production and productivity of major kharif crops in world, India and Puducherry.
2. Rice – Origin, geographic distribution, economic importance, soil and climatic requirements, important varieties and hybrids.
3. Rice - Systems of rice cultivation, System of Rice Intensification, cultural practices and yield.
4. Maize - Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield.
5. Sorghum - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.
6. Pearl millet and Finger Millet - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.
7. Minor millets - Foxtail millet, little millet, Kodo millet, Common millet and barnyard millet. - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.
8. Pigeon pea – Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.

**Mid Semester Examination.**

9. Mung bean and Urd bean – Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.
10. Groundnut - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.
11. Soyabean - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.
12. Sesame - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.
13. Castor - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.

14. Cotton - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.
15. Jute - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.
16. Forage crops - Fodder Sorghum, Fodder Maize, Fodder Cowpea, Fodder Cluster bean, Guinea grass and Napier grass - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.

**Practical schedule:**

1. Identification of seeds of kharif crops.
2. Nursery area preparation for rice / selected kharif crop cultivation.
3. Acquiring skill in different seed treatment techniques for kharif crops.
4. Acquiring skill in seed treatment practices for rice / selected kharif crop.
5. Layout and raising of crop cafeteria.
6. Practicing nursery sowing and management for rice / selected kharif crop.
7. Acquiring skill in nursery preparation and sowing of kharif crops.
8. Study and practice of main field preparation for selected kharif crop.
9. To study the effect seed size and sowing depth on germination of kharif crops.
10. Practicing of application of manures and fertilizers for selected kharif crop.
11. Acquiring skill in main field preparation, manuring and sowing/transplanting of kharif crops.
12. Practicing sowing / pulling out of seedling and transplanting of selected kharif crop / exposure to mechanized sowing.
13. Calculation of seed rate, plant population per unit area of kharif crops.
14. Acquiring skill in pre-emergence application of herbicides.
15. Acquiring skill in after cultivation practices of cereals, millets and pulses.
16. Estimation of plant population and acquiring skill in gap filling and thinning.
17. Acquiring skill in after cultivation practices of oilseeds, fibre and forage.
18. Study of weeds and weed management in selected kharif crop / exposure to mechanized weeder.
19. Observations on growth parameters/morphological description of kharif crops.
20. Observation on nutritional deficiency symptoms and corrective measures.
21. Study of yield contributing characters and yield estimation of kharif crops.
22. Recording growth parameters and assessing dry matter production.
23. Acquiring skill in harvesting of kharif crops.
24. Study of water management practices for selected kharif crop.
25. Preparation of silage and hay.
26. Observation of insect pests and diseases and their management.
27. Working out cost and returns of kharif crops.

28. Estimation of yield and yield parameters in selected kharif crop.

29. Study of crop varieties and important agronomic experiments at experimental farm.

30. Harvesting, threshing and cleaning of the produce/ exposure to mechanized harvesting and threshing.

31. Visit to nearby Forage farm / Agricultural Research Station / Farmer's field.

32. Working out economics for selected kharif crop.

**Final Practical Examination.**

**Total Hours: 80**

| **TEXT BOOKS :** | |
|---|---|
| 1. | Chidda Singh, "Modern Techniques of Raising Field Crops", Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1997. |
| 2. | S. S. Singh, "Crop Management", Kalyani Publishers, New Delhi, 2005. |
| 3. | S. R. Reddy, "Agronomy of Field Crops", Kalyani Publishers, New Delhi, 2009. |
| 4. | Rajendra Prasad, "Textbook of Field Crops Production – Commercial Crops", Volume II, ICAR Publication, New Delhi, 2010. |
| 5. | B. Gurarajan, R. Balasubramanian and V. Swaminathan, "Recent Strategies on Crop Production", Kalyani Publishers, New Delhi, 2013. |

| **REFERENCE BOOKS :** | |
|---|---|
| 1. | J. S. P. Yadav and S. S. Bains, "Agricultural Production and Management", Prentice Hall of India Pvt. Ltd., New Delhi, 1989. |
| 2. | P. S. Rathore, "Techniques and Management of Field Crop Production", Agrobios (India), Jodhpur, 2000. |
| 3. | C. Chattopadhyay, "Modern Crop Production", Books and Allied (P) Ltd., Kolkata, 2008. |
| 4. | K. Govindan and V. Thirumurugan, "Principles and Practices of Dryland Agriculture", Kalyani Publishers, 2012. |
| 5. | P. Rangaswamy, "Dry Farming Technology in India", Agricole Publishing Academy, New Delhi, 1990. |

| **WEB REFERENCES :** | |
|---|---|
| 1. | https://icar.gov.in |
| 2. | https://agritech.tnau.ac.in |
| 3. | https://agriwelfare.gov.in |
| 4. | https://www.irri.org/ |
| 5. | https://www.icrisat.org/ |

| U25AG22B | Production Technology of Fruit and Plantation Crops | (1+1) |
|---|---|---|

**COURSE OBJECTIVES:**

| |
|---|
| • To understand the importance, scope, classification, and production status of fruit, palm, and plantation crops in India. |
| • To acquire knowledge of the production technologies, cultivation practices, and management techniques of major fruit crops under different agro-climatic conditions. |
| • To Study about the propagation methods, orchard establishment, canopy management, nutrient and water management, and the use of growth regulators in fruit crops. |
| • To gain knowledge of the cultivation, processing, value addition, and marketing potential of major palms and plantation crops. |
| • To learn about the scientific and sustainable production technologies to improve the productivity, quality, and profitability of fruit and plantation crops. |

**COURSE OUTCOMES:**

*After completion of the course, the students will be able to*

| | |
|---|---|
| **CO1 :** | Explain the importance, classification, production status, and cultivation practices of major fruit crops in India |
| **CO2 :** | Apply appropriate production technologies, including propagation, orchard establishment, nutrient management, irrigation, canopy management, and harvesting techniques for tropical, subtropical, and temperate fruit crops |
| **CO3 :** | Demonstrate knowledge of modern horticultural practices such as high-density planting, fertigation, plant growth regulation, and integrated crop management |
| **CO4 :** | Describe the cultivation, processing, and value addition techniques of major palms and plantation crops. |
| **CO5 :** | Recommend sustainable production technologies to improve the productivity, quality, and profitability of fruit, palm, and plantation crop cultivation. |
| **CO6 :** | Apply practical techniques for the propagation, cultivation, nursery management, processing, and field assessment of major fruit, palm, and plantation crops to enhance productivity and quality. |

| **UNIT I : Importance, Scope and Production Technology of Fruit Crops (Mango and Banana)** | **4 Hrs.** |
|---|---|
| Importance and scope of fruit and plantation crop industry in India – nutritional value of fruit crops - classification of fruit crops – area, production, productivity and export potential of fruit and plantation crops - Climate and soil requirements – varieties – propagation and use of rootstocks- planting density and systems of planting - High density and ultra-high density planting - cropping systems - after care - training and pruning - water, nutrient and weed management –fertigation - special horticultural techniques - plant growth regulation - important disorders – maturity indices and harvest- value addition.<br>**Fruit crops**: mango, banana | |

| UNIT II : Production Technology of Tropical Fruit Crops | 3 Hrs. |
|---|---|
| Climate and soil requirements – varieties – propagation and use of rootstocks- planting density and systems of planting - High density and ultra-high density planting - cropping systems - after care - training and pruning - water, nutrient and weed management – fertigation - special horticultural techniques - plant growth regulation - important disorders – maturity indices and harvest- value addition.<br>**Fruit crops**: Papaya, guava, sapota, citrus, grape. | |

| UNIT III : Production Technology of Subtropical Fruit Crops | 3 Hrs. |
|---|---|
| Climate and soil requirements – varieties – propagation and use of rootstocks- planting density and systems of planting - High density and ultra-high density planting - cropping systems - after care - training and pruning - water, nutrient and weed management – fertigation - special horticultural techniques - plant growth regulation - important disorders – maturity indices and harvest and value addition.<br>**Fruit crops:** Litchi, pineapple, pomegranate, jackfruit and minor fruits, apple, pear. | |

| UNIT IV : Production Technology of Temperate Fruit Crops and Major Palms | 3 Hrs. |
|---|---|
| Climate and soil requirements – varieties – propagation and use of rootstocks - planting density and systems of planting - High density and ultra-high density planting - cropping systems - after care - training and pruning - water, nutrient and weed management – fertigation - special horticultural techniques - plant growth regulation - important disorders – maturity indices and harvest and value addition.<br>**Fruit crops:** Peach, strawberry, nut crops.<br>Climate and soil requirements - varieties - propagation - nursery management - planting and - planting systems - cropping systems - after care - water, nutrient and weed management - intercropping - multi-tier cropping system - mulching - special horticultural practices - maturity indices, harvest and yield - pests and diseases - processing - value addition<br>**Palms and plantation cropx:** Coconut, Arecanut,Cocoa. | |

| UNIT V - Production Technology of Palms and Plantation Crops | 3 Hrs. |
|---|---|
| Climate and soil requirements - varieties - propagation - nursery management - planting and - planting systems - cropping systems - after care - water, nutrient and weed management - intercropping - multi-tier cropping system - mulching - special horticultural practices - maturity indices, harvest and yield - pests and diseases - processing - value addition<br>**Palms:** Oil palm and Palmyrah<br>Climate and soil requirements - varieties- propagation - nursery management - planting and planting | |

systems - cropping systems- after care- training and pruning - water, nutrient and weed management - shade management - intercropping - mulching - cover cropping - special horticultural practices - maturity indices, harvest and yield - pests and diseases - processing - value addition.

