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| B.sc.,Agri biology |
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| **SYLLABUS** |
| **from the academic year****2023-2024** |

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| **TAMILNADU STATE COUNCIL FOR HIGHER EDUCATION, CHENNAI – 600 005** |
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| **LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK GUIDELINES BASED REGULATIONS FOR UNDER GRADUATE PROGRAMME** |
| **Programme:** | **B.Sc. AGRI BIOLOGY** |
| **Programme Code:** |  |
| **Duration:** | **3 Years (UG)** |
| **Programme Outcomes:** | **PO1: Disciplinary knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study**PO2: Communication Skills:** Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one’s views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.**PO3: Critical thinking:** Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development. **PO4: Problem solving: Capacity** to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one’s learning to real life situations. **PO5: Analytical reasoning**: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.**PO6: Research-related skills**: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation**PO7: Cooperation/Team work:** Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team**PO8: Scientific reasoning**: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.**PO9: Reflective thinking**: Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society. **PO10 Information/digital literacy:** Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data. **PO 11 Self-directed learning**: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.**PO 12 Multicultural competence:** Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups. **PO 13: Moral and ethical awareness/reasoning**: Ability toembrace moral/ethical values in conducting one’s life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstratingthe ability to identify ethical issues related to one‟s work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.**PO 14: Leadership readiness/qualities:** Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way.**PO 15: Lifelong learning:** Ability to acquire knowledge and skills, including „learning how to learn‟, that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling. |
| **Programme Specific Outcomes:** | On successful completion of Bachelor of Physics with Computer Applications programme, the student should be able to:**PSO1: Disciplinary Knowledge:** Understand the fundamental principles, concepts, and theories related to physics and computer science. Also, exhibit proficiency in performing experiments in the laboratory.**PSO2: Critical Thinking:** Analyse complex problems, evaluate information, synthesize information, apply theoretical concepts to practical situations, identify assumptions and biases, make informed decisions and communicate effectively**PSO3: Problem Solving:** Employ theoretical concepts and critical reasoning ability with physical, mathematical and technical skills to solve problems, acquire data, analyze their physical significance and explore new design possibilities.**PSO4: Analytical & Scientific Reasoning:** Apply scientific methods, collect and analyse data, test hypotheses, evaluate evidence, apply statistical techniques and use computational models.**PSO5: Research related skills:** Formulate research questions, conduct literature reviews, design and execute research studies, communicate research findings and collaborate in research projects.**PSO6: Self-directed & Lifelong Learning:** Set learning goals, manage their own learning, reflect on their learning, adapt to new contexts, seek out new knowledge, collaborate with others and to continuously improve their skills and knowledge, through ongoing learning and professional development, and contribute to the growth and development of their field.  |

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| **PO/PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **PO1** |  |  |  |  |  |  |
| **PO2** |  |  |  |  |  |  |
| **PO3** |  |  |  |  |  |  |
| **PO4** |  |  |  |  |  |  |
| **PO5** |  |  |  |  |  |  |
| **PO6** |  |  |  |  |  |  |

**2. Highlights of the Revamped Curriculum**:

* Student-centric, meeting the demands of industry & society, incorporating industrial components, hands-on training, skill enhancement modules, industrial project, project with viva-voce, exposure to entrepreneurial skills, training for competitive examinations, sustaining the quality of the core components and incorporating application oriented content wherever required.
* The Core subjects include latest developments in the education and scientific front, advanced programming packages allied with the discipline topics, practical training, devising statistical models and algorithms for providing solutions to industry / real life situations. The curriculum also facilitates peer learning with advanced statistical topics in the final semester, catering to the needs of stakeholders with research aptitude.
* The General Studies and Statistics based problem solving skills are included as mandatory components in the ‘Training for Competitive Examinations’ course at the final semester, a first of its kind.
* The curriculum is designed so as to strengthen the Industry-Academia interface and provide more job opportunities for the students.
* The Statistical Quality Control course is included to expose the students to real life problems and train the students on designing a mathematical model to provide solutions to the industrial problems.
* The Internship during the second year vacation will help the students gain valuable work experience, that connects classroom knowledge to real world experience and to narrow down and focus on the career path.
* Project with viva-voce component in the fifth semester enables the student, application of conceptual knowledge to practical situations. The state of art technologies in conducting a Explain in a scientific and systematic way and arriving at a precise solution is ensured. Such innovative provisions of the industrial training, project and internships will give students an edge over the counterparts in the job market.
* State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature are incorporated as Elective courses, covering conventional topics to the latest DBMS and Computer software for Analytics.

**Value additions in the Revamped Curriculum:**

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| Semester | Newly introduced Components | Outcome / Benefits |
| I  | **Foundation Course**To ease the transition of learning from higher secondary to higher education, providing an overview of the pedagogy of learning abstract Statistics and simulating mathematical concepts to real world. | * Instil confidence among students
* Create interest for the subject
 |
| I, II, III, IV | **Skill Enhancement papers** (Discipline centric / Generic / Entrepreneurial)  | * Industry ready graduates
* Skilled human resource
* Students are equipped with essential skills to make them employable
 |
| * Training on Computing / Computational skills enable the students gain knowledge and exposure on latest computational aspects
 |
| * Data analytical skills will enable students gain internships, apprenticeships, field work involving data collection, compilation, analysis etc.
 |
| * Entrepreneurial skill training will provide an opportunity for independent livelihood
* Generates self – employment
* Create small scale entrepreneurs
* Training to girls leads to women empowerment
 |
| * Discipline centric skill will improve the Technical knowhow of solving real life problems using ICT tools
 |
| III, IV, V & VI  | Elective papers-An open choice of topics categorized under Generic and Discipline Centric  | * Strengthening the domain knowledge
* Introducing the stakeholders to the State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature
* Students are exposed to Latest topics on Computer Science / IT, that require strong statistical background
* Emerging topics in higher education / industry / communication network / health sector etc. are introduced with hands-on-training, facilitates designing of statistical models in the respective sectors
 |
| IV  | DBMS and Programming skill, Biostatistics, Statistical Quality Control, Official Statistics, Operations Research | * Exposure to industry moulds students into solution providers
* Generates Industry ready graduates
* Employment opportunities enhanced
 |
| II year Vacation activity | Internship / Industrial Training | * Practical training at the Industry/ Banking Sector / Private/ Public sector organizations / Educational institutions, enable the students gain professional experience and also become responsible citizens.
 |
| V Semester | Project with Viva – voce  | * Self-learning is enhanced
* Application of the concept to real situation is conceived resulting in tangible outcome
 |
| VI Semester | Introduction of Professional Competency component  | * Curriculum design accommodates all category of learners; ‘Statistics for Advanced Explain’ component will comprise of advanced topics in Statistics and allied fields, for those in the peer group / aspiring researchers;
* ‘Training for Competitive Examinations’ –caters to the needs of the aspirants towards most sought - after services of the nation viz, UPSC, ISS, CDS, NDA, Banking Services, CAT, TNPSC group services, etc.
 |
| Extra Credits:For Advanced Learners / Honors degree  | * To cater to the needs of peer learners / research aspirants
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| **Skills acquired from the Courses** |  Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |

**Credit Distribution for UG Programmes**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sem I** | **Credit** | **H** | **Sem II** | **Credit** | **H** | **Sem III** | **Credit** | **H** | **Sem IV** | **Credit** | **H** | **Sem V** | **Credit** | **H** | **Sem VI** | **Credit** | **H** |
| Part 1. Language – Tamil  | 3 | 6 | Part..1. Language – Tamil | 3 | 6 | Part..1. Language – Tamil | 3 | 6 | Part..1. Language – Tamil | 3 | 6 | 5.1 Core Course –\CC IX  | 4 | 5 | 6.1 Core Course – CC XIII | 4 | 6 |
| Part.2 English | 3 | 6 | Part..2 English | 3 | 6 | Part..2 English | 3 | 6 | Part..2 English | 3 | 6 | 5.2 Core Course – CC X | 4 | 5 | 6.2 Core Course – CC XIV | 4 | 6 |
| 1.3 Core Course – CC I  | 5 | 5 | 2..3 Core Course – CC III  | 5 | 5 | 3.3 Core Course – CC V  | 5 | 5 | 4.3 Core Course – CC VII Core Industry Module  | 5 | 5 | 5. 3.Core Course CC -XI | 4 | 5 | 6.3 Core Course – CC XV | 4 | 6 |
| 1.4 Core Course – CC II | 5 | 5 | 2.4 Core Course – CC IV | 5 | 5 | 3.4 Core Course – CC VI | 5 | 5 | 4.4 Core Course – CC VIII | 5 | 5 | 5. 4.Core Course –/ Project with viva- voce CC -XII | 4 | 5 | 6.4 Elective -VII Generic/ Discipline Specific  | 3 | 5 |
| 1.5 Elective I Generic/ Discipline Specific  | 3 | 4 | 2.5 Elective II Generic/ Discipline Specific  | 3 | 4 | 3.5 Elective III Generic/ Discipline Specific  | 3 | 4 | 4.5 Elective IV Generic/ Discipline Specific  | 3 | 3 | 5.5 Elective V Generic/ Discipline Specific  | 3 | 4 | 6.5 Elective VIII Generic/ Discipline Specific  | 3 | 5 |
| 1.6 Skill Enhancement CourseSEC-1  | 2 | 2 | 2.6 Skill Enhancement CourseSEC-2  | 2 | 2 | 3.6 Skill Enhancement Course SEC-4, (Entrepreneurial Skill) | 1 | 1 | 4.6 Skill Enhancement CourseSEC-6 | 2 | 2 | 5.6 Elective VI Generic/ Discipline Specific  | 3 | 4 | 6.6 Extension Activity | 1 | - |
| 1.7 Skill Enhancement -(Foundation Course) | 2 | 2 | 2.7 Skill Enhancement Course –SEC-3 | 2 | 2 | 3.7 Skill Enhancement Course SEC-5 | 2 | 2 | 4.7 Skill Enhancement Course SEC-7 | 2 | 2 | 5.7 Value Education  | 2 | 2 | 6.7 Professional Competency Skill | 2 | 2 |
|  |  |  |  |  |  | 3.8 E.V.S. | - | 1 | 4.8 E.V.S | 2 | 1 | 5.8 Summer Internship /Industrial Training | 2 |  |  |  |  |
|  | **23** | **30** |  | **23** | **30** |  | **22** | **30** |  | **25** | **30** |  | **26** | **30** |  | **21** | **30** |
| **Total – 140 Credits** |

**Choice Based Credit System (CBCS), Learning Outcomes Based Curriculum Framework (LOCF) Guideline Based Credit and Hours Distribution System**

**for all UG courses including Lab Hours**

**First Year – Semester-I**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **No. of Hours** |
| Part-1 |  Language – Tamil  | 3 | 6 |
| Part-2 |  English | 3 | 6 |
| Part-3 |  Core Courses & Elective Courses [in Total] | 13 | 14 |
| Part-4 |  Skill Enhancement Course SEC-1  | 2 | 2 |
| Foundation Course | 2 | 2 |
|  |  | **23** | **30** |

**Semester-II**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **No. of Hours** |
| Part-1 | Language – Tamil | 3 | 6 |
| Part-2 |  English | 3 | 6 |
| Part-3 | Core Courses & Elective Courses including laboratory [in Total] | 13 | 14 |
| Part-4 | Skill Enhancement Course -SEC-2  | 2 | 2 |
| Skill Enhancement Course -SEC-3 (Discipline / Subject Specific) | 2 | 2 |
|  |  | **23** | **30** |

**Second Year – Semester-III**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **No. of Hours** |
| Part-1 | Language - Tamil | 3 | 6 |
| Part-2 |  English | 3 | 6 |
| Part-3 | Core Courses & Elective Courses including laboratory [in Total] | 13 | 14 |
| Part-4 | Skill Enhancement Course -SEC-4 (Entrepreneurial Based) | 1 | 1 |
| Skill Enhancement Course -SEC-5 (Discipline / Subject Specific) | 2 | 2 |
|  E.V.S  | - | 1 |
|  |  | **22** | **30** |