**Plantation crops:** Tea, Coffee, Cocoa, Cashew, Rubber

**Lecture Schedule**

1. Importance and scope of fruit and plantation crop industry in India – nutritional value of fruit crops.
2. Classification of fruit crops – area, production, productivity and export potential of fruit and plantation crops.
3. Climate and soil – varieties - propagation methods - planting and cropping systems - after care- training and pruning- top working - water, nutrient and weed management- canopy management - plant growth regulation - important disorders – maturity indices and harvest - post harvest management of Mango.
4. Climate and soil – varieties - propagation methods - planting and cropping systems - after care- water and nutrient management – fertigation - Weed control - Plant growth regulation - important disorders – maturity indices and harvest- post harvest management of Banana.
5. Climate and soil – varieties - propagation methods - planting and cropping systems - after care - water, nutrient and weed management - crop regulation- important disorders – maturity indices and harvest - post harvest management of Papaya, Guava and sapota.
6. Climate and soil – varieties - propagation methods - planting and cropping systems - after care - water, nutrient and weed management - crop regulation – nutrient deficiencies and important disorders – maturity indices and harvest- post harvest management of Citrus (Sweet orange, Mandarin and Acid Lime).
7. Climate and soil – varieties - propagation methods - planting and cropping systems-after care – systems of training and pruning and bud forecasting - water, nutrient and weed management - plant growth regulation - important disorders – maturity indices and harvest - post harvest management of Grapes.
8. Climate and soil – varieties - propagation methods - planting and cropping systems - after care - water, nutrient and weed management - plant growth regulation- important disorders – maturity indices and harvest - post harvest management of pineapple and litchi.

   **Mid Semester Examination.**
9. Climate and soil – varieties - propagation methods - planting and cropping systems - after care - training and pruning - water, nutrient and weed management - plant growth regulation - important disorders – maturity indices and harvest - post harvest management of Pomegranate, jackfruit and minor fruits.

10. Climate and soil – varieties - propagation methods - planting and cropping systems - after care-training and pruning - water, nutrient and weed management - plant growth regulation - important disorders – maturity indices and harvest- post harvest management of Apple and pear.
11. Climate and soil – varieties - propagation methods - planting and cropping systems - after care-training and pruning - water, nutrient and weed management - plant growth regulation - important disorders – maturity indices and harvest - post harvest management of Peach and strawberry, nut crops.
12. Climate and soil requirements - varieties - propagation - nursery management - planting systems - planting density -nutrient, water and weed management - intercropping at various ages of plantation -multitier cropping - shade management - nutritional disorders - maturity indices - harvest and yield - pests and diseases - grading - processing and value addition of Coconut.
13. Climate and soil requirements - varieties - propagation - nursery management - planting systems - planting density - nutrient, water and weed management - intercropping at various ages of plantation - multitier cropping – shade management - nutritional disorders - maturity indices - harvest and yield - pests and diseases - grading - processing and value addition of Arecanut and Cocoa.
14. Climate and soil requirements - varieties – propagation - nursery management - planting - nutrient, water and weed management - water conservation techniques - leaf pruning - pollination - maturity indices - harvest and yield - pests and diseases - grading - processing and value addition Oil palm and Palmyrah.
15. Climate and soil requirements - varieties - propagation - nursery management - planting and planting density - HDP - UHDP - nutrient, water and weed management - cover cropping - tapping - use of plant growth regulators - top working - maturity indices - harvest and yield, latex yield and processing - pests and diseases - grading - processing and value addition Rubber and Cashew.
16. Climate and soil requirements- varieties – propagation - nursery management - planting density and systems of planting - nutrient, water and weed management - mulching - cropping systems - shade regulation - training and pruning - role of growth regulators - nutritional disorders - maturity indices - harvest and yield - pests and diseases - grading - processing and value addition of Tea and Coffee.

**Practical schedule:**

1. Propagation techniques, selection of planting material, varieties, important cultural practices for Mango.
2. Propagation techniques, selection of planting material, varieties, important cultural practices for Banana.

3. Propagation techniques, selection of planting material, varieties, important cultural practices for Papaya.
4. Propagation techniques, selection of planting material, varieties, important cultural practices for Guava.
5. Propagation techniques, selection of planting material, varieties, important cultural practices for Sapota.
6. Propagation techniques, selection of planting material, varieties, important cultural practices for Grapes.
7. Propagation techniques, selection of planting material, varieties, important cultural practices for Citrus (Mandarin and acid lime).
8. Propagation techniques, selection of planting material, varieties, important cultural practices for Pomegranate.
9. Propagation techniques, selection of planting material, varieties, important cultural practices for Jackfruit.
10. Preparation and application of PGR's for propagation.
11. Micro propagation, protocol for mass multiplication and hardening of fruit crops.
12. Identification and description of varieties - mother palm and seed nut selection - nursery practices seedling selection – fertilizers - application - nutritional disorders - pests and diseases of Coconut.
13. Identification and description of varieties - mother palm and seed nut selection- nursery practices- fertilizers - application - nutritional disorders - pests and diseases of Arecanut and cocoa.
14. Identification and description of varieties - nursery practices - training and pruning - pests and diseases – processing of Tea and coffee.
15. Identification and description of varieties, clones - bud wood nursery practices - propagation techniques - top working – preparation of plant bio regulators and its uses- pests and diseases - processing of Rubber and cashew.
16. Visit to commercial orchard and plantation industries.

**Final Practical Examination.**

**Total Hours: 48**

| **TEXT BOOKS :** | |
|---|---|
| 1. | Chadha, K.L., "Handbook of Horticulture", Indian Council of Agricultural Research (ICAR), New Delhi, 2019. |
| 2. | Bose, T.K., Mitra, S.K. and Sanyal, D., "Fruits: Tropical and Subtropical", Naya Udyog, Kolkata, 2002. |
| 3. | Singh, H.P., Negi, J.P. and Samuel, J.C., "Advances in Horticulture: Fruit Crops", Malhotra Publishing House, New Delhi, 2014. |
| 4. | Kumar, N., "Introduction to Horticulture", Rajalakshmi Publications, Nagercoil, 2018. |

| | |
|---|---|
| 5. | Parthasarathy, V.A., Bose, T.K. and Deka, P.C., "Plantation Crops", Naya Prokash, Kolkata, 2006. |

| **REFERENCE BOOKS :** | |
|---|---|
| 1. | M. Kavino, V. Jegadeeswari, R. M. Vijayakumar and S. Balakrishnan, "*Production Technology of Fruits and Plantation Crops*". Narendra Publishing House, New Delhi, 2018. |
| 2. | Ankur Sharma, Prabhat Kumar and V. K. Tripathi, "*Production Technology of Fruits and Plantation Crops*". CRC Press, Boca Raton, 2025. |
| 3. | K. K. Mishra, "*Production Technology for Fruits and Plantation Crops*". Brillion Publishing, New Delhi, 2019. |
| 4. | Shailesh Kumar Singh, Ankur Sharma and Anmol, "*Production Technology of Fruits, Nuts and Plantation Crop (Theory and Competitive Approach)*". Jaya Publishing House, New Delhi, 2020. |
| 5. | M. Kavino, V. Jegadeeswari, R. M. Vijayakumar and S. Balakrishnan, "*Production Technology of Fruits and Plantation Crops*". Om Publications, New Delhi, 2019. |

| **WEB REFERENCES :** | |
|---|---|
| 1. | https://www.scribd.com/document/979749233/Syllabus-Production-Technology-for-Fruit-Plantation-Crops-T-AG3CO29-T |
| 2. | https://agrimoon.com/wp-content/uploads/Production-Technology-of-Fruit-and-Plantation-Crops.pdf |
| 3. | https://www.tnu.in/wp-content/uploads/2021/09/production-technology-of-fruits-and-plantation-crops.pdf |
| 4. | https://agrigyan.in/hort-221-production-technology-for-fruit-and-plantation-crops-book-pdf/ |
| 5. | https://agritech.tnau.ac.in/horticulture/horti_fruits.html |

| U25AG23B | Fundamentals of Extension Education | (1+1) |
|---|---|---|

**COURSE OBJECTIVES:**

- To state the importance of extension education in agriculture
- To familiarize the students with the different types of agriculture and rural development programs launched by govt. of India
- To classify the types of extension teaching methods
- To elaborate the importance and different models of communication
- To explain the process and stages of adoption along with adopters' categories

**COURSE OUTCOMES:**

*After completion of the course, the students will be able to*

| | |
|---|---|
| **CO1 :** | Apply the concepts of extension education and programme planning to design and implement effective agricultural extension programmes. |
| **CO2 :** | Describe the historical development of agricultural extension in India and summarize the objectives and achievements of extension programmes towards agriculture and rural development. |
| **CO3 :** | Explain the concepts and principles of rural and community development, evaluate major rural development programmes, and identify rural leadership and its role in community development. |
| **CO4 :** | Describe the principles of extension administration, monitoring and evaluation, transfer of technology models, capacity building, and ICT applications for effective rural development and extension services. |
| **CO5 :** | Explain the principles of extension teaching methods, communication, agricultural journalism, and the diffusion and adoption of innovations for effective agricultural extension. |
| **CO6 :** | Apply agricultural extension communication, participatory approaches, and rural institutional knowledge to plan and implement effective extension and rural development programmes. |

| **UNIT I: Extension Education and Extension Programme Planning** | **3 Hrs.** |
|---|---|

Education- meaning, definition, types and differences between formal and informal education - Extension education – meaning, definition, scope and process; objectives and principles and function of Extension Education - Extension Programme Planning: Meaning, Definition, Process, Principles and Steps in Programme Development.

| **UNIT II: Extension System in India and New trends in Agriculture Extension** | **3 Hrs.** |
|---|---|

Extension efforts in pre-independence era (Sriniketan, Marthandam, Firka Development Scheme, Gurgaon Experiment, etc.) and in post-independence era (Etawah Pilot Project, Nilokheri Experiment, etc.); Reorganised Extension System (T&V system); Various extension / agriculture development programs launched by ICAR/ Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND, NATP, NAIP, etc.). Social Justice and poverty alleviation programme: ITDA, IRDP/SGSY/NRLM. Women Development Programme: RMK, MSY etc.; New trends in agriculture extension: privatization extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems, etc., DWCRA, Commodity Interest Groups (CIGs)., Farmers Producer Group (FPG).

| UNIT III: Rural Development, Community Development and Rural Leadership | 3 Hrs. |
|---|---|
| Rural Development: concept, meaning, definition; various rural development programs launched by Govt. of India; Community Development: meaning, definition, concept and principles, Philosophy of C.D; Rural Leadership: concept and definition, types of leaders in rural context; Method of identification of Rural Leader. | |

| UNIT IV: Extension Administration, Monitoring, Evaluation and ToT | 3 Hrs. |
|---|---|
| Extension administration: meaning and concept, principles and functions; Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programs; Transfer of technology: concept and models, capacity building of extension personnel, ICT Applications in TOT (New and Social Media) | |

| UNIT V: Extension Teaching Methods, Communication and Diffusion and Adoption of Innovation | 4 Hrs. |
|---|---|
| Extension teaching methods: meaning, classification, individual, group and mass contact methods, media mix strategies; Communication: meaning and definition; Principles and Functions of Communication, models and barriers to communication; Agriculture journalism; Diffusion and adoption of innovation: concept and meaning, process and stages of adoption, adopter categories.. | |

**Lecture schedule:**

1. Education- meaning, definition, types and differences between formal and informal education;
2. Extension education – meaning, definition, scope and process; objectives and principles and function of Extension Education.
3. Extension Programme Planning – Meaning, Definition, Process, Principles and Steps in Programme Development.
4. Extension efforts in pre-independence era (Sriniketan, Marthandam, Firka Development scheme, Gurgaon Experiment, etc.) and in Post–independence era (Etawah pilot project, Nilokheri Experiment, etc.); Reorganised Extension System (T&V system)
5. Various extension/ agricultural development programmes launched by ICAR/Govt. of India (IADP, IAAP, HYVP, KVK, ORP, ND, NATP, NAIP, etc.); Social Justice and poverty alleviation programme: ITDA, IRDP/SGSY/NRLM. Women Development Programme: RMK, MSY etc.
6. New trends in agriculture extension: privatization extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems, etc., DWCRA, Commodity Interest Groups (CIGs)., Farmers Producer Group (FPG).
7. Rural Development: concept, meaning, definition; various rural development programs launched by Govt. of India

**Mid Semester Examination.**

8. Community Development: meaning, definition, concept and principles, Philosophy of C.D.
9. Rural leadership: concept and definition, types of leaders in rural context, Method of identification of Rural Leader.
10. Extension administration: meaning, concept, principles and functions;
11. Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programmes.
12. Transfer of technology: concept and models, capacity building of extension personnel; ICT Applications in TOT (New and Social Media)
13. Extension teaching methods: meaning, classification, individual, group and mass contact methods, media mix strategies;
14. Communication; meaning, definition, Principles and Functions of Communication; Models and Barriers to communication;
15. Agriculture journalism.- definition, principles, importance, ABC of news, types of news.
16. Diffusion and adoption of innovation: concept and meaning, definition; Attributes of Innovation; Process and stages of adoption, adopter categories.

**Practical Schedule:**

1. To get acquainted with university extension system.
2. Group discussion- exercise.
3. Identification of rural leaders in village situation;
4. Preparation and use of AV aids.
5. Preparation of extension literature (leaflet, booklet, folder, pamphlet news stories and success stories).
6. Presentation skills exercise.
7. Micro teaching exercise.
8. A visit to village to understand the problems being encountered by the villagers/ farmers.
9. A visit to study organization and functioning of DRDA/PRI and other development departments at district level.
10. A visit to NGO/FO/FPO and learning from their experience in rural development.
11. Understanding PRA techniques and their application in village development planning.
12. & 13. Exposure to mass media: visit to community radio and television studio for understanding the process of programme production.
14. Script writing, writing for print and electronic media.
15. Developing script for radio and television.
16. Organizing and conducting a method demonstration/farm advisory programme in a village.

**Final Practical Examination.**

**Total Hours: 48**

| TEXT BOOKS : | |
|---|---|
| 1. | Dahama, O. P. and Bhatnagar, O.P. 1998. Education and Communication for Development, Oxford and IBH publishing Co. Pvt. Ltd, New Delhi |
| 2. | Jalihal, K. A. and Veerabhadraiah, V. 2007. Fundamentals of Extension Education and Management in Extension, Concept publishing company, New Delhi |
| 3. | Sagar Mondal and Ray, G. L., Text Book on Rural Development, Entrepreneurship and Communication Skills, Kalyani Publications. |
| 4. | Sandhu, A.S. 1993. Text book on Agricultural Communication: Process and Methods. Oxford and IBH Publishing Pvt. Ltd, New Delhi. |
| 5. | Reddy A. Adivi. 1978. "Extension Education", Sree Lakshmi Press, Bapatla, Andhra Pradesh |
| 6. | Rogers, E.M. 1995. Diffusion of Innovations, The Free Press, New York |

| REFERENCE BOOKS : | |
|---|---|
| 1. | Jalihal, K. A. and Veerabhadraiah, V. 2007. Fundamentals of Extension Education and Management in Extension, Concept publishing company, New Delhi. |
| 2. | Muthaiah Manoraharan, P. and Arunachalam, R., Agricultural Extension, Himalaya Publishing House, Mumbai |
| 3. | Rathore, O. S. et al. 2012. Handbook of Extension Education, Agrotech Publishing Academy, Udaipur. |
| 4. | Dudhani, C.M., Hirevenkatgoudar, L.V., Manjunath, L. Hanchinal, S.N. and Patil, S.L. 2004. Extension Teaching Methods and Communication Technology, UAS, Dharwad |
| 5. | Singh, A.K., Lakhan Singh, R. and Roy Burman. 2006. Dimensions of Agricultural Extension. Aman Publishing House, Meerut |