**Semester-IV**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **No. of Hours** |
| Part-1 | Language - Tamil | 3 | 6 |
| Part-2 |  English | 3 | 6 |
| Part-3 | Core Courses & Elective Courses including laboratory [in Total] | 13 | 13 |
| Part-4 | Skill Enhancement Course -SEC-6 (Discipline / Subject Specific) | 2 | 2 |
| Skill Enhancement Course -SEC-7 (Discipline / Subject Specific) | 2 | 2 |
|  E.V.S  | 2 | 1 |
|  |  | **25** | **30** |

**Third Year**

**Semester-V**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **No. of Hours** |
| **Part-3** | Core Courses including Project / Elective Based | 22 | 26 |
| **Part-4** | Value Education  | 2 | 2 |
| Internship / Industrial Visit / Field Visit | 2 | 2 |
|  |  | **26** | **30** |

**Semester-VI**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **No. of Hours** |
| Part-3 | Core Courses including Project / Elective Based & LAB | 18 | 28 |
| **Part-4** | Extension Activity | 1 | - |
| Professional Competency Skill | 2 | 2 |
|  |  | **21** | **30** |

**Consolidated Semester wise and Component wise Credit distribution**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parts**  | **Sem I** | **Sem II** | **Sem III** | **Sem IV** | **Sem V** | **Sem VI** | **Total Credits** |
| **Part I** | 3 | 3 | 3 | 3 | - | - | 12 |
| **Part II** | 3 | 3 | 3 | 3 | - | - | 12 |
| **Part III** | 13 | 13 | 13 | 13 | 22 | 18 | 92 |
| **Part IV**  | 4 | 4 | 3 | 6 | 4 | 1 | 22 |
| **Part V** | - | - | - | - | - | 2 | 2 |
| **Total** | 23 | 23 | 22 | 25 | 26 | 21 | **140** |

**\*Part I. II, and Part III components will be separately taken into account for CGPA calculation and classification for the under graduate programme and the other components. IV, V have to be completed during the duration of the programme as per the norms, to be eligible for obtaining the UG degree.**

**Remarks: English Soft Skill Two Hours Will be handled by English Teachers**

**(4+2 = 6 hours for English).**

**B.SC., AGRI BIOLOGY**

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| **First Year – Semester – I** |
| **Part** | **List of courses** | **Credits** | **No. of Hrs** |
| **Part I** | Language – Tamil Paper  | 3 | 6 |
| **Part II** | English Paper  | 3 | 6 |
| **Part-III** | Core Course – I Agricultural Crop Diversity And Culture Techniques - I | 5 | 5 |
| Core Course – II Agricultural Crop Diversity And Culture Technique -Ii | 5 | 5 |
| Elective Course I (Generic / Discipline Specific) Agricultural Informatics | 3 | 4 |
| **Part-IV** | Skill Enhancement Course SEC 1 Mushroom Cultivation | 2 | 2 |
| Skill Enhancement Course | 2 | 2 |
| **TOTAL** |  | **23** | **30** |
| **First Year – Semester – II** |
|  |
| **Part** | **List of courses** | **Credits** | **No. of Hrs** |
| **Part I** | Language – Tamil Paper  | 3 | 6 |
| **Part II** | English Paper  | 3 | 6 |
| **Part III** | Core Course III – Cultivation And Management Of Cash Crops & Plantation Crops | 5 | 5 |
| Core Course IV – Agro Practices (Irrigation, Maintenance Of Soil fertility And Nutrient Status) | 5 | 5 |
| Elective Course II (Generic / Discipline Specific)Agricultural Entomology | 3 | 4 |
| **Part IV** | Skill Enhancement Course SEC 2 Ornamental Horticulture And Land Scape Gardening | 2 | 2 |
| Skill Enhancement Course SEC-3 Dairy Products Technology | 2 | 2 |
| **TOTAL** |  | **23** | **30** |

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| **Second Year – Semester – III** |
|  |
| **Part** | **List of Courses** | **Credits** | **No. of Hrs** |
| **Part I** | Language – Tamil  | 3 | 6 |
| **Part II** | English | 3 | 6 |
| **Part III** | Core Course –V **General** Plant Genetics, Breeding And Biostatistics | 5 | 5 |
| Core Course –VI Farming Technology (Organic And Integrated Farming, Green House) | 5 | 5 |
| Elective Course III (Generic / Discipline Specific) Agricultural Marketing And Finance | 3 | 4 |
| **Part IV** | Skill Enhancement Course SEC 4 (NME) | 1 | 1 |
| Skill Enhancement Course SEC 5 (Entrepreneurial Skills) | 2 | 2 |
|  | EVS | - | 1 |
| **TOTAL** |  | **22** | **30** |
| **Second Year – Semester – IV** |
|  |
| **Part** | **List of Courses** | **Credits** | **No. of Hrs** |
| **Part I** | Language – Tamil  | 3 | 6 |
| **Part II** | English | 3 | 6 |
| **Part III** | Core Course –VII Harvest Technology | 5 | 5 |
| Core Course –VIII Agro Based Industries | 5 | 5 |
| Elective Course IV (Generic / Discipline Specific) Agricultural Pest And Pest Control | 3 | 3 |
| **Part IV** | Skill Enhancement Course SEC 6 (NME) | 2 | 2 |
| Skill Enhancement Course SEC 7  | 2 | 2 |
|  | EVS | 2 | 1 |
| **TOTAL** |  | **25** | **30** |

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| **Third Year – Semester – V** |
| **Part** | **List of Courses** | **Credits** | **No. of Hours** |
| **Part III** | Core Course IX Fundamentals Of Agroeconomics And Trading | 4 | 5 |
| Core Course X Entrepreneurship Development And Business Management | 4 | 5 |
| Core Course XI  | 4 | 5 |
| Core Course / Project with Viva Voce CC- XII  | 4 | 5 |
| Elective Course V (Generic / Discipline Specific)Agricultural Finance and Business Management | 3 | 4 |
| Elective Course VI (Generic / Discipline Specific)Agricultural Finance and Business Management | 3 | 4 |
| **Part IV** | Value Education | 2 | 2 |
| Summer Internship/Industrial Training | 2 | - |
| **TOTAL** |  | **26** | **30** |
| **Third Year – Semester – VI** |
|  |
| **Part** | **List of Courses** | **Credits** | **No. of Hrs** |
| **Part III** | Core Course XIII  | 4 | 6 |
| Core Course XIV  | 4 | 6 |
| Core Course XV  | 4 | 6 |
| Elective Course VII (Generic / Discipline Specific)  | 3 | 5 |
| Elective Course VIII (Generic / Discipline Specific) | 3 | 5 |
| **Part IV** | Extension Activity | 1 | - |
| Professional Competency Skill    | 2 | 2 |
| **TOTAL** |  | **21** | **30** |

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| **Coursecode** |  | **AGRICULTURAL CROP DIVERSITY AND CULTURE TECHNIQUES - I**  | **L** | **T** | **P** | **C** |
| **Core/Elective/Supportive** | **Core paper-I** | **120** |  |  | **4** |
| **Pre-requisite** | **BasicknowledgeinAgro-meteorology andbasicknowledgeinhostpathogeninteractiongainedin previousclasses.** |  |  |
| **CourseObjectives:** |
| Themainobjectivesofthiscourseareto:* Understanding the weather and climatic factors affecting crops.
* Learn the cultivation practices of important kharif cereals and pulses.
* Gain the knowledge on production technology of economically important oil seeds
* Study the types and methods of cultivation of a selected fiber crops
* Learn to cultivate a few forage crops
 |
|  |
| **ExpectedCourseOutcomes:** |
| Onthesuccessfulcompletionofthecourse,students areable: |
| 1 | Scientifically understand the significance of meteorology in agriculture | K2 |
| 2 | Gain the technical know-how and cultural practices in cultivation of cereals and pulses. | K2 |
| 3 | Acquire the skills and knowledge in cultivation of fibre and forage crops | K4 |
| 4 | Tooverviewthestructureandreproductionof Lichens. | K3 |
| 5 | ToImplement knowledgeonmanagementofplantdiseasestoincreasecrop yield. | K3 |
| **K1**-Remember;**K2** -Understand;**K3** -Apply;**K4**-Analyze; **K5**-Evaluate;**K6**-Create |
|  |
| **Unit:1** | **Introduction to Agro-meteorology** | **30hours** |
| Introduction to Agro-meteorology - importance - Weather and climatic factors affecting crops |
| **Unit:2** | **Production Technology of Cereals** | **15hours** |
| Production Technology (origin, geographical distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield) of Cereals: Rice, Maize, Kharif Sorghum, Pearl millet and Minor millets. |
| **Unit:3** | **Production Technology of Pulses** | **30hours** |
| Production Technology (origin, geographical distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield) of Pulses: Pigeon pea, Mungbean, Horse gram, Moth bean, Cowpea. |
| **Unit:4** | **Production Technology of Oilseeds** | **30hours** |
| Production Technology (origin, geographical distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield) of Oilseeds: Soybean, Castor, Niger, Groundnut, Sesame. |

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| **Unit:5** | **Production Technology of Fibre crops** | **15hours** |
| Production Technology (origin, geographical distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield) of Fiber crops: Cotton, Jute, Sun hemp, Dhaincha. Production Technology of Forage crops : Rain fed and Irrigated grasses. |
| **TotalLecturehours** | **120hours** |
| **Practicals:** |
| 1. Introduction to agro-meteorological instruments
2. Cultivation of various Kharif crops may be carried out in model farms inside the campus or outstation studies carried out in nearby agricultural farms
3. Rice nursery preparation and transplanting/seed bed preparation and sowing of Kharif crops
4. Calculations of seed rate, Effect of seed size on germination and seedling vigour
5. Study types of weeds and their control experiments in these crops
6. Study of fertilizer experiments on rice, maize, sorghum and millets
7. Study of yield contributing characters, yield calculations, harvesting and yield estimation of above crops
8. Study of forage experiments.
 |
| **TextBooks** |
| 1 | Hand book of Agriculture, ICAR Publication, 6th edition, 2006.  |
| 2 | Chhida Singh, Prem Singh and Rajbir Singh Modern Techniques of raising field crops, 2nd edition. |
| 3 | Rajendra Prasad Field Crops.  |
| 4 | Reddy SR,Principles of Agronomy, Kalyani Publishers, Third edition. |
| 5 | S.S. Cheema, B.K. Dhaliwal and T.S. Sahota Theory and Digest Agronomy.  |

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|  | **ReferenceBooks** |
| 1 | M.M. Hosmani, B.M. Chittarpur and H.B. Babalad.Farm Productivity New CenturyNew Challenges. |
| 2 | V.G. Vaidya, K.R. Sahasrabuddhe and V.S. Khuspe,Crop production and field experimentation Continental Prakashan, Pune.  |
| **RelatedOnlineContents[MOOC,SWAYAM,NPTEL,Websitesetc.]** |
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| **MappingwithProgrammeOutcomes** |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | S | S | S | S | S | S | M | M |
| **CO2** | M | S | M | M | S | S | S | S | S | S |
| **CO3** | S | S | M | M | S | S | M | S | M | S |
| **CO4** | M | S | S | S | M | S | S | M | S | S |
| **CO5** | S | M | S | S | S | S | M | S | S | M |

\***S**-Strong;**M**-Medium;**L**-Low

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| **Coursecode** |  | **AGRICULTURAL CROP DIVERSITY AND CULTURE TECHNIQUE -II**  | **L** | **T** | **P** | **C** |
| **Core/Elective/Supportive** | **Corepaper-II** | **120** |  |  | **4** |
| **Pre-requisite** | **Knowledge gained about Rabi crops cultivation and cultural practices employed in cereals and pulses cultivation** |  |  |
| **CourseObjectives:** |
| Themainobjectivesofthiscourseare:* To acquire the knowledge of Rabi crops cultivation
* To learn the cultural practices employed in cultivation of few common cereals and pulses
* Gain the skills to cultivate some economically important oilseeds, aromatic and medicinal plants
 |
| **ExpectedCourseOutcomes:** |
| Onthesuccessfulcompletionofthecourse,studentareableto: |
| 1 | Trained to cultivate a various cereals and pulses | K2 |
| 2 |  Developed skills to cultivate various oil seeds | K2 |
| 3 |  Developed skills to profitably manage aromatic plants cultivation | K3 |
| 4 | Trained to cultivate Medicinal plants | K2 |
| 5 | Understandproduction technology of commercial crops | K4 |
| **K1**-Remember;**K2** -Understand;**K3** -Apply;**K4**-Analyze; **K5**-Evaluate;**K6**-Create |
| **Unit:1** | **Production Technology of other Cereals and Pulses** | **15hours** |
| Production Technology (origin, geographical distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield) of following Cereals: Barley, Rabi sorghum, Pulses: chickpea, lentil, peas, French bean |
| **Unit:2** | **Production Technology of other Oilseeds** | **30hours** |
| Production Technology (origin, geographical distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield) of following Oilseeds: safflower, sunflower, linseed, rapeseed and mustard Sugar crops: sugarcane. |
| **Unit:3** | **Production Technology of Aromatic Plants** | **30hours** |
| Production Technology (origin, geographical distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield) of Aromatic plants: Mentha, Lemon grass, Citronella, Palma Rosa Isabgol, Posta. |
| **Unit:4** | **Production Technology of Medicinal plants** | **30hours** |
| Production Technology (origin, geographical distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield) of following medicinal plants: Vincarosea, Senna, Gloriosa superb, Andrographis, Brammi, Centellaasiatica, Neem. |

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| **Unit:5** | **Production Technology of Commercial crops** | **15hours** |
| Production technology (origin, geographical distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield) of Commercial crops: Potato, . Production technology of Forage crops: Maize, Barseem, Lucerne, Oats. |
| **TotalLecturehours** | **120hours** |
| **Practicals:** |
| 1. Cultivation of various Rabi crops may be carried out in model farms inside the campus or outstation studies carried out in nearby agricultural farms
2. Seed bed preparation and sowing of sugarcane and sunflower
3. Calculations on seed rate and study of fertilizer experiments on Rabi cereals, pulses and oil seeds.
4. Identification of weeds in Rabi cereals, pulses, sugarcane, sunflower
5. Application of herbicide and study of weed control experiments
6. Study the yield contributing characters rabi crops. Yield and quality analysis of Sugarcane
7. Crop distribution in the state and the region; Important agronomic experiments of rabi crops and visit to research stations related to rabi crops.
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| **TextBooks** |
| 1 | Hand book of Agriculture, ICAR Publication, 6th edition. |
| 2 | Chhida Singh, Prem Singh and Rajbir Singh Modern Techniques of raising field crops, 2nd edition. |
| 3 | Rajendra Prasad Field Crops. |
| 4 | Reddy SR Principles of Agronomy Kalyani Publishers Third edition. |
| 5 | Fageria MS Vegetable Crop Production, Kalyani Publishers. |
| 6 | Syamal MM Production Technology of Medicinal and Aromatic plants |

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|  | **Referencebooks** |
| **RelatedOnlineContents[MOOC,SWAYAM,NPTEL,Websitesetc.]** |
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| **MappingwithProgrammeOutcomes** |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | S | S | M | M | M | M | M | S | S |
| **CO2** | M | S | S | M | S | S | M | M | M | S |
| **CO3** | S | S | S | M | M | S | M | M | S | S |
| **CO4** | M | S | S | M | M | S | S | S | S | S |
| **CO5** | S | M | S | M | M | M | M | S | S | M |

\***S**-Strong;**M**-Medium;**L**-Low

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| **Course code** |  | **CULTIVATION AND MANAGEMENT OF CASH CROPS & PLANTATION CROPS** | **L** | **T** | **P** | **C** |
| **Core/Elective/Supportive** | **Core paper-III** | **75** |  |  | **4** |
| **Pre-requisite** | **Basic knowledgeaboutstructureandfunctionof****cellorganelle,cellcycleandinstrumentationgainedinStdXII** |  |  |
| **CourseObjectives:** |
| Themainobjectivesofthiscourseare:* To learn the difference of plantation crops from other agricultural crops
* To study the biology and agro practices of various plantation crops
* To acquire the skills from establishment to management of various types of plantation
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| **ExpectedCourseOutcomes:** |
| Onthesuccessfulcompletionofthecourse,studentsareableto: |
| 1 | Learned the basic steps involved in establishment and maintenance of selected plantation crops. | K1 |
| 2 | Acquired skills in seed selection, sowing, pruning, tapping and shade management methods . | K2 |
| 3 | Trained in monitoring and maintenance of irrigation, fertilizing and crop growth. | K3 |
| 4 | Learned the harvest methods and processing of plant produce | K3 |
| 5 | Learned about the plantation spices | K4 |
| **K1**-Remember;**K2** -Understand;**K3** -Apply;**K4**-Analyze; **K5**-Evaluate;**K6**-Create |
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| **Unit:1** | **Introduction about plantation crops** | **20hours** |
| Introduction to plantation crops; definition, types of plantation crops, Tamilnadu and Indian scenario, topography, Yield gap, commercial Importance. |
| **Unit:2** | **Plantation of Tea, Coffee and Cocoa** | **15hours** |
| Plantation of Tea, Coffee and Cocoa: Botany of the species, Climate and soil requirement, varieties, planting and plantation establishment, shade management, pruning, manuring, irrigation, plant protection, harvesting and processing, yield |
| **Unit:3** | **Plantation of Banana, Coconuts and Arecanut** | **15hours** |
| Plantation of banana, coconuts and arecanut: Introduction, climate and soil requirement, propagation, planting, establishment of plantation, manuring, pest management, plant protection, harvest and yield. |
| **Unit:4** | **Plantation of Rubber and oil palm** | **15hours** |
| Plantation of Rubber and oil palm : Botany of the species, Climate and soil requirement, propagation and plantation establishment, tapping, pruning, plant protection, harvest, processing and yield. |

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| **Unit:5** | **Plantation of Cashew and Spice** | **10hours** |
| Plantation of Cashew and spice : Introduction, climate and soil requirement, propagation and plantation establishment, tapping, pruning, plant protection, harvest, processing and yield. |
|  | **Total Lecturehours** | **75hours** |
| **Practicals:** |
| Cultivation of various plantation crops may be carried out in model farms inside the campus or outstation studies carried out in nearby plantation farms /estates.1. Steps involved in land preparation for various plantation crops in .
2. Seed/ Saplings/ Propagule selection procedure
3. Seed sowing and establishment of plantation
4. Type of irrigation and fertilizing employed for each plantation crop.
5. Tapping, pruning, shade management methods.
6. Harvesting and processing yield.
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| **TextBooks** |
| 1 | Hayes, W. B. Fruit Growing in India. Kitab Publishing Co., Allahabad.  |
| 2 | Shanmugavelu, K. G. Production Technology of Fruit Crops, SBA Publishers |
| 3 | Singh, Ranjeet. Fruits. National Book Trust Ltd., New Delhi.  |
| 4 | Sham Singh. Fruit Growing. Kalyani Publishers, New Delhi.  |
| 5 | Bose, T. K. and S. K. Mitra. Propagation of Tropical and Subtropical Horticultural |
| 6 | Crops, NayaUdyog, 206, BidhanSavani, Kolkatta-700016.  |
|  | **Referencebooks** |
| 1 | Baker, H. Fruits. Mitchell Meagrely Publications, London.  |
| 2 | Singh, A. Fruit Production and Technology. Kalyani Publishers, New Delhi.  |
| 3 | Yadav, P. K. Fruit Production Technology. International Book Distributing Co., Division, Lucknow, Inida. . |
| 4 | Sharma, R. R. Fruit Production Problems and Solutions. International Book Distributing Co., Division, Lucknow, India. |
| 5 | Kumar, P. Management of Horticultural Crops. (HortSciene Series Vol. 11, New India Publishing Agency, NIPA). Kumar, P. Management of Horticultural Crops. (HortSciene Series Vol. 11, New India Publishing Agency, NIPA). |
| 6 | Kunte, Y. N, Kawthalkar, M. P., Yawalkar, K.S. Principles of Horticulture and Fruit growing, Agro-Horticultural Pub.House, Nagpur |
| 7 | Textbook of Production Technology for Fruits & Plantation Crops  B.GChhipa, R.S Rathore, 2018. |
| 8 | Crop production manual A guide to fruit and vegetable production in the Federated States of Micronesia - Compiled by Sayed Mohammad Naim Khalid, 2020. |
| **RelatedOnlineContents[MOOC,SWAYAM,NPTEL,Websitesetc.]** |
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| **MappingwithProgrammeOutcomes** |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | M | S | S | M | S | S | M | M |
| **CO2** | S | S | M | M | S | S | S | S | M | M |
| **CO3** | S | M | M | S | S | M | S | S | M | M |
| **CO4** | S | S | S | S | S | S | S | S | S | M |
| **CO5** | S | S | S | S | S | S | S | S | S | M |

\***S**-Strong;**M**-Medium;**L**-Low

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| **coursecode** |  | **AGRO PRACTICES (IRRIGATION, MAINTENANCE OF SOIL****FERTILITY AND NUTRIENT STATUS)** | **L** | **T** | **P** | **C** |
| **Core/Elective/Supportive** | **Corepaper-IV** | **75** |  |  | **4** |
| **Pre-requisite** | **Basicknowledgeinunderstanding soil water-plant relationship. Knowledge in types of irrigation methods. Knowledge in the strategies to maintain soil fertility.** |  |  |
| **CourseObjectives:** |
| Themainobjectivesofthis courseare:* To understand soil water- plant relationship importance of irrigation
* To learn various types of irrigation methods, design, components, cost, care and maintenance
* To study the role of macro and micronutrients in plant growth
* To learn the strategies to maintain the soil fertility and productivity.
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| **ExpectedCourseOutcomes:** |
| Onthesuccessfulcompletionofthecourse,studentsareableto: |
| 1 | GainknowledgeaboutIrrigation. | K1 |
| 2 | Learned the types, design, cost, components of irrigation system. | K2 |
| 3 | Gained knowledge on role of different nutrients in maintaining soil fertility and productivity | K5 |
| 4 | Figureout the evaluation methods of soil fertility | K2 |
| 5 | Acquired skills in determining amount and application of manures and fertilizers | K4 |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4**-Analyze; **K5**-Evaluate;**K6**–Create |
| **Unit:1** | **Introduction on Irrigation** | **20hours** |
| Introduction, Irrigation in Indian agriculture and present status, Water budget of India, Water resources and their development, Sources of water for crop plants. Importance of Irrigation- Soil, water, plant relationship. |
| **Unit:2** | **Methods of Irrigation** | **20hours** |
| Measurement of soil moisture, methods for measurement of irrigation water, Infiltration and its measurement, Water requirement of important crops, Different irrigation methods (design, components, maintenance of surface, sub-surface and pressurized irrigation methods). |
| **Unit:3** | **Soil fertility and productivity** | **10hours** |
| Soil fertility and soil productivity: Essential nutrient elements and functions, deficiency symptoms. Mechanism of Nutrient transport / uptake to plants and nutrient availability. Role of microorganisms in organic matter decomposition and humus formation, importance of C:N ratio and pH in plant nutrition. Integrated plant nutrient management |
| **Unit:4** | **Soil fertility evaluation methods** | **15hours** |
| Soil fertility evaluation methods. Critical levels of different nutrients and hidden hunger in soil. DRIS Approach, critical limit approach,. Manures and fertilizer classification and manufacturing process. . NPK fertilizers: composition and application methodology, deficiency symptom by visual diagnosis |