| WEB REFERENCES : | |
|---|---|
| 1. | **https://archive.org/details/dli.scoerat.5775extensioneducation** |
| 2. | https://openbooks.col.org/fundamentalsofagextn/index.html |
| 3. | https://agrimoon.com/wp-content/uploads/FUNDAMENTALS-OF-AGRICULTURAL-EXTENSION-EDUCATION.pdf |
| 4. | https://agri-bsc.kkwagh.edu.in/uploads/department_course/Fundamentals_of_Extension_Education.pdf |
| 5. | **https://ir.avinuty.ac.in/items/e7fc01a8-84d2-4d98-9499-01b49eb56102** |

| U25AG24B | Fundamentals of Nematology | (1+1) |
|---|---|---|

**COURSE OBJECTIVES:**

- To understand the history, development, economic importance, and significance of phytonematology in agriculture.
- To explain the morphology, anatomy, taxonomy, biology, and classification of plant-parasitic nematodes.
- To identify the symptoms, bio-ecology, life cycles, and disease complexes associated with economically important plant-parasitic nematodes.
- To recognize the major nematode pests affecting agricultural, horticultural, plantation, and ornamental crops and assess the nature of crop damage.
- To apply integrated nematode management strategies using legislative, cultural, physical, biological, host resistance, and chemical methods for sustainable crop production.

**COURSE OUTCOMES:**

*After completion of the course, the students will be able to*

| | |
|---|---|
| **CO1 :** | Describe the historical development, economic importance, and diversity of plant-parasitic nematodes. |
| **CO2 :** | Classify plant-parasitic nematodes based on morphological, anatomical, taxonomic, and biological characteristics. |
| **CO3 :** | Diagnose nematode infestations by identifying characteristic symptoms, disease complexes, and life cycles of major nematode genera. |
| **CO4 :** | Identify important nematode pests of field, vegetable, fruit, plantation, spice, ornamental, and tuber crops. |
| **CO5 :** | Recommend suitable integrated nematode management practices for sustainable management of economically important nematode pests. |
| **CO6 :** | Demonstrate the ability to collect, extract, identify and study economically important plant-parasitic nematodes, recognize their damage symptoms in crops, and apply appropriate nematode management practices. |

| **UNIT I : History and Importance of Nematology** | **2 Hrs.** |
|---|---|
| Introduction - History of Phyto Nematology in India and at international level - Position of nematodes in animal kingdom - Beneficial nematicides - Economic importance of nematodes-plants, animals. | |

| **UNIT II : Morphology, Anatomy and Taxonomy of Nematodes** | **4 Hrs.** |
|---|---|
| Taxonomy of phyto-nematodes - Nematode definition - General morphology of nematodes: cuticle, sensory organs and muscles - Nematode anatomy- digestive, excretory, nervous and reproductive systems - General biology of nematodes. | |

| **UNIT III : Biology, Symptoms and Disease Complex** | **3 Hrs.** |
|---|---|
| Classification of nematodes based on parasitism and temperature - Different types of nematode damage | |

symptoms on various horticultural crops - Nematode disease complex involving bacteria, fungi and viruses - Life cycle of important nematodes: *Meloidogyne, Heterodera, Globodera, Rotylenchulus, Tylenchulus, Radopholus and Pratylenchus.*

| **UNIT IV : Nematode Pests of Agricultural and Horticultural Crops** | **4 Hrs.** |
|---|---|

Nematode pests of cereals: rice & wheat - Millets: sorgum & maize - Pulses: redgram, blackgram, greengram & cowpea - Oilseeds: groundnut, castor & gingelly - Fibre crops-cotton - Vegetables: tomato, brinjal, bhendi, cabbage, cauliflower & chilli - tuber crops: potato, carrot, sugar beet, beetroot & yam - Flowers: crossandra, chrysanthemum, jasmine & tuberose - Fruits: banana, citrus, grapevine, papaya & guava - Spices and plantation crops: pepper, betel vine, turmeric, cardamom & coconut.

| **UNIT V - Nematode Management** | **3 Hrs.** |
|---|---|

Principles of nematode Management-Legislative, physical methods-soil solarization, hot water treatment - cultural methods-deep ploughing, fallowing, flooding, crop-rotation, trap crops and anti-nemic plants - Host plant resistance - Biological control bacteria, PGPR - Fungi-Nematode trapping fungi, egg parasitic fungi, antagonistic fungi and micorrhizal fungi - Chemical control and integrated nematode management.

**Lecture Schedule:**

1. History of plant Nematology-India & at international level. Position of nematodes in animal kingdom.
2. Economic importance of nematodes on plants & animals. Habitat and diversity. Beneficial nematodes.
3. Taxonomy of plant parasitic nematodes: Secernentea & Adenophorea.
4. Nematode definition. General morphology and biology of nematodes.
5. Anatomy of nematodes-digestive, excretory and nervous systems.
6. Anatomy of nematodes-different sensory organs and male, female reproductive systems.
7. Classification of plant nematodes based on feeding habits, temperature and different types of damage symptoms.
8. Role of nematodes in disease developments & interaction of plant nematodes with other microorganisms.

   **Mid Semester Examination.**
9. Bio-ecology of *Meloidogyne, Heterodera, Globodera, Radopholus, Tylenchulus, Rotylenchulus* & *Pratylenchus.*
10. Nematode pests of rice, wheat, sorgum, maize, redgram, blackgram, greengram & cowpea.
11. Nematode pests of oilseeds, fibre crop.
12. Nematode pests of vegetables, fruits and flower crops.

13. Nematode pests of spices and plantation crops.
14. Nematode management: legislative, cultural, physical
15. Nematode management: chemical, biological & HPR.
16. INM.

**Practical Schedule:**

1. Collection of soil, plant and root samples.
2. Extraction of soil nematodes by Cobb's sieving, Baermann funnel and modified Baermann funnel techniques.
3. Extraction of soil nematodes by sugar flotation technique.
4. Extraction of nematodes from seeds, roots and staining of nematode infested roots
5. Observing morphology of *Hoplolaimus* (Ord: Tylenchida) and *Xiphinema* (Ord: Dorylaimida).
6. Identification of *Meloidogyne.*
7. Identification of *Heterodera* and *Globodera.*
8. Identification of *Pratylenchus* and *Hirschmanniella.*
9. Identification of *Helicotylenchus* and *Tylenchorhynchus.*
10. Identification of *Aphelechoides* and *Tylechulus.*
11. Study of life stages of *Meloidogyne.*
12. Study of life stages of *Rotylenchulus.*
13. Study of life stages of *Radopholus.*
14. Nematode damage symptoms in rice: white-tip, rice root nematode and root knot nematode.
15. Nematode damage symptoms in banana and citrus.
16. Study of nematicides, application methods and calculation of dosages.

**Final Practical Examination.**

**Total Hours: 48**

| **TEXT BOOKS :** | |
|---|---|
| 1. | Dropkin, V.H. (1989). Introduction to Plant Nematology. 2nd Edition. John Wiley & Sons, New York. |
| 2. | Sasser, J.N. and Taylor, A.L. (1978). Plant Nematology – An Agricultural Training Aid. North Carolina State University, USA. |
| 3. | Luc, M., Sikora, R.A. and Bridge, J. (2005). Plant Parasitic Nematodes in Subtropical and Tropical Agriculture. 2nd Edition. CAB International, Wallingford, UK. |
| 4. | Gaur, H.S. and Perry, R.N. (2002). Plant Nematology. Oxford & IBH Publishing Co., New Delhi. |
| 5. | Jain, R.K. and Mathur, K.N. (2010). Principles of Plant Nematology. Scientific Publishers, Jodhpur, India. |

| **REFERENCE BOOKS :** | |
|---|---|
| 1. | Nickle, W.R. (1991). Manual of Agricultural Nematology. Marcel Dekker Inc., New York. |
| 2. | Mai, W.F. and Mullin, P.G. (1996). Plant Parasitic Nematodes: A Pictorial Key to Genera. 5th Edition. Cornell University Press, USA. |