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| **Unit:5** | **Application of Manures and Fertilizers** | **10hours** |
| Secondary & Micronutrient fertilizers their types, composition, reaction in soil and effect on crop growth. Fertilizer control order. Plant nutrient toxicity symptoms and remedial measures. Biofertilizers. Nutrients use efficiency (NUE) and management. Effect of potential toxic elements in soil and plant. |
| **TotalLecturehours** | **75hours** |
| **Practicals:** |
| 1. Determination of bulk density of soil, soil moisture and soil water potential.
2. Measurement of irrigation water by weirs, orifice and flumes.
3. Study of different methods of irrigation.
4. Visit to different pressurized irrigation system manufacturers.
5. Determination of organic matter from compost / FYM /oil cake (Ignition method)
6. Determination of soil Micronutrients
7. Determination of Lime requirement of Problem soils (SMP buffer method)
8. Fertilizer Adulteration test / Identification of Adulteration in fertilizer / Detection of adulteration in fertilizers (Rapid test)
9. Determination of total nitrogen from FYM / Compost / oilseed cake and C : N ratio (By Kjeldahl method)
10. Use of soil testing kit and Use of leaf colour chart for nutrient deficiency diagnosis
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| **TextBooks** |
| 1 | Kanwar, J. S. Soil Fertility-Theory and Practice. Published by ICAR, New Delhi.  |
| 2 | Tisdale, S.L., W.L. Nelson, J.D. Beaton and J.L. Havlin, Soil Fertility and Fertilizers, Published by Prentice - Hall of India, Ltd., New Delhi |
| 3 | Brady, N. C. and Ray R. Well.The Nature and Properties of Soils.Pearson Education (Singapore) Pvt. Ltd. Indian Branch, 482 F.I.E., New Delhi |
| 4 | Purohit, S.S. and DushyentGehlot. Trends in Organic Farming in India. AGROBIOS Agro House, Behind Nasrani Cinema, Chopasani Road, Jodhapur |
| 5 | Acharya, C.L., P.K. Ghosh and A. SubbaRao. Indigenous Nutrient Management  |

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|  | **ReferenceBooks** |
| 1 | Practices-Wisdom alive in India – 2001. Indian Institute of Soil Science, Nabibagh, Berasia Road, Bhopal.  |
| 2 | More, S.D., K.G. Kachhave, A.S. Dhawan and V.D. Patil. Organic Farming, Issues and Strategies. Atul Book Agency, Pune  |
| 3 | Michael, A.M. Irrigation: Theory and Practice. Vikas Publishing House Pvt. Ltd., Delhi.  |
| 4 | Murthy, V. V. N. Land and Water Management. Kalyani Publishers, Ludhiana.  |
| 5 | Michael, A.M. and T.P. Ojha. Principles of Agricultural Engineering. Vol. II, Jain Brothers, Jodhpur.  |
| 6 | Shivnappan, R.K. Sprinkler Irrigation. Oxford IBM Publishing Co. Pvt.Ltd., New Delhi.  |
| 7 | Shivnappan, R. K. Drip Irrigation. Keerti Publishers House, Trivandraum |
| 8 | RadheyLal. Irrigation Hydraulics. SarojPrakashan, Allahabad. |
| **RelatedOnlineContents[MOOC,SWAYAM,NPTEL,Websitesetc.]** |
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| **MappingwithProgrammeOutcomes** |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | S | M | S | M | M | M | S | S |
| **CO2** | S | S | M | M | M | S | M | M | M | M |
| **CO3** | M | M | S | M | S | M | S | M | S | S |
| **CO4** | S | S | S | M | M | M | S | S | S | S |
| **CO5** | S | S | S | M | M | M | S | S | S | S |

\***S**-Strong;**M**-Medium;**L**-Low

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| **Coursecode** |  | **PLANT GENETICS, BREEDING AND BIOSTATISTICS** | **L** | **T** | **P** | **C** |
| **Core/Elective/Supportive** | **Corepaper-V** | **75** |  |  | **4** |
| **Pre-requisite** | **Basicknowledgegained in Plant genetics. Knowledge inbreeding and biostatistics****.** |  |  |
| **CourseObjectives:** |
| Themain objectivesofthiscourseare:1. Tolearn Mendelian Inheritance and type of cross
2. TounderstandLinkages and crossing over
3. To get thorough knowledge plant genetics and breeding
 |
| **ExpectedCourseOutcomes:** |
| Onthesuccessfulcompletionofthecourse,studentareableto: |
| 1 | Getathoroughknowledgeofinheritances and cross | K1 |
| 2 | KnowaboutLinkages and crossing over | K2 |
| 3 | Understand thedescriptivecharactersPlant genetics, structure, function and genetic code | K3 |
| 4 | Understand theconcept of plant breeding | K3 |
| 5 | Understand theBiostatistics Data, Types and methods of collection of Data, Sampling techniques and various tests | K3 |
| **K1**-Remember;**K2** -Understand;**K3** -Apply;**K4**-Analyze; **K5**-Evaluate;**K6**-Create |
| **Unit:1** | **Mendelian Inheritance and type of cross** | **15hours** |
| Mendelian inheritance, Monohybrid and Dihybrid cross, Test cross, Back cross, Incomplete dominance, Gene Interaction (Complementary, Supplementary, Duplicate and Inhibitory), Polygenic inheritance. |
| **Unit:2** | **Linkages and crossing over** | **15hours** |
| Linkages and crossing over Multiples alleles - Blood groups in man, Mutation types, physical and Chemical Mutagens, Sex determination in plants. |
| **Unit:3** | **Plant Genetics** | **15hours** |
| Polyploidy Cytoplasmic inheritance, Population Genetics, Gene structure and function, Genetic code, DNA barcoding in plants. |
| **Unit:4** | **Plant Breeding** | **15hours** |
| Plant breeding - Objectives, Plant introduction, Selection, Hybridization, hybrid vigour, - Breeding for disease resistance. Evolution – Evolutionary theories- Lamark, Darwin, Deviris- Modern synthetic theory. |

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| **Unit:5** | **Biostatistics** | **15hours** |
| Biostatistics Data, Types and methods of collection of Data, Sampling techniques, Frequency distribution. Presentation of Data – Tabulation – Parts of Table, Types of table, Graphic representation of data- Histogram. Measures of central tendency– Arithmatic Mean, Median and Mode. Measures of dispersion – Standard Deviation and standard error. Test of significance – ChiSquare test Goodness of fit. |
| **TotalLecturehours** | **75hours** |
| **Practicals:** |
| 1. Observation of charts for Mendelian ratios, Gene interaction and Linkage – Simple Problems in genetics.
2. Simple problems in mean, median, mode and Chi square test.
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| **TextBooks** |
| 1 | Gupta, P.K. & M.S. Swaminathan. (2000). Cytology, genetics and Evolution. Rastogi Publication, Meerut. |
| 2 | Gupta, P.K. (2004). Elements of genetics. FNA 2nd Edition.  |
| 3 | Meyyan, R.P. (2000). Genetics & Evolution. Saras Publication, Nagercoil. |
| 4 | Chaudhari, H.K. (2005). Elementary principles of plant breeding (25th Ed.). Oxford & IBH Publishing Co. (P) Ltd., New Delhi. |
| 5 | Arumugam, N. (2003). Basic concepts of Biostatistics. Saras Publications, Nagarcoil.  |

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|  | **ReferenceBooks** |
| 1 | Palanichamy, S & M. Manoharan. (1994). Statistical methods for biologists. Paramount Publication, Palani. |
| 2 | Sinha, U. and Sinha, S. (1989). Cytogenetics, Plant Breeding & Evolution. Vikas Publishing House, New Delhi. |
| 3 | S.P. Gupta, S.P. (2001). Statistical methods. Sultan Chand & Sons, Educational Publishers, New Delhi |
| 4 | Verma, P.S. and Agarwal, V.K. (1999). Concepts of Evolution. S. Chand & Company Ltd., New Delhi |
| 5 | Sinnott, E.W., Dunn, L.C. and Dobshansky, J. (1958). Principles of Genetics (5th Edition) McGraw Hill Publishing Co., New York.  |
| 6 | Strickberger, M.W. (1976). Genetics (2nd Ed.). MacMillan Publishing Co. Inc., New York.  |
| 7 | Shukla, R.S. and Chandel, P.S. (1996). Cytogenetics, Evolution & Plant Breeding. S. Chand & Company Ltd., New Delhi. |
| **RelatedOnlineContents[MOOC,SWAYAM,NPTEL,Websitesetc.]** |

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| **MappingwithProgrammeOutcomes** |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | S | S | M | S | M | S | S | S |
| **CO2** | S | S | S | S | M | S | M | S | S | S |
| **CO3** | S | S | S | S | S | S | S | S | S | S |
| **CO4** | S | S | S | S | S | S | S | S | S | S |
| **CO5** | S | S | S | S | S | S | S | S | S | S |
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\***S**-Strong;**M**-Medium;**L**-Low

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| **Coursecode** |  | **FARMING TECHNOLOGY (ORGANIC AND INTEGRATED FARMING, GREEN HOUSE)** | **L** | **T** | **P** | **C** |
| **Core/Elective/Supportive** | **Corepaper-VI** | **60** |  |  | **4** |
| **Pre-requisite** | **Basicknowledgeinfarming technology. Knowledge gained in poultry and dairy barn.. Knowledge in farming systems** |  |  |
| **CourseObjectives:** |
| Themainobjectivesofthis courseare:* To learn the planning, construction and uses of farmstead and green house
* To gain the knowledge over poultry and dairy barn
* To understand the pros and cons of different farming systems like integrated and organic farming
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| **ExpectedCourseOutcomes:** |
| Onthesuccessfulcompletionofthecourse,studentareableto: |
| 1 | Trained to plan, construct and manage farmstead and green houses | K2 |
| 2 | Gained knowledge on various types of farming systems. | K2 |
| 3 | Acquired knowledge in Green House Technology | K3 |
| 4 | Gain knowledgeofFarming systems and its components. | K2 |
| 5 | Acquired skills to initiate and manage integrated farming and organic farming | K4 |
| **K1**-Remember;**K2** -Understand;**K3** -Apply;**K4**-Analyze; **K5**-Evaluate;**K6**-Create |
| **Unit:1** | **Introduction of Farmstead** | **12hours** |
| Introduction, Location, Size and arrangement of farmstead . Planning of farm residence, Septic tank, Farm house design. Farm Silo and their type. Irrigation Methods Hand watering, Flooding, Perimeter Watering, Sprinkler Irrigation, Drip Irrigation . Disposal field - Soak pit, Bore- hole latrine. Farm fencing, types, its uses |
| **Unit:2** | **Types of Dairy barn** | **12hours** |
| Animal shelter – its types, Types of dairy barn 1.Stanchion barn a) face in type b) Face out type, 2. Loose housing barn, 3. Open air barn, Milking parlour, Pen barn, Community barn. Poultry housing and their types - 1.Wire floored poultry houses, 2.Deep litter poultry houses, 3.Cage houses Brooder Houses, Poultry equipments  |
| **Unit:3** | **Green house technology** | **12hours** |
| Green house technology - History, scope and Advantages of greenhouse, Site selection, Green houseeffect.Types of greenhouses; on the basis of span, shape, glazing/covering material. se, Greenhouse orientation and Layout of greenhouse .Effect of temperature, pH, CO2, light, Ventilation. Cooling systems and Methods. Fertigation and Humidification inside greenhouse |
| **Unit:4** | **Farming systems, classification and components** | **12hours** |
| Farming systems - Definition and Scope Classification and Components. Components of Farming Systems . Integrated Farming Systems (IFS) -Advantages of IFS,4 Models for Irrigated and Rainfed situations . Cropping systems – Introduction and Types, Indices for Evaluation of Cropping Systems |

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| **Unit:5** | **Organic Farming** | **12hours** |
| Organic farming – Definition and Principles .Benefits and constraints of organic farming , 8 Components of organic farming .Sustainable agriculture - definition, goal and current concepts Precision farming- importance and scope. Factors affecting ecological balance and ameliorative measures. |
|  | **TotalLecturehours** | **60hours** |
| **Practicals:**1. Study of Furrow Openers, Seed cum Fertilizer drill
2. Study of Repairs, Maintenance and Operation of Tractor and Power Tiller
3. Study of Farm Fencing & Its Types
4. Study of Planning and cost estimation of Greenhouse types, Irrigation , Cooling Systems & Ventilation of Green Houses
5. Preparation of integrated farming system model for wetlands and dry lands
6. Preparation of enriched farmyard manure, vermi-compost
7. Study of profitable utilization of agricultural wastes
8. Pre-cooling, grading, packaging and storage of fruits and vegetables.
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| **TextBooks** |
| 1 | A. M. Michael, and T. P. Ojha Principles of Agricultural Engineering.. Vol. I, Jain Brothers., New Delhi |
| 2 | Sawant B.P., Potekar J. M. and H. W. Awari. A text book of Greenhouse and Post Harvest Technology. Nikita Publication, Latur |
| 3 | P. V. Nelson.Green House Operation and Management. Reston Pub. Co. Inc. Apprentice Hall Co. Reston, Virginia |
| 4 | K. RadhaManohar, and C. Igathinathane, Greenhouse – Technology & Management. Publications, Hyderabad |
| 5 | Tiwari, GN. and R. Green House Technology – Fundamentals, Design, Modelling and Application..K. Goyal. Naroso Publishing Co. Bombay |
| 6 | B.N. and Maiti S. 1984 Cropping systems - Theory and practice. Chatterjee. Oxford and IBH Publishing Co., Calcutta, India |

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|  | **ReferenceBooks** |
| 1 | Palanniappan S.P. Cropping systems in tropics – Principles and practices –1985. Willey Eastern Ltd., New Delhi |
| 2 | Panda S.G. Soil management and organic farming. 2006. AGROBIOS, New Delhi |
| 3 | Thapa U. and TripathiP Organic Farming , . 2006. Organic Farming in India, Problems and Prospect |
| 4 | K Palanippan S.P. and Anandurai Organic Farming – theory and practice, 1999. Scientific Publishers, Jodhpur.  |

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| **RelatedOnlineContents[MOOC,SWAYAM,NPTEL,Websitesetc.]** |
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| **MappingwithProgrammeOutcomes** |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | S | S | S | S | S | S | S | S |
| **CO2** | S | S | S | S | S | S | S | S | S | S |
| **CO3** | S | S | S | S | S | S | S | S | S | S |
| **CO4** | S | S | S | S | S | S | S | S | S | S |
| **CO5** | S | S | S | S | S | S | S | S | S | S |

\***S**-Strong;**M**-Medium;**L**-Low

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| **Coursecode** |  | **POST – HARVEST TECHNOLOGY** | **L** | **T** | **P** | **C** |
| **Core/Elective/Supportive** | **Corepaper-VII** | **60** |  |  | **4** |
| **Pre-requisite** | **Basic knowledge in post-harvest technology. Knowledge gained in overcoming the problems occurring in harvesting, threshing. Learned the techniques to increase the horticultural produce** |  |  |
| **CourseObjectives:** |
| Themainobjectivesofthiscourseare:* To understand the importance of Post-harvest technology to overcome problems occurring in harvesting, threshing, transport drying, milling and marketing.
* To learn the methods, significance of drying grain for storage
* To acquire skills in cleaning, sorting, grading, separation and milling of agricultural produce.
* To learn the techniques to increase the shelf life of horticultural produce
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| **ExpectedCourseOutcomes:** |
| Onthesuccessfulcompletionofthecourse,studentsareableto: |
| 1 | Gained the knowledge and skills of post harvest technology of agricultural and horticultural produce. | K2 |
| 2 | Learned to utilize various equipments used for drying, sorting, grading and milling of agricultural produce. | K2 |
| 3 | Acquired scientific knowledge and methods to increase the shelf life of fruits and vegetables | K4 |
| 4 | Learned techniques of preservation of fruits and vegetables  | K3 |
| 5 | Trained to prepare jams, squash, pickles, syrups, ketchups and jellies | K3 |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4**-Analyze; **K5**-Evaluate;**K6** -Create |
|  |
| **Unit:1** | **Importance of Post Harvest Technology** | **12hours** |
| Importance of Post Harvest Technology, Unit Operations in grain processing, Problems occurring during harvesting, threshing, transport, drying, milling and milling & marketing. Moisture Content and its measurement, Drying and its importance: Methods of grain drying, Thin layer and deep bed drying, Grain dryers,Equilibrium moisture content. |
| **Unit:2** | **Storage Structures** | **12hours** |
| Food grain storage structures Bulk and Bag storage structures -Types of storage structures: a) Traditional storage structures- Morai type, Bukhari type, Kothar type, Grain bins- Cylindrical, Rectangular bins b) Improved storage structures – Pusa bin, PuccaKothi, Metal bins • Bag storage structure& design |
| **Unit:3** | **Equipments Cleaning, Milling** | **12hours** |
| Cleaning – Equipments for cleaning; cleaning, grading, sorting .Types of Screen openings, Cleaning equipments .Grading and Separation equipment. Milling ;Size reduction procedure, Size reduction Machinery. Milling of paddy - Types of rice milling machinery. Technology of parboiling of paddy Principles of parboiling. Principles of refrigeration and cold storage .Oil expression and extraction. |
| **Unit:4** | **Harvesting Horticultural produce** | **12hours** |
| Horticultural produce: Maturity, harvesting and handling in relation to extended shelf-life and storage quality of fruits, vegetables and flowers-Maturity and harvesting indices,Factors responsible for maturity, ripening and deterioration of horticultural produce.Methods used for harvesting and post-harvest treatment for delaying ripening. |
| **Unit:5** | **Packaging and storing** | **12hours** |
| Packaging and storing:Respiration and transpiration rate during packaging and storage.Methods of pre -cooling, grading. Methods of packaging, storage and transport of fruits, vegetables and flowers. Importance and scope of fruits and vegetable preservation. Principles and methods of preservation of fruits and vegetables. |
| **TotalLecturehours** | **60hours** |
| **Practicals:** |
| Pre-harvest and post-harvest application of chemical substances.10. Harvesting, packaging, storage and marketing of cut flowers11. Canning of fruits and vegetables- preparation jam, squash, juice, syrup, pickles etc.,Pre-harvest and post-harvest application of chemical substances.10. Harvesting, packaging, storage and marketing of cut flowers11. Canning of fruits and vegetables- preparation jam, squash, juice, syrup, pickles etc.,Pre-harvest and post-harvest application of chemical substances.10. Harvesting, packaging, storage and marketing of cut flowers11. Canning of fruits and vegetables- preparation jam, squash, juice, syrup, pickles etc.,Pre-harvest and post-harvest application of chemical substances.10. Harvesting, packaging, storage and marketing of cut flowers11. Canning of fruits and vegetables- preparation jam, squash, juice, syrup, pickles etc.,Pre-harvest and post-harvest application of chemical substances.10. Harvesting, packaging, storage and marketing of cut flowers11. Canning of fruits and vegetables- preparation jam, squash, juice, syrup, pickles etc.,Pre-harvest and post-harvest application of chemical substances.10. Harvesting, packaging, storage and marketing of cut flowers11. Canning of fruits and vegetables- preparation jam, squash, juice, syrup, pickles etc.,Pre-harvest and post-harvest application of chemical substances.10. Harvesting, packaging, storage and marketing of cut flowers11. Canning of fruits and vegetables- preparation jam, squash, juice, syrup, pickles etc., Pre-harvest and post-harvest application of chemical substances.10. Harvesting, packaging, storage and marketing of cut flowers11. Canning of fruits and vegetables- preparation jam, squash, juice, syrup, pickles etc.,1. Pre-harvest and post-harvest application of chemical substances.
2. Harvesting, packaging, storage and marketing of cut flowers
3. Canning of fruits and vegetables- preparation jam, squash, juice, syrup, pickles etc.,
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| **TextBooks** |
| 1 | K. M. Sahay and K. K. SinghUnit Operations of Agricultural Processing. Vikas Publishing House Pvt. Ltd., New Delhi. |
| 2 | M. Michael & T. P. Ojha. Principles of Agricultural EngineeringVol. I, Farm Power & Machinery, Farm Buildings and Post harvest technology. Jain Brothers., Jodhapur |
| 3 | A. Chakravarty Post Harvest Technology of Cereals, Pulses and Oilseeds.. Oxford and IBH, Publishing Com. Pvt. Ltd., New Delhi. |
| 4 | G.A. Henderson and R.C. Perry Agricultural Processing Engineering.. AVI Publishing Co. West-Port, Connecticut, USA |
| 5 | C.W. Hall. Mohan Makhijani Drying Farm Crops. atRekha Printers, New Delhi. |
| 6 | Sawant B.P., Potekar J. M. and H. W. Awari.A text book of Greenhouse and Post Harvest Technology. Nikita Publication, Latur |

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|  | **ReferenceBooks** |
| 1 | Pantastico, E. R., B. Post Harvest Technology, Handling, Utilization of Tropical and Sub-tropical Fruits and Vegetables. The AVI Publishing Co.,West-Post, Connecticut, USA. |
| 2 | Salunke, D. K. and Desai, B. B. Post Harvest Biotechnology of Vegetables. II CRC Press, Boca Raton, Florida |
| 3 | Kader, A. A. Post Harvest Technology of Horticultural Crops. Publication Co. 3311, University of California, Division of Agricultural and Natural Resources, California |
| 4 | Varma, L. R. and V. K. Joshi. Post Harvest Technology of Fruits and Vegetables, Vol. II. Indus Publishing Company, New Delhi-110 027 |
| 5 | Shrivastva, R.D and Kumar Sanjeev. Fruits and Vegetables( Principle and Practices). 3 rd Edition.  |
| 6 | Saraswathy.S,T.L.Preethi,S.Natarajan.Post Harvest Management of Horticultural Crops.AGROBIOS (INDIA). |
| 7 | Chadda .K.L. Handbook of Horticulture. ICAR |
| 8 | Jature,S.J, S.J Shinde and V.S.Khandare.A Text Book of Post Harvest Management &Value addition of Fruits and Vegetables ShriRajlakshmiPrakashan.Aurangabad |
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| **RelatedOnlineContents[MOOC,SWAYAM,NPTEL,Websitesetc.]** |
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| **MappingwithProgrammeOutcomes** |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | S | S | M | S | M | S | S | S |
| **CO2** | S | S | S | S | M | S | M | S | S | S |
| **CO3** | S | S | S | S | M | S | M | S | S | S |
| **CO4** | S | S | S | S | M | S | M | S | S | S |
| **CO5** | S | S | S | S | M | S | M | S | S | S |