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|---|---|
| 3. | Taylor, A.L. and Sasser, J.N. (1978). Biology, Identification and Control of Root-Knot Nematodes (Meloidogyne Species). North Carolina State University, USA. |
| 4. | Zuckerman, B.M., Mai, W.F. and Krusberg, L.R. (1985). Plant Nematology: Laboratory Manual. University of Massachusetts Agricultural Experiment Station, USA. |
| 5. | Khan, M.R. (2008). Plant Nematodes: Methodology, Morphology, Systematics, Biology and Ecology. Oxford & IBH Publishing Co., New Delhi. |


| **WEB REFERENCES :** | |
|---|---|
| 1. | **https://www.nematologists.org/** |
| 2. | **https://www.esn-online.org/** |
| 3. | **https://plantwiseplusknowledgebank.org/** |
| 4. | **https://www.ars.usda.gov/** |
| 5. | **https://www.iari.res.in/** |

| U25AG25B | Entrepreneurship Development and Business Communication | (2+1) |
|---|---|---|

**COURSE OBJECTIVES:**

- To introduce the historical evolution, motivational theories, and core psychological, social, and environmental traits that define an entrepreneur.
- To teach systematic environmental scanning, opportunity spotting techniques, and the network of supportive financial institutions and government policies.
- To guide students through product selection, choice of business ownership, site selection, and the formulation of a bankable project report.
- To train students in product mix design, inventory control models, raw material costing, and structural human resource workforce planning.
- To deliver core competencies in double-entry bookkeeping, working capital estimation, financial statement analysis, 4Ps marketing strategies, and operational crisis management.

**COURSE OUTCOMES:**

*After completion of the course, the students will be able to*

| | |
|---|---|
| **CO1 :** | Students will be able to identify and evaluate personal and external factors that drive successful entrepreneurial behavior and classify various business founders. |
| **CO2 :** | Students will be able to perform market scans to identify business opportunities and navigate institutional schemes to launch an enterprise legally. |
| **CO3 :** | Students will be able to compile a structured, investor-ready Detailed Project Report (DPR) covering ownership, site layout, and manufacturing logistics. |
| **CO4 :** | Students will be able to optimize manufacturing workflows, control inventory costs, and execute formal employee recruitment and retention strategies. |
| **CO5 :** | Students will be able to audit financial records, execute targeted marketing campaigns throughout a product's life cycle, and engineer business contingency plans. |
| **CO6 :** | Formulate bankable agri-business project proposals by evaluating the operational dynamics of agro-industries, entrepreneurial strategies, and the institutional credit systems identified during field visits. |

| **UNIT I : Entrepreneur and Entrepreneurial Process** | **7 Hrs.** |
|---|---|
| Development of entrepreneurship, motivational factors, social factors, environmental factors, characteristics of entrepreneurs, entrepreneurial attributes/competencies. Concept, need for and importance of entrepreneurial development. Evolution of entrepreneurship, objectives of entrepreneurial activities, types of entrepreneurs, functions of entrepreneurs, importance of entrepreneurial development, and process of entrepreneurship development. | |

| **UNIT II : Environment Scanning and Financial Institutions** | **6 Hrs.** |
|---|---|
| Environment scanning and opportunity identification need for scanning–spotting of opportunity-scanning of the environment– identification of product/service – starting a project; factors influencing sensing the opportunities. Infrastructure and support systems- good policies, schemes for | |

entrepreneurship development; role of financial institutions, and other agencies in entrepreneurship development. Steps involved in the functioning of an enterprise.

| **UNIT III : Selection of Products and Project Preparation** | **5 Hrs.** |
|---|---|
| Selection of the product/services, selection of form of ownership; registration, selection of site, capital sources, acquisition of manufacturing know-how, packaging and distribution. Planning of an enterprise, project identification, selection, and formulation of project; project report preparation, Enterprise Management. | |

| **UNIT IV : Production Management and Personal Management** | **6 Hrs.** |
|---|---|
| Production management – product, levels of products, product mix, quality control, cost of production, production controls, Material management. Production management – raw material costing, inventory control. Personal management–manpower planning, labour turnover, wages/salaries. | |

| **UNIT V : Financial Management and Marketing Management** | **7 Hrs.** |
|---|---|
| Financial management/accounting–funds, fixed capital and working capital, costing and pricing, long-term planning and short-term planning, bookkeeping, journal, ledger, subsidiary books, annual financial statement, taxation. Marketing management- market, types, marketing assistance, market strategies. Crisis management- raw material, production, leadership, market, finance, natural etc. | |

**Lecture Schedule**

1. Development of entrepreneurship, motivational factors, social factors, environmental factors.
2. Characteristics of entrepreneurs, entrepreneurial attributes/competencies.
3. Concept, need for entrepreneurship development.
4. Importance of entrepreneurial development.
5. Evolution of entrepreneurship, objectives of entrepreneurial activities.
6. Types of entrepreneurs, functions of entrepreneurs.
7. Importance of entrepreneurial development and process of entrepreneurship development.
8. Environment scanning and opportunity identification need for scanning–spotting of opportunity.
9. Scanning of the environment– identification of product/service.
10. Starting a project; factors influencing sensing the opportunities.
11. Infrastructure and support systems- good policies, and schemes for entrepreneurship development.
12. Role of financial institutions, and other agencies in entrepreneurship development.
13. Steps involved in the functioning of an enterprise.
14. Selection of the product/services, selection of form of ownership;
15. Registration, selection of site, capital sources, acquisition of manufacturing know how,

packaging, and distribution.

**16.** Planning of an enterprise, project identification.

**Mid-Semester Examination.**

**17.** Selection, and formulation of project.

**18.** Project report preparation, Enterprise Management.

**19.** Production management – product, levels of products, product mix, quality control.

**20.** Production management – cost of production, production controls.

**21.** Production management – material management and raw material costing.

**22.** Production management – inventory management and control.

**23.** Personnel management–manpower planning, labour turnover, wages/salaries.

**24.** Staffing – Job Analysis, Human Resource Planning Process, Recruitment and Selection

**25.** Financial management/accounting: funds, fixed capital, and working capital, costing and pricing.

**26.** Financial management/accounting: long-term planning and short-term planning.

**27.** Financial management/accounting: bookkeeping, journal, ledger, subsidiary books, annual

**28.** Financial statement: Balance Sheet, Cash flow statement and Income Statement

**29.** Financial management/accounting: taxation.

**30.** Marketing management- market, types, marketing assistance, market strategies.

**31.** Marketing mix and Market segmentation.

**32.** Crisis management- raw material, production, leadership, market, finance, natural etc.

**Practical schedule**

1. Introduction to Small-Scale Industries and types.
2. Identification of new agri-business opportunities.
3. Guest lecture by successful entrepreneurs.
4. Visit to farm input industries and suppliers.
5. Visit to smart farming units.
6. Visit to sericulture.
7. Visit to apiculture.
8. Visit to mushroom/ vermicomposting.
9. Visit to perennial crop units.
10. Visit to fruits and vegetable processing units.
11. Visit to livestock units.
12. Visit to farmer producer organizations (FPO).
13. Visit to DIC (District Industry Centre).
14. Visit/ Guest lecture to financial institutions.
15. Business Plan Preparation.

16. Project proposal preparation.

**Final Practical Examination**

**Total Hours: 64**

| **TEXT BOOKS:** | |
|---|---|
| 1. | Desai, V. (2023). Dynamics of entrepreneurial development and management. Himalaya Publishing House. |
| 2. | Khanka, S. S. (2020). Entrepreneurial development (Revised ed.). S. Chand & Company Ltd. |
| 3. | Reddy, M. V. S., Naik, R. G., & Shivalingaiah, Y. N. (2021). Agribusiness management and entrepreneurship development. Century Publications. |
| 4. | Somani, L. L., Khadda, B. S., & Rajveer. (2023). Textbook of entrepreneurship development and business management (2nd ed.). Agrotech Publishing Academy. |
| 5. | Soundarya, S. R., Nethrayini, K. R., Sree Lakshmi, A., & Reddy, M. V. S. (2025). Entrepreneurship development and business management. Brillion Publishing. |

| **REFERENCE BOOKS:** | |
|---|---|
| 1. | Charantimath P.M. 2009. Entrepreneurship Development and Small Business Enterprises. Pearson Publications, New Delhi. |
| 2. | Desai, V. 2015. Entrepreneurship: Development and Management, Himalaya Publishing House. |
| 3. | Mehra, P. 2016. Business Communication for Managers. Pearson India, New Delhi. |
| 4. | Grover, Indu. 2008. Handbook on Empowerment and Entrepreneurship. Agrotech Public Academy. |
| 5. | Singhal, R.K. 2013, Entrepreneurship Development & Management, Katson Books. |

| **WEB REFERENCES:** | |
|---|---|
| 1. | MANAGE E-Books Repository |
| 2. | ni-msme Official Portal |
| 3. | Calicut University Distance Education Materials |
| 4. | NIESBUD E-Books & Handbooks |

| U25AG26P | Physical Education, First Aid, Yoga Practices and Meditation | (0+2) |
|---|---|---|

**COURSE OBJECTIVES:**

- Develop physical fitness through exercise and sports.
- Practice yoga, meditation, and pranayama for holistic health.
- Understand sports training, nutrition, and healthy lifestyle practices.
- Learn basic skills, rules, and techniques of major games.
- Apply first aid skills in sports and emergency situations.