\***S**-Strong;**M**-Medium;**L**-Low

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| **Coursecode** |  | **AGRO BASED INDUSTRIES** | **L** | **T** | **P** | **C** |
| **Core/Elective/Supportive** | **Corepaper-VIII** | **60** |  |  | **4** |
| **Pre-requisite** | **Basicknowledgeonimportance of agro-based industries. Gained knowledge in industrial process.** |  |  |
| **CourseObjectives:** |
| Themainobjectivesofthiscourseare:* To understand the importance of agro-based industries in Indian economy and employment
* To study the status and industrial process of various agro-based industries
* To learn the course of action involved in setting up of agro-based industries.
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| **ExpectedCourseOutcomes:** |
| Onthesuccessfulcompletionofthecourse,studentsareableto: |
| 1 | Gained the knowledge on the role of agro-based industries in rural and Indian economy | K1 |
| 2 | Trained in processing methods involved in various types of agro-based industries. | K2 |
| 3 | Learned the modes operanding involved in establishing a agro-based industry | K3 |
| 4 | Gained knowledge on setting up of Agro-based Industries | K2 |
| 5 | Understand Growth and modernization of Agro-based industries | K4 |
| **K1**-Remember;**K2** -Understand;**K3** -Apply;**K4**-Analyze; **K5**-Evaluate;**K6**-Create |
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| **Unit:1** | **Importance of Agro-based Industries** | **12hours** |
| Agro -based Industries Importance and Need, IMP, Need .Classification of Agro -based Industries on the various basis .Role of Agro -processing Industries in the Indian Economy and employment, Trading, EXIM. |
| **Unit:2** | **Present status of Agro-based Industries** | **12hours** |
| Agro -based Industries- Sugar Mills: Present status of sugar mills in India, Products and By Products. Cotton Ginning mills; Present status, Products and By Products Dal mills : Present status, Processing management:- Methods; Dry milling, wet milling, Rice mills : Present status, Processing, Products Fruit Processing Industries: Present status, Examples, Need and scope |
| **Unit:3** | **Processing procedures** | **12hours** |
| Soybean Processing Present status Processing Procedure Products and by products . Mango pulp processing Industry-Present status Processing Management Products and By Products . Milk Processing Present status, Production and Processing of Important value-added products.Grape wine making Industries -Present status Economic Importance Post Harvest management wine making process. |
| **Unit:4** | **Setting up of Agro-based industries** | **12hours** |
| Steps in setting up of Agro - based Industries 1) Identification of Project 2) Market Analysis 3) Technical and Organizational Analysis 4) Financial and Economic Analysis 5) Feasibility Report Preparation 6) Finance 7) Government Aid 8) Monitoring and Evaluation .Constraints in establishing agrobased industries -1) Infrastructural constraints 2) Technological constraints 3) Social and the cultural constraints 4) Resource utilization constraints . |
| **Unit:5** | **Growth and modernization of Agro-based industries** | **12hours** |
| Growth and modernization of Agro based Industries -Government Initiatives for growth, modernization and development of AgrobasedIndustries . Employment and income generation from agro based industries at macro level and overall impact in the development .Employment and income generation from Agro-processing, Forward and backward, Export, Research, Transport. Marketing of commercial crops with special reference to all marketing functions and price analysis. Commercial commodities ( cotton, sugarcane, onion, grapes, banana, citrus, mango, cut flowers –roses, gerbera, gladiolus, etc) vegetables ( cauliflower, cabbage, tomato, potato, onion, ladies finger, brinjal). Existing levels of processing and future potential. Export and export potential. |
|  | **Total Lecturehours** | **60hours** |
| **Practicals** |
| 1. Visit to Agro -Processing Industries
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| **TextBooks** |
| 1 | Srivastava, U.K. Agro-processing Strategy for Acceleration and Exports. Oxford University Press YMCA, Library Building, Jai Singh Road, New Delhi -110 001.  |
| 2 | Diwase, Smita. Agri-Business Management. Everest Publishing House, Everest Lane, 536, ShaniwarPeth, AppaBalwantChowk, Pune – 411 030. |

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|  | **ReferenceBooks** |
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| **RelatedOnlineContents[MOOC,SWAYAM,NPTEL,Websitesetc.]** |
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| **MappingwithProgrammeOutcomes** |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | S | S | S | M | S | S | S | S |
| **CO2** | S | S | M | S | S | M | S | S | S | S |
| **CO3** | S | S | S | S | S | S | S | S | S | M |
| **CO4** | S | S | M | S | S | S | S | S | S | S |
| **CO5** | S | S | S | S | S | S | S | S | S | M |

\***S**-Strong;**M**-Medium;**L**-Low

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| **Coursecode** |  | **FUNDAMENTALS OF AGROECONOMICS AND TRADING** | **L** | **T** | **P** | **C** |
| **Core/Elective/Supportive** | **Corepaper-IX** | **75** |  |  | **4** |
| **Pre-requisite** | **Basic knowledge in micro and macroeconomics. Gained the knowledge of marketing and selling.** |  |  |
| **CourseObjectives:** |
| Themainobjectivesofthiscourseare:* Understanding the fundamentals of micro and macroeconomics.
* To learn the differences and functioning of marketing and selling
* To train in marketing management
* To study the various market legislation, rural marketing and agricultural marketing.
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| **ExpectedCourseOutcomes:** |
| Onthesuccessfulcompletionofthecourse,studentsareableto: |
| 1 | Gained knowledge on the basics of micro and macroeconomics, their importance and application. | K1 |
| 2 | Acquired skills in marketing management | K2 |
| 3 | Trained in trade practices of rural marketing and agricultural marketing. | K3 |
| 4 | Learnon rural marketing | K4 |
| 5 | Knowabout study of agricultural marketing | K2 |
| **K1**-Remember;**K2** -Understand;**K3** -Apply;**K4**-Analyze; **K5**-Evaluate;**K6**-Create |
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| **Unit:1** | **Significance of Micro and Macro Economics** | **15hours** |
| Nature and significance of Micro and Macro Economics-Subject matter, Definition, Importance or utility and limitations of Micro and Macro economics. Utility function: Marginal Utility Analysis, Indifference curve; Budget line, Marginal rate of substitution, Consumer’s equilibrium. Theory of demand and supply |
| **Unit:2** | **Marketing Management** | **15hours** |
| Marketing management - Meaning, definition of marketing, marketing management & Marketing concepts .Difference between marketing and selling . Entities to be marketed in market place. Functions of marketing management. Marketing planning process. Development of marketing strategies. |
| **Unit:3** | **Market Legislations** | **15hours** |
| Evolution of market legislation. Procedures, need and scope for market legislation. Regulation of market. Growth and development of regulated markets. Review of Agricultural Produce Market Acts in India. Regulated Marked Act, 1937, Organization of regulated markets, constitution of market committee, finance of the market committee, functions of market committee. |
| **Unit:4** | **Rural Marketing** | **15hours** |
| Profile of rural marketing- definition, classification, strategies, characteristics, changing pattern of rural market, problems in rural marketing. Difference between urban and rural market. Dos and don’ts for rural marketing and rural industries. Rural segmentation - Targeting and positioning. Rural product and prices – Introduction, packing, pricing methods, rural branding. Rural distribution / channels of distribution, functions of rural sales persons |
| **Unit:5** | **Study on Marketing**  | **15hours** |
| Importance of agricultural commodities in agricultural marketing. Marketing of cereals., pulses- rice, mung . Average cost of processing paddy to rice, whole pulses in to split pulses, comparison of different rice milling methods. Study on price spread of important crops and producer’s share in consumer’s rupee. Marketing of mango, citrus and grapes. Marketing of vegetables. Improving efficiency in commodity marketing. Role of co-operative and regulated market in commodity marketing. |
|  | **Total Lecturehours** | **75hours** |

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| **TextBooks** |
| 1 | Dewett K. K., M. H. Navalur. Modern Economic Theory, S. Chand Publication, New Delhi |
| 2 | M. L. Seth. Principles of Economics, Lakshmi NarainAgarwal Educational Publishers, Agra |
| 3 | Dewett K. K.,J. D. Verma. Elementary Economic theory, S. Chand Publication, New Delhi. by S. Subba Reddy Agricultural Economics, Oxford and IBH Publ. Co. Pvt. Ltd 3) |
| 4 | Acharya, S. S. and N.L. Agrawal. Agricultural marketing in India. Oxford and IBH publishing co. Ltd. ,Janpath, New Delhi. 110 001.5 th edition |
| 5 | Mamoria, C.B. and R.L. Joshi. Principles and practices of marketing in India. KitabMahal, thorn hill road, Allahabad. |
| 6 | Panvar, J.S. Beyond consumer marketing. Response books sage publications, NewDelhi |

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|  | **ReferenceBooks** |
| 1 | RajanNijhawan, food safety and standards act 2006, rules 2011, regulations 2011. International law Book Company, church road, kashmere gate, Delhi. 12 th edition |
| 2 | Subbareddy, P. Raghu ram, Agricultural economics, oxford and IBH publishing company Pvt. Ltd. 2004 |
| 3 | Acharya, S.S. and N.L. Agrawal. Agricultural Marketing in India. Oxford and IBH Publishing company Pvt. Ltd., 66, Janpath, New Delhi 110001 |
| 4 | Mamoria, C.B. and R.L. Joshi. Principles and Practice of Marketing in India. KitabMahal, Thorn hill Road, Allahabad |
| 5 | Acharya, S.S. and N.L. Agrawal. Agricultural Marketing in India Oxford and IBH Publishing Co. Ltd., 66, Janpath, New Delhi. 110 001 |
| 6 | Mamoria, C.B. and R.L. Joshi. Principles and Practices of Marketing in India. KitabMahal, Thorn Hill Road, Allahabad |
| 7 | Panvar, J.S. Beyond Consumer Marketing. Response Books Sage Publications, New Delhi. |
| **RelatedOnlineContents[MOOC,SWAYAM,NPTEL,Websitesetc.]** |
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| **MappingwithProgrammeOutcomes** |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | S | S | S | M | S | S | S | S |
| **CO2** | S | S | M | S | S | S | S | S | S | M |
| **CO3** | S | S | S | S | S | M | S | S | S | S |
| **CO4** | S | S | M | S | S | S | S | S | S | M |
| **CO5** | S | M | S | S | S | S | S | S | S | M |

\***S**-Strong;**M**-Medium;**L**-Low

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| **Coursecode** |  | **ENTREPRENEURSHIP DEVELOPMENT AND BUSINESS MANAGEMENT** | **L** | **T** | **P** | **C** |
| **Core/Elective/Supportive** | **Corepaper-X** | **75** |  |  | **4** |
| **Pre-requisite** | **Basic knowledge in entrepreneur and entrepreneurship. Gained knowledge in entrepreneurial skills** |  |  |
| **CourseObjectives:** |
| Themainobjectivesofthis courseareto:* To learn the conceptual differences between entrepreneur and entrepreneurship.
* To get trained in entrepreneurial skills.
* To gain knowledge on various institutions involved in entrepreneurship development
* To acquire skills to establish farming as a business
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| **ExpectedCourseOutcomes:** |
| Onthesuccessfulcompletionofthecourse,studentsareableto: |
| 1 | Trained to become a entrepreneur and to establish enterprises | K2 |
| 2 | Gainedknowledgeonvariousprogrammesandinstitutionsinvolvedinentrepreneurshipdevelopment .Gained knowledge on various programmes and institutions involved in entrepreneurship development | K3 |
| 3 | Trained to institute and manage farming as a business | K3 |
| 4 | Learn about types of enterprises | K3 |
| 5 | Learnabout Agri Business Management | K4 |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4**-Analyze; **K5**-Evaluate;**K6**–Create |
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| **Unit:1** | **Concept, Characteristics of entrepreneurs** | **15hours** |
| Entrepreneur : Concept, Characteristics, functions & classification of entrepreneurs . Entrepreneurship: Concept, Role of Entrepreneurship in Economic development, Factors affecting Entrepreneurial Growth: Economic factors, Non-Economic factors, Barriers to entrepreneurship |
| **Unit:2** | **Policies, EDP** | **15hours** |
| Policies & Programmes for entrepreneurs : Small scale industrial policies, industrial policy resolution 1948,1956,1977,1980,1990,1991 .Entrepreneurial Development Programmes (EDP): Introduction, meaning, phases in entrepreneurial development, importance of EDP, objectives of EDP |
| **Unit:3** | **Institutions for Entrepreneurship Development** | **15hours** |
| Institutions for Entrepreneurship Development: Entrepreneurship Development Institute of India, National Institute for Entrepreneurship and Small Business Development, Centre for Entrepreneurship Development their objectives & Activities |