**COURSE OUTCOMES:**

*After completion of the course, the students will be able to*

| | |
|---|---|
| **CO1 :** | Perform physical fitness exercises and training methods effectively. |
| **CO2 :** | Demonstrate yoga, pranayama, meditation, and Surya Namaskar correctly. |
| **CO3 :** | Apply principles of sports training, nutrition, and health for improved fitness. |
| **CO4 :** | Demonstrate basic skills and officiating of major games and athletics. |
| **CO5 :** | Provide appropriate first aid for common sports injuries and emergencies. |

**Practical**

Demonstration and practice of physical fitness exercises, aerobic and anaerobic exercises, calisthenics, weight training, circuit training, interval training and Fartlek training. Assessment of physical fitness and posture. Practice of corrective exercises for postural deformities. Demonstration and practice of Surya Namaskar, selected yogasanas, pranayama, meditation, yogic kriyas and mudras. Teaching methodology of yoga including demonstration, correction and practice of asanas. Practice of major games and athletics involving basic skills, techniques and officiating. First aid techniques for common sports injuries, wounds, fractures, burns, poisoning, bites and emergency situations. Handling and transportation of injured persons. Visit to sports facilities, yoga centres, fitness centres and sports medicine/physiotherapy units.

**Practical Schedule:**

1. Introduction to physical education, training and coaching – meaning, concept and importance.
2. Methods of Training – Aerobic and Anaerobic Exercises.
3. Calisthenics, Weight Training and Circuit Training.
4. Interval Training and Fartlek Training.
5. Effects of Exercise on Muscular, Respiratory, Circulatory and Digestive Systems.
6. Balanced Diet, Nutrition and Effects of Diet on Sports Performance.
7. Physiological Changes Due to Ageing and Role of Regular Exercise.
8. Personality – Types, Dimensions and Role of Sports in Personality Development.
9. Motivation, Achievement in Sports and Theories of Learning.

10. Adolescent Problems, Management, Posture and Postural Deformities.
11. Corrective Exercises for Good Posture.
12. Introduction to Yoga – History, Types and Importance.
13. Asanas – Padmasana, Gomukhasana, Bhadrasana, Vajrasana and Shashankasana.
14. Asanas – Paschimottanasana, Ushtrasana, Tadasana, Padahastasana and Ardhachandrasana.
15. Asanas – Bhujangasana, Uttanapadasana, Sarvangasana and Parvatasana.
16. Asanas – Patangasana, Shishupalanasana, Pavanamuktasana, Halasana, Sarpasana, Ardha Dhanurasana and Shavasana.

    **Mid Semester Examination.**
17. Surya Namaskar – Demonstration and Practice.
18. Pranayama – Omkar, Suryabhedana, Chandrabhedana, Anulom-Vilom, Sheetali, Sheetkari, Bhastrika and Bhramari.
19. Meditation, Kapalbhati, Trataka, Jalneti and Tribandha.
20. Mudras, Role of Yoga in Sports and Teaching of Asanas.
21. History of Sports, Ancient Games and Governance of Sports in India.
22. National Sporting Events, Sports Awards and Athletics.
23. Cricket – Rules, Playfield, Equipment, Skills and Coaching.
24. Football– Rules, Equipment, Skills and Coaching.
25. Volleyball – Rules, Equipment, Skills and Coaching.
26. Basketball and Kabaddi – Rules, Equipment, Skills and Coaching.
27. Badminton, Table Tennis and Kho-Kho – Rules, Equipment, Skills and Coaching.
28. Introduction to First Aid – Need, Principles, Equipment and Upkeep.
29. First Aid for Respiratory, Heart, Blood and Circulatory Emergencies.
30. First Aid for Wounds, Bleeding, Bones, Joints and Muscle Injuries.
31. First Aid for Nervous System Disorders, Unconsciousness and Gastrointestinal Problems.
32. First Aid for Burns, Skin Injuries, Poisoning, Bites and Stings, Sense Organ Injuries, Transport of Injured Persons, Sports Injuries and Their Treatment.

    **Final Practical Examination.**

**Total Hours: 64**

| **TEXT BOOKS :** | |
|---|---|
| 1. | Uppal, A.K. (2014). Physical Education. Friends Publications, New Delhi. |
| 2. | Acharjya, S., & Jaiswal, R. (2018). Health and Physical Education. Khel Sahitya Kendra, New Delhi. |
| 3. | Iyengar, B.K.S. (2005). Light on Yoga. HarperCollins Publishers India, New Delhi. |
| 4. | St. John Ambulance Association. (2016). First Aid Manual. Dorling Kindersley (India) Pvt. Ltd., New Delhi. |

| REFERENCE BOOKS : | |
|---|---|
| 1. | Ghosh, A.K. (2019). Exercise Physiology. Khel Sahitya Kendra, New Delhi. |
| 2. | ACSM. (2021). ACSM's Guidelines for Exercise Testing and Prescription (11th ed.). Wolters Kluwer. |
| 3. | Swami Satyananda Saraswati. (2013). Asana Pranayama Mudra Bandha. Yoga Publications Trust, Munger, Bihar. |
| 4. | Singh, H. (2017). Science of Sports Training. D.V.S. Publications, New Delhi. |

| WEB REFERENCES : | |
|---|---|
| 1. | https://yas.nic.in/ |
| 2. | https://fitindia.gov.in/ |
| 3. | https://www.who.int/health-topics/physical-activity |
| 4. | https://www.ayush.gov.in/ |

| U25AG27P | Beneficial Insect Farming | (0+2) |
|---|---|---|

**COURSE OBJECTIVES:**

| |
|---|
| • To understand the biology, morphology, diversity and economic importance of honey bees, silkworms, lac insects, parasitoids and predators. |
| • To acquire practical skills in apiculture, sericulture, lac culture, and mass production of beneficial insects for sustainable agriculture. |
| • To develop competency in the identification, diagnosis and management of pests and diseases affecting honey bees, mulberry, silkworms and lac insects. |
| • To apply scientific principles of integrated production, management and utilization of beneficial insects and their products. |
| • To enhance entrepreneurial and extension skills related to beekeeping, sericulture, lac culture and biological control through practical training and field visits. |

**COURSE OUTCOMES:**

*After completion of the course, the students will be able to*

| | |
|---|---|
| **CO1 :** | Identify economically important species of honey bees, silkworms, lac insects, parasitoids, predators and other beneficial insects. |
| **CO2 :** | Demonstrate the techniques involved in beekeeping, silkworm rearing, lac cultivation and mass multiplication of natural enemies. |
| **CO3 :** | Diagnose and manage major pests and diseases of honey bees, mulberry, silkworms and lac insects using appropriate control measures. |
| **CO4 :** | Produce and utilize honey, silk, lac and biological control agents following recommended production and quality management practices. |
| **CO5 :** | Evaluate the role of beneficial insects in sustainable agriculture and recommend suitable production and management practices. |

**Practical**

Identification, morphology, structural adaptations, species and castes of honey bees - Bee hives, beekeeping appliances, colony organization, queen, worker and drone rearing, seasonal and apiary management practices - Bee pasturage, bee foraging behaviour, communication, enemies, diseases, and their management - Techniques for handling managed colonies, capturing wild bee colonies, and extraction of honey and other bee products - Morphology and botanical aspects of mulberry, mulberry cultivation, nursery bed preparation, methods of planting, pruning, harvesting and preservation of leaves, and management of mulberry pests and diseases - Morphology, biology, voltinism and breeds of mulberry and non-mulberry silkworms - Silkworm rearing requirements, rearing house and appliances, grainage technology, disinfection methods, chawki and late-age silkworm rearing, mounting, harvesting, marketing of cocoons, post-cocoon technology, and management of silkworm pests and diseases - Species, morphology, biology, host plants, strains, cultivation, production, extraction and processing of lac products, and management of pests and diseases of lac insects -

Identification of economically important parasitoids, predators, pollinators, weed killers, scavengers and soil builders - Insect orders containing major natural enemies used in biological control and their mass multiplication techniques - Educational visits to apiculture units, sericulture units and mulberry fields, grainage centres, silk reeling and weaving centres, and biocontrol laboratories for practical exposure.