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| **Unit:4** | **Types of enterprises** | **15hours** |
| Enterprise: Concept & Definition. Types of enterprises, difference between small & large enterprises Small scale enterprises: Steps in setting up small scale enterprises, role of small scale enterprises in economic development |
| **Unit:5** | **Agri Business Management** | **15hours** |
| Agri Business Management: Meaning, definition and scope of agri – business. Importance of agri -business in Indian economy, Characteristics or features of Agri-business constraints in agri business management. Farming as a business : Characteristics of farming . |
|  | **Total Lecturehours** | **75hours** |
| **Practicals:** |
| 1. Study of Law of Demand and Supply.
2. Study of agriculture marketing and marketing strategies
3. Study of stages of PLC.
4. Study of Marketing Cost, Price and Margin, Price for any two agro-based products.
5. Study of Steps in Entrepreneurship
6. Identification and selection of business idea
7. Preparation of business plan
8. Visit to Entrepreneurship development Institute.
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| **TextBooks** |
| 1 | V. Gangadhar et al. Entrepreneurship Development.Kalyani Publishers, Ludhiana |
| 2 | J.M. talathi et al. Introduction to Agricultural Economics & Agribusiness Management. Ane Books Pvt.Ltd. New Delhi  |
| 3 | Ellis, R.S., Educational Psychology. D.N. Van No Strand Co. Inc. New York.  |
| 4 | Entrepreneurship Development Institute of India (1987), Developing New Entrepreneurs, EDIT, Ahmedabad, NISIET. Library : 338-93/EDI/87/25104 |
|  | **Referencebooks** |
| 1 | Khanka S.S. (2001), Entrepreneurial Development chand and company Ltd, 7361, Ramnagar, New Delhi – 110055 |
| 2 | Vasant Desai (2004), Dynamics of Entrepreneurial Development and Management.  |
| 3 | Agarwal R.C. Fundamentals of Entrepreneurship |
| 4 | Akhouri, M.M., P. Mishra S.P. and Sengupta, Ritha (1989). Trainers manual on developing entrepreneurial motivation, NIESBUD, NEW Delhi.  |
|  | Entrepreneurship Development Institute of India (1987), Developing New Entrepreneurs, EDIT, Ahmedabad, NISIET. Library : 338-93/EDI/87/25104.  |
|  | Betty Gordan B (1979). Entrepreneurship, playing to win. Taraporewala, Bombay.  |
|  | Mancuso Joseph (1974). The entrepreneurs handbook (1st and 2nd). Arteck House.INC, USA  |
|  | Singh A.K., Lakhansingh, R.RoyBurman (2006). Dimensions of Agricultural Extension. Aman publishing House, Meerut.  |
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| **RelatedOnlineContents[MOOC,SWAYAM,NPTEL,Websitesetc.]** |
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| **MappingwithProgrammeOutcomes** |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | S | M | M | S | S | S | S | S |
| **CO2** | S | S | S | M | M | S | S | S | S | S |
| **CO3** | S | S | S | M | S | S | S | S | S | S |
| **CO4** | S | S | S | S | S | S | S | S | S | S |
| **CO5** | S | S | S | S | S | S | S | S | S | S |

\***S**-Strong;**M**-Medium;**L**-Low

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| **Coursecode** |  | **SKILLEDBASEDSUBJECT** | **L** | **T** | **P** | **C** |
| **Core/Elective/Supportive** | **PAPER-1-MUSHROOM CULTIVATION** | **45** |  |  | **3** |
| **Pre-requisite** | **Basic Knowledge gained in Mushroom Cultivation** |  |  |
| **CourseObjectives:** |
| Themainobjectivesofthiscourseare:Indentify business opportunities in chosen sector / sub-sector and plan and market and sell products /servicesIndentify business opportunities in chosen sector / sub-sector and plan and market and sell products /services•Work out the economics of Mushroom CultivationIndentify business opportunities in chosen sector / sub-sector and plan and market and sell products /services•Work out the economics of Mushroom Cultivation•Indentify business opportunities in chosen sector / sub-sector and plan and market and sell products /services•Work out the economics of Mushroom Cultivation•Indentify business opportunities in chosen sector / sub-sector and plan and market and sell products /services•Work out the economics of Mushroom CultivationIndentify business opportunities in chosen sector / sub-sector and plan and market and sell products /services•Work out the economics of Mushroom CultivationUnitndentify business opportunities in chosen sector / sub-sector and plan and market and sell products /services1. Identify business opportunities in chosen sector / sub-sector and plan and market and sell products / services
2. Work out the economics of Mushroom Cultivation
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| **ExpectedCourseOutcomes:** |
| Onthesuccessfulcompletionofthecourse,studentsareableto: |
| 1 | Gained knowledge in identification of edible mushrooms | K1 |
| 2 | Learn about Preparation of media, Isolation, spawn and packing | K2 |
| 3 | Knowledge in purchase of chemicals, containers and raw materials for mushroom bed preparation | K3 |
| 4 | Learn about Pest and Disease management | K4 |
| 5 | Preparation of spawn of Coirpith composting | K5 |
| 6 | Marketing Coirpith compost | K6 |
| **K1**–Remember; **K2**–Understand; **K3**–Apply;**K4**–Analyze;**K5**–Evaluate;**K6**–Create |
|  |
| **Unit:1** | **Familiarization of Mushrooms** | **09hours** |
| Introduction to the world of mushrooms - Familiarization of different edible mushrooms, poisonous, hallucinogenic and medicinal mushrooms  |
| **Unit:2** | **Preparation of media, Isolation, spawn and packing** | **09hours** |
| Preparation of solid and liquid media -Isolation and pure culturing - Preparation of spawn (mother spawn and commercial spawn) - Inoculation of spawn and incubation - Different types of spawn and packing - Collection and cultivation of different mushrooms (Pleurotus, Calocybe, Volvariella,)  |
| **Unit:3** | **Purchase of chemicals and raw materials** | **09hours** |
| Purchase of chemicals, containers and raw materials for sterilization - Sterilization of substrates for bed preparation - Oyster mushroom bed preparation using different substrates - Milky mushroom bed preparation - Preparation of casing materials and casing of laid out beds |
| **Unit:4** | **Pest and Disease Management** | **09hours** |
| After care of mushrooms – pest and disease management - Mushroom house design -Harvesting, packaging and marketing mushrooms and mushroom products - Processing of harvested mushrooms and value addition  |
| **Unit:5** | **Coirpith composting** | **09hours** |
| Preparation of spawn for coirpith composting - Procuring coirpith from nearby centres -Composting of coirpith -Packing of coirpith compost - Marketing of coirpith compost - Visit on mushroom enterprises for familiarisation of activities, Evaluation, Practical Examination |
| **Practicals** |

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| 1. Morphology and identification of local mushroom Flora and preserved specimen of mushroom
2. Study of different species of mushrooms.
3. Diagrammatic study of life cycle of typical mushroom
 |
|  | **TotalLecturehours** | **45hours** |
| **TextBooks** |
| 1 | Advances in Horticulture Vol. XIII Chadha, K. L. & Sharma, S. R. 2001.Malhothra Publication House, New Delhi.  |
| 2 | Ahlawat O.P. and Tewari R.P. 2007. Cultivation technology of paddy straw mushroom (Volvariellavolvacea) Technical Bulletin- National Research Centre for Mushroom (Indian Council of Agricultural Research) Chambaghat, Solan-173 213, HP |
| 3 | Chadha K L & Sharma S R. 2001.Advances in Horticulture (Mushroom). Vol. XIII. Malhotra Publ. House, New Delhi |
| 4 | Chang S T & Hayes W A. 1997.The Biology and Cultivation of Edible Mushrooms. Academic Press, New York.  |

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|  | **Referencebooks** |
| 1 | Chang S T & Miles P G. 2002.Edible Mushrooms and their Cultivation. CRC Press, Florida |
| 2 | Dhar B L. 2005. Cultivation Technology of High Temperature Tolerant White Button Mushroom. DIPA, ICAR, New Delhi |
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| **RelatedOnlineContents[MOOC,SWAYAM,NPTEL,Websitesetc.]** |
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| **MappingwithProgrammeOutcomes** |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | S | M | S | S | M | M | S | M |
| **CO2** | S | M | M | S | S | S | M | M | S | S |
| **CO3** | S | M | M | S | S | M | S | M | M | M |
| **CO4** | S | S | S | M | M | S | S | M | S | S |
| **CO5** | S | S | S | S | M | S | M | S | S | S |

\***S**-Strong;**M**-Medium;**L**-Low

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| **Coursecode** | **SKILLBASEDSUBJECT** | **L** | **T** | **P** | **C** |
| **Core/Elective/Supportive** | **PAPER-II****ORNAMENTAL HORTICULTURE AND LAND SCAPE GARDENING** | **45** |  |  | **3** |
| **Pre-requisite** | **BasicKnowledgeonornamental horticulture and landscape gardening** |  |  |
| **CourseObjectives:**Themainobjectivesofthiscourseare:1. Familiarization with principles and practices of landscaping and ornamental gardening.
2. Landscape designs, its principles and practices of landscaping and ornamental Gardening structure, features.
 |
| **ExpectedCourseOutcomes:** |
| Onthesuccessfulcompletionofthecourse,studentsareableto: |
| 1 | Learnabout Importance of Ornamental Horticulture | K2 |
| 2 | Establishment of orchards | K6 |
| 3 | Knowabout lawn making and maintenance | K6 |
| 4 | AcquireknowledgeaboutIndoor Gardening | K2 |
| 5 | Implementtheknowledgeon Principles of pruning and systems of training of fruit plants and rejuvenation of orchards | K3 |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4**-Analyze; **K5**-Evaluate;**K6**–Create |
| **Unit:1** | **Importance of Ornamental Horticulture** | **09Hours** |
| Importance and scope of ornamental horticulture in India - Botanical classification of fruits. -Cultivation of annuals- Commercial cultivation of rose, canna, Chrysanthemum, marigold and Gladiolus |
| **Unit:2** | **Establishment of orchards** | **09Hours** |
| Establishment of orchards; Selection of site, systems of planting.- Orchard soil management. |
| **Unit:3** | **Lawn Making** | **09Hours** |
|  Making and maintenance of Lawn-Making and maintenance of Hedge and edging. - Elementary knowledge of common shrubs, climbers and trees and their various uses. |
| **Unit:4** | **Indoor Gardening** | **09Hours** |
| Indoor gardening - Styles of gardens with special reference to Mughal and Japanese gardens. - Flower arrangement and techniques to prolong vase life of flowers |
| **Unit:5** | **Fruit plants** | **09Hours** |
| Principles of pruning and systems of training of fruit plants. - Unfruitfulness - its causes and measures to overcome it. - Fruit drop - its causes and measures to control it. - Rejuvenation of orchards. - Brief studies of Polyembryony, Parthenocarpy and incompatibility |
| **PRACTICAL**1. Identification of ornamental plants.
2. Practice of making garlands, Bouquet and arrangements in vases.
3. Practice of potting and re-potting of plants.
4. Visit to ornamental gardens and research station.
 |
| **TotalLecturehours** | **45Hours** |

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| **Coursecode** |  | **SKILLBASEDSUBJECT** | **L** | **T** | **P** | **C** |
| **Core/Elective/Supportive** | **PaperIII-DAIRY PRODUCTS TECHNOLOGY** | **45** |  |  | **3** |
| **Pre-requisite** | **Basicknowledgeaboutdairy products technology** |  |  |
| **CourseObjectives:** |
| Themainobjectivesofthiscourseare:1. Prepare and maintain work area and processing machineries for production of dairy products
2. Prepare for production of dairy products
3. Supervise production of dairy products.
 |
| **ExpectedCourseOutcomes:** |
| Onthesuccessfulcompletionofthecourse,studentsareableto: |
| 1 | UnderstandMilk, Milk products, Milk by-products and its ranking | K2 |
| 2 | Learnabout Value Addition to Milk | K2 |
| 3 | StudyaboutNutritive value, legal standards and methods of manufacturing of special milk | K3 |
| 4 | OverviewofMethods of manufacturing of Acidophilus milk, yoghurt, standardized milk, reconstituted milk, recombined milk and toned milk | K4 |
| 5 | KnowabouttheMethods of manufacturing of Indigenous milk products. | K2 |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4**-Analyze; **K5**-Evaluate;**K6** -Create |
| **Unit:1** | **Milk and Milk Products** | **09hours** |
| Introduction – Milk- Milk Products- Milk by-products- Ranking wise Milk production- composition of milk (Different species) |
| **Unit:2** | **Value Addition** | **09hours** |
| Value Addition to Milk- Why process the Milk- Processing of Milk |
| **Unit:3** | **Nutritive Value and Legal standards** | **09hours** |
| Milk Products- Nutritive value, legal standards and methods of manufacturing of special milk- sterilized milk, homogenized milk, flavored milk & drink, fermented milk |
| **Unit:4** | **Manufacturing Methods of various milk and its by-products** | **09hours** |
| Methods of manufacturing of Acidophilus milk, yoghurt, standardized milk, reconstituted milk, recombined milk and toned milk |

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| **Unit:5** | **Methods of manufacturing of Indigenous milk products** | **09hours** |
| Methods of manufacturing of Indigenous milk products- paneer, chhana, ghee, khoa, dahi, cream, butter, lassi, cream, ice-cream, condensed milk, milk powder, cheese,dairy by products |
| **Practical:**1. Demonstration of preparation of flavored milk, paneer, ghee, khoa, dahi and ice-cream in laboratory.
2. Study of cost of preparation of different milk products.
3. Visit of a milk processing plants
 |
|  | **TotalLecturehours** | **45hours** |
| **TextBooks** |
| 1 | Devendra, C. and G. B. McElroy. Goat and Sheep Production in Tropics – Long man Group Ltd., London. |
| 2 | Wong, et al. Fundamentals of Dairy Chemistry. Publishers Van Nastrand Rain hold Comp. New York |
| 3 | Ling, E.R. Text Book and Dairy Chemistry. Chapman Hall Ltd., London. |
| 4 | Sukumar de Outline of Dairy Technology. |

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|  | **ReferenceBooks** |
| 1 | Dairy processing Hand book |
| **RelatedOnlineContents[MOOC,SWAYAM,NPTEL,Websitesetc.]** |
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| **MappingwithProgrammeOutcomes** |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | M | S | S | S | S | S | S | S |
| **CO2** | S | S | S | S | S | S | M | S | S | S |
| **CO3** | S | S | M | S | S | S | S | S | S | S |
| **CO4** | S | S | S | S | S | S | M | S | S | S |
| **CO5** | S | S | S | S | S | S | S | S | S | S |

\***S**-Strong;**M**-Medium;**L**-Low

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| **Coursecode** | **ELECTIVEI** | **L** | **T** | **P** | **C** |
| **Core/Elective/Supportive** | **A.AGRICULTURAL INFORMATICS** | **60** | **-** | **-** | **4** |
| **Pre-requisite** | **Basicknowledgeoncomputer and its applications in Agriculture** |  |  |
| **CourseObjectives:**Themainobjectivesofthis courseareto:1. To introduce the concept of computer and its applications in Agriculture.
2. To create knowledge on MS words, MS –Excel, MS Access and PowerPoint to meet the new corporate world.
3. To provide insight about Applications of computer in Agriculture field
 |
| **ExpectedCourseOutcomes:** |
| Onthesuccessfulcompletionofthecourse,studentsareableto: |
| 1 | Learn about anatomy of computers. | K1 |
| 2 | Understandkinds of operating systems. | K2 |
| 3 | Create Documents, Tables and Spreadsheets | K2 |
| 4 | Know about creation and use of PowerPoint presentations, DBMS and MS Access | K3 |
| 5 | Gain knowledge on ComputerModels in Agriculture | K5 |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4**-Analyze; **K5**-Evaluate;**K6**–Create |
| **Unit:1** | **Basics of computer** | **12Hours** |
| Introduction to Computers, Anatomy of Computers, Input and Output Devices. Units of Memory, Hardware, Software and Classification of Computers. Personal Computers, Types of Processors, booting of computer, warm and cold booting. Computer Viruses, Worms and Vaccines.  |
| **Unit:2** | **Operating Systems** | **12Hours** |
| Operating System – DOS and WINDOWS. Disk Operating System (DOS): Some fundamental DOS Commands, FORMAT, DIR, COPY, PATH, LABEL, VOL, MD, CD and DELTREE, Rules for naming files in DOS and Types of files. WINDOWS: GUI, Desktop and its elements, WINDOWS Explorer, working with files and folders; setting time and date, starting and shutting down of WINDOWS. Anatomy of a WINDOW, Title Bar, Minimum, Maximum and Close Buttons, Scroll Bars, Menus and Tool Bars.  |
| **Unit:3** | **Microsoft office-I** | **12Hours** |
| Applications – MSWORD: Word, processing and units of document, features of word-processing packages. Creating, Editing, Formatting and Saving a document in MSWORD; MSEXCEL: Electronic Spreadsheets, concept, packages. Creating, Editing and Saving a spreadsheet with MSEXCEL. Use of in-built Statistical and other functions and writing expressions. Use of Data Analysis Tools, Correlation and Regression, t-test for two-samples and ANOVA with One-way Classification. Creating Graphs.  |
| **Unit:4** | **Microsoft office-II** | **12Hours** |
| MS Power Point: Features of Power Point Package. MSACCESS: Concept of Database, Units of database, creating database;Application of innovative ways to useinformation and communication technologies (IT) in Agriculture. |
| **Unit:5** | **Computer Models in Agriculture** | **12Hours** |
| ComputerModels in Agriculture: statistical, weather analysis and crop simulation models, concepts,structure, inputs-outputs files, limitation, advantages and application of models for understandingplant processes, sensitivity, verification, calibration and validation. IT application forcomputation of water and nutrient requirement of crops, Computer-controlled devices(automated systems) for Agri-input management, Smartphone mobile apps in Agriculture forfarm advises, market price, postharvest management etc; Geospatial technology, concepts,techniques, components and uses for generating valuable agri-information |
| **Practical** |
| 1. Practice of important DOS Commands.
2. MS WORD - Creating, editing and presenting a scientific Document, Handling of Tabular data
3. MS POWER POINT - Creating animation, video tools, art tool, graphics, template & designs
4. MS-EXCEL - Creating a spreadsheet, use of statistical tools,writing expressions, creating graphs, analysis of scientific data, handling macros.
5. MS-ACCESS: Creating Database, preparing queries and reports, demonstration of Agri-information system.
6. Introduction to World Wide Web (WWW) and its components, creation of scientific website, presentation and management agricultural information through web.
7. Hands on practice on Crop Simulation Models (CSM), DSSAT/Crop-Info/Crop Syst/ Wofost.
8. Preparation of Inputs file for CSM and study ofmodel outputs, computation of water and nutrient requirements of crop using CSM and IT tools.
9. Use of smart phones and other devices in agro-advisory and dissemination of market information.
10. Introduction of Geospatial Technology, demonstration of generating information important for Agriculture.
 |
|  | **TotalLecturehours** | **60Hours** |
| **TextBooks** |
| 1 | Pradeep K. Sinha and PritiSinha Computer Fundamentals, III edition, BPB Publications, B-14, Connaught Place, New Delhi – 110 001. |
| 2 | Mastering Office Professional for window 95, BPB Publications, B-14, Connaught Place, New Delhi – 110 001. |

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|  | **ReferenceBooks** |
| 1 | P.K. Sinha Computer Fundamentals, BPB Publications, B-14, Connaught Place, New Delhi – 110 001 |
| 2 | Statistical Methods for Agricultural workers by V.G. Panse and P.V. Sukhatma, ICAR, New Delhi. |
| **RelatedOnlineContents[MOOC,SWAYAM,NPTEL,Websitesetc.]** |
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| **MappingwithProgrammeOutcomes** |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **S** | **S** | **S** | **S** | **S** | **M** | **S** | **S** | **S** | **S** |
| **CO2** | **S** | **S** | **M** | **S** | **S** | **M** | **S** | **S** | **S** | **S** |
| **CO3** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **M** |
| **CO4** | **S** | **S** | **M** | **S** | **S** | **S** | **S** | **S** | **S** | **S** |
| **CO5** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **M** |
| **CO6** | **S** | **S** | **S** | **S** | **S** | **M** | **S** | **M** | **S** | **S** |

\***S**-Strong;**M**-Medium;**L**-Low

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| **Coursecode** | **ELECTIVEI** | **L** | **T** | **P** | **C** |
| **Core/Elective/Supportive** | **B:AGRICULTURAL ENTOMOLOGY** | **60** | **-** | **-** | **4** |
| **Pre-requisite** | **Knowledgeonhost,pathogen,disease,symptoms,virulence****and managementofcropsgainedduringClassXII.** |  |  |
| **CourseObjectives:**Themainobjectivesofthis courseareto:1. To learn the fundamental characters and types of insects.
2. To gain knowledge on major insects causing damage to common crops cultivated locally
3. To acquire skills in apiculture and sericulture
 |
| **ExpectedCourseOutcomes:** |
| Onthesuccessfulcompletionofthecourse,studentsareableto: |
| 1 | Gained knowledge on salient features of PhyllumArthropoda and Hexopoda members | K3 |
| 2 | Acquired knowledge on characteristic features of damage causing insects of common crops cultivated locally. | K2 |
| 3 | Study of Morphology of insects which damages crops | K3 |
| 4 | Study of Morphology of insects which damages fruits | K4 |
| 5 | Study of Morphology of insects which damages cash crops | K3 |
| 6 | Gain knowledge on Bee-keeping | K5 |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4**-Analyze; **K5**-Evaluate;**K6**–Create |
| **Unit:1** | **Systematic and Taxonomy** | **12Hours** |
| Systematic and Taxonomy – Classification and characteristics of Phylum Arthropoda&Characteristics of Hexapoda |
| **Unit:2** | **Morphology of insects -I** | **12Hours** |
| Morphology of insects, Major pests in following crops( a. Scientific name, b. Symptoms of insect damages, c. Lifecycle of insect/pests);Cereals- Paddy,Jawar,Bajra,Maize . Pulses- Pigeon pea, cow pea, Bengal and green gram. Oilseed crops- Ground nut, Soya bean . |
| **Unit:3** | **Morphology of insects -II** | **12Hours** |
| Morphology of insects, Major pests in following crops( a. Scientific name, b. Symptoms of insect damages, c. Lifecycle of insect/pests);Fruits- Mango, Grapes, Pomegranate, Citrus, Banana. Vegetable crops- Brinjal, Okra, Tomato, Chilly, Onion, Cabbage & cauliflower |
| **Unit:4** | **Morphology of insects -III** | **12Hours** |
| Morphology of insects, Major pests in following crops( a. Scientific name, b. Symptoms of insect damages, c. Lifecycle of insect/pests);Cash crops- Sugarcane, cotton. Plantation crops – Tea, coffee |

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| **Unit:5** | **Bee-Keeping** | **12Hours** |
| Honey Bees and Bee