**Practical Schedule:**

1. Identification, morphology and structural adaptations in honey bees.
2. Different species of honey bees.
3. Types of bee hive, bee keeping appliances and seasonal management.
4. Rearing of queen, worker and drone cell and colony organization.
5. Bee enemies and diseases.
6. Apiary management tactics, bee pasturage, bee foraging and communication.
7. Practicing and handling of honey bee colonies.
8. Capturing techniques of wild bee colonies.
9. Beekeeping products – extraction of honey bee products.
10. Morphology and botanical aspects of mulberry plants.
11. Mulberry cultivation - mulberry nursery bed preparation – methods of planting - pruning methods – leaf / shoot harvest– preservation of leaves.
12. Pests and diseases of mulberry.
13. Morphology and biology of different species of silkworm.
14. Voltinism and silkworm breeds.
15. Silkworm rearing requirements - rearing house and appliances.
16. Practicing the disinfection methods in rearing house, larval rearing and Disinfectants grainage.

    **Mid Semester Examination.**

17. Grainage technology.
18. Methods of rearing – chawki and late age silkworm rearing.
19. Mounting, harvesting and marketing of cocoon.
20. Post cocoon technology and rearing techniques of non mullberry silkworm.
21. Pests and diseases of mulberry silkworm.
22. Lac insects, biology, host plant, strains, cultivation and their management.
23. Pests and diseases of lac.
24. Extraction of lac and their products.
25. Identification of different types of parasitoids.
26. Identification of different types of predators.
27. Mass production techniques of parasitoids.

28. Mass production techniques of predators.
29. Identification of weed killers, pollinators, scavengers and soil builders.
30. Visit to apiculture unit.
31. Visit to sericulture unit and mulberry field.
32. Visit to grainage centre and silk reeling/weaving centre, bio control laboratory.

**Final Practical Examination.**

**Total Hours: 64**

| **TEXT BOOKS :** | |
|---|---|
| 1. | Mishra, R.C. (2017). Honey Bees and Their Management. ICAR, New Delhi. |
| 2. | Ullal, S.R. & Narasimhanna, M.N. (2018). Handbook of Practical Sericulture. CBS Publishers & Distributors, New Delhi. |
| 3. | Ganga, G. & Sulochana Chetty, J. (2019). An Introduction to Sericulture (3rd Ed.). Oxford & IBH Publishing Co., New Delhi. |
| 4. | Omkar (Ed.) (2017). Beneficial Insects: Ecology and Diversity. Springer, Singapore. |
| 5. | Dhaliwal, G.S. & Arora, R. (2019). Integrated Pest Management: Concepts and Approaches. Kalyani Publishers, Ludhiana. |

| **REFERENCE BOOKS :** | |
|---|---|
| 1. | Morse, R.A. & Flottum, K. (2018). Honey Bee Pests, Predators and Diseases. Root Publishing Company, USA. |
| 2. | Vasantharaj David, B. & Ramamurthy, V.V. (2016). Elements of Economic Entomology (8th Ed.). Brillion Publishing, New Delhi. |
| 3. | Krishnaswami, S. (2015). New Technology of Silkworm Rearing. Central Silk Board, Bengaluru. |
| 4. | Clausen, C.P. (2012). Biological Control of Insect Pests in the Continental United States. Scientific Publishers, Jodhpur. |
| 5. | Metcalf, R.L. & Luckmann, W.H. (2017). Introduction to Insect Pest Management (4th Ed.). Wiley India. |

| **WEB REFERENCES :** | |
|---|---|
| 1. | https://icar.org.in |
| 2. | https://csb.gov.in |
| 3. | https://nbb.gov.in |
| 4. | https://iihr.res.in |
| 5. | https://www.fao.org |

| U25VA06T | Constitution of India | (1+0) |
|---|---|---|

**COURSE OBJECTIVES:**

- To acquaint students with the foundational principles, philosophy, and significance of the Constitution of India.
- To make students understand the Fundamental Rights and Duties, and Constitutional Values of the Constitution and their significance in promoting responsible citizenship.
- To acquaint students with the structure, functions, and roles of the different organs and levels of government in India.
- To familiarize students with the structure, functions, and significance of democratic institutions and governance in promoting participatory democracy and sustainable development.
- To acquaint students with the constitutional provisions, principles, and governance mechanisms that promote rural development and inclusive agricultural growth.

**COURSE OUTCOMES:**

*After completion of the course, the students will be able to*

| | |
|---|---|
| **CO1 :** | Explain the foundational principles, philosophy, and significance of the Constitution of India. |
| **CO2 :** | Describe the Fundamental Rights and Duties, and Constitutional Values of India and demonstrate their relevance to responsible citizenship and ethical conduct. |
| **CO3 :** | Explain the structure and functions of the Government of India and its different levels of governance. |
| **CO4 :** | Explain the structure, functions, and role of democratic institutions and governance in ensuring effective public administration and citizen participation. |
| **CO5 :** | Explain the role of the Constitution in rural development and evaluate constitutional provisions, institutions, and policies that support sustainable agricultural and rural development. |

| **UNIT I: Foundations of the Constitution** | **3 Hrs.** |
|---|---|
| Constitution of India - Meaning, significance and Historical background, Framing of the Constitution, Preamble, Basic Structure and Salient features of the Constitution | |

| **UNIT II: Rights, Duties and Constitutional Values** | **3 Hrs.** |
|---|---|
| Fundamental Rights and their significance, Directive Principles of State Policy (DPSP), Fundamental Duties, Constitutional values and Ethics. | |

| **UNIT III: Structure of Government** | **3 Hrs.** |
|---|---|
| Union Government - President, Prime Minister and Parliament, State Government - Governor, Chief Minister and State Legislature, Judiciary - Supreme Court, High Courts and judicial review. | |

| **UNIT IV: Democratic Institutions and Governance** | **3 Hrs.** |
|---|---|
| Electoral system and Election Commission of India, Local self-government - Panchayati Raj and Urban Local Bodies, Constitutional bodies and commissions | |

| **UNIT V: Constitution and Rural Development** | **4 Hrs.** |
|---|---|
| Constitutional provisions for social justice - SC/ST, Women and Weaker sections, Democracy and citizenship, Secularism, and Gender equality, Important constitutional amendments, Agricultural and rural development policies under constitutional framework | |

**Lecture Schedule**

1. Constitution of India - Meaning, significance and Historical background.
2. Framing of the Constitution.
3. Preamble, Basic Structure and Salient features of the Constitution.
4. Fundamental Rights and their significance.
5. Directive Principles of State Policy (DPSP).
6. Fundamental Duties, Constitutional values and Ethics.
7. Union Government - President, Prime Minister and Parliament.
8. State Government - Governor, Chief Minister and State Legislature

**Mid Semester Examination.**

9. Judiciary - Supreme Court, High Courts and judicial review.
10. Electoral system and Election Commission of India.
11. Local self-government - Panchayati Raj and Urban Local Bodies.
12. Constitutional bodies and commissions.
13. Constitutional provisions for social justice - SC/ST, Women and Weaker sections,
14. Democracy and citizenship, Secularism, and Gender equality.
15. Important constitutional amendments.
16. Agricultural and rural development policies under constitutional framework.

**Total Hours: 16**

| **TEXT BOOKS :** | |
|---|---|
| 1. | Basu, D.D. (2024). *Introduction to the Constitution of India.* LexisNexis, New Delhi. |
| 2. | Laxmikanth, M. (2024). *Indian Polity*. McGraw Hill Education, New Delhi. |
| 3. | Subhash C. Kashyap. (2022). *Our Constitution*, National Book Trust (NBT), India |

| **REFERENCE BOOKS :** | |
|---|---|
| 1. | Jain, M.P. *Indian Constitutional Law*. LexisNexis, New Delhi. |
| 2. | Singh, M.P. and Saxena, Rekha *Indian Politics: Constitutional Foundations and Institutional Functioning*. PHI Learning Pvt. Ltd., New Delhi. |
| 3. | Government of India. *The Constitution of India (Bare Act)*. Ministry of Law and Justice. |
| 4. | Ministry of Panchayati Raj, Government of India. Publications on Panchayati Raj and Rural Local Governance. |

| **WEB REFERENCES :** | |
|---|---|
| 1. | Constitution of India (Official PDF – Ministry of Law & Justice) |
| 2. | National Portal of India – Constitution Overview |
| 3. | **Parliament of India – Constitution and Parliament** |

| U25VA13B | Principles and Practices of Natural Farming | (1+1) |
|---|---|---|

**COURSE OBJECTIVES:**

| |
|---|
| • **To understand** the philosophical concepts, its principles, and significance of natural farming and its role in sustainable agriculture |
| • To learn about the principles of agroecology and various natural farming systems practiced in India and across the world. |
| • To Study about the scope of natural farming in addressing present-day agricultural challenges, including soil degradation, climate change, and food security. |
| • To gain scientific and indigenous natural farming practices for crop, horticultural, and livestock production while conserving natural resources |
| • To know about the government initiatives, entrepreneurship opportunities, and digital technologies that promote chemical-free and sustainable farming. |

**COURSE OUTCOMES:**

*After completion of the course, the students will be able to*

| | |
|---|---|
| **CO1 :** | Discuss the concept, principles, philosophy, components, advantages, and limitations of natural farming and explain its relevance in sustainable agriculture. |
| **CO2 :** | Explain the principles of agroecology and compare different natural farming systems and other ecological farming approaches. |
| **CO3 :** | Examine the scope of natural farming in modern agriculture by integrating ecological principles, Indian philosophy of *Pancha Mahabhoot*, and sustainable management practices for crops, horticultural crops, and livestock. |
| **CO4 :** | Appraise the scientific basis of ecological and natural farming in enhancing food and nutritional security, conserving biodiversity, improving soil and water health, promoting ecological pest management, and strengthening climate-resilient agricultural production. |
| **CO5 :** | Describe the indigenous farming systems practiced in India and other countries, assess government initiatives such as PKVY, BPKP, and the National Mission on Natural Farming, and identify opportunities for entrepreneurship, start-ups, and digital innovations. |
| **CO6 :** | Demonstrate practical skills in natural farming practices, on-farm input preparation, field assessment, and documentation. |

| **UNIT I: Natural farming: Concept and importance** | **3 Hrs.** |
|---|---|
| Natural farming: Concept and importance - Modern agriculture and need for new strategies, Origin of concept of natural farming, Natural farming: principles, philosophy and components, Merits and demerits of natural farming. | |

| **UNIT II: Agroecology: Concept and Principles** | **3 Hrs.** |
|---|---|
| Agroecology: Concept and Principles, history of development in agro-ecology, Principles of Fukuoka and other methods of natural farming, Practices of Natural Farming - case studies, Types of natural farming systems - Community based natural farming, Palekar's Natural Farming, Bio-dynamic, homa farming, natu- eco farming, Rishi Krishi, panchagavvya Krishi, Yogic farming. | |

| UNIT III: Scope of natural farming in modern time | 3 Hrs. |
|---|---|
| Scope of natural farming in modern time - Laws of nature, Indian philosophy /Bhartiya Chintan of Pancha Mahabhoot and their role in human life and development - Important management practices for crops, fruits, vegetables and animals in natural farming, comparison of conventional, organic and natural farming production systems. | |

| UNIT IV: Scientific aspects of ecological and natural farming | 3 Hrs. |
|---|---|
| Scientific aspects of ecological and natural farming for supporting food, nutritional and livelihood security - food sovereignty, livelihood of farmers and rural communities, biodiversity and conservation of biodiversity - Sustainable soil health and clean water, Ecological pest protection - Climate resilient food production. | |

| UNIT V: Indigenous farming systems prevalent in India and other countries | 4 Hrs. |
|---|---|
| Indigenous farming systems prevalent in India and other countries - Government schemes supporting natural farming (PKVY, BPKP, National Mission on Natural Farming) - Start-Ups in chemical free agriculture, Digital India. | |

**Lecture Schedule:**

1. Natural farming: Concept and importance.
2. Modern industrial agriculture and need for new alternative strategies.
3. Origin of concept of natural farming, Natural farming: principles, philosophy and components, Merits and demerits of natural farming.
4. Agroecology: Concept and Principles, history of development in agro-ecology.
5. Principles of Fukuoka and other methods of natural farming, Practices of Natural Farming case studies.
6. Types of natural farming systems (Community based natural farming, Palekar's Natural farming, Bio-dynamic, homa farming, natu- eco farming, Rishi Krishi, panchagavvya Krishi, Yogic farming etc.
7. Scope of natural farming in modern time, Laws of nature, Indian philosophy /Bhartiya Chintan of Pancha Mahabhoot and their role in human life and development.
8. Important management practices for crops, fruits, vegetables and animals in natural farming.
   **Mid Semester Examination.**
9. Comparison of conventional, organic and natural farming production systems.
10. Scientific aspects of ecological and natural farming.
11. Livelihood security, Biodiversity and Conservation of Biodiversity.
12. Sustainable soil health and clean water, Ecological pest protection, Climate resilient food production.

13. Indigenous farming systems prevalent in India and other countries.
14. Government schemes supporting natural farming.
15. Start-Ups in chemical free agriculture, Digital India.
16. Certification, marketing and value chain development for natural farming produce.

**Practical Schedule:**

1. Identification of indigenous crops and practices.
2. Study of different farming systems and its characterization.
3. Visit of natural farms.
4. Concept, components and management practices and interpretation of Natural Farms.
5. Development of natural farm inventory.
6. Practical field application of Bio dynamic farming.
7. Practical field application of Homa farming.
8. Practical field application of Natu-eco farming.
9. Practical field application of Yogic farming.
10. Practical field application of Rishi Krishi farming.
11. Practical field application of Panchagavya Krishi farming.
12. Design of natural farm based on locally available resources.
13. Preparation of on-farm inputs for nutrient, pest and disease management.
14. Indigenous technology knowledge (ITK) for nutrient, insect, pest disease and weed management.
15. Development of documentary on management of natural farm.
16. Field assessment and documentation of natural farming practices, including preparation of a practical report and presentation.

**Final Practical Examination.**

**Total Hours: 48**

| **TEXT BOOKS :** | |
|---|---|
| 1. | S.S.Walia, Tamanpreet Kaur and N Ravisankar, "Principles and Practices of Natural farming". Scientific Publishers, Jodhpur, 2025. |
| 2. | Vaibhav, Jumale, Namitha, Anitrosa Innazent, and Diksha Sinha, "Text Book of Principles and Practices of Natural farming". Scientific International Publishers, Tamil Nadu, 2025. |
| 3. | Dhanshree Bharat Yadav, V. M. Bhale and B. V. Asear , "Principles and Practices of Natural farming", The Pustakalaya, Uttar Pradesh, 2026. |
| 4. | S. R. Reddy and S. Sahadeva reddy, "Principles and Practices of Natural farming". Kalyani Publisher, New Delhi, 2026 |

| **REFERENCE BOOKS :** | |
|---|---|
| 1. | Behera, U.K, "A Text Book of Farming Systems", Agrotech Publishing House, Rajasthan, 2013 |

| | |
|---|---|
| 2. | Nicole Faires, "The Ultimate Guide to Natural Farming and Sustainable Living: Permaculture for Beginners (Ultimate Guides)". Skyhorse Publications, New Delhi, 2016. |
| 3. | Prathapan Paramu, "Natural Farming Techniques: Farming without tilling". Ebook, 2021. |
| 4. | Khurana, A. and Kumar, V, "State of Organic and Natural Farming: Challenges and Possibilities". Centre for Science and Environment, New Delhi, 2020. |
| 5. | Hill S.B. and Ott P, "Basic Techniques in Ecological Farming". Berkhauser, New Delhi, 1982. |


| **WEB REFERENCES :** | |
|---|---|
| 1. | https://naturalfarming.dac.gov.in/uploads/studymaterial/Technical-Manual-on Natural_Farming_10.03.2025.pdf |
| 2. | https://niti.gov.in/sites/default/files/2026-03/Training-Manual-English.pdf |
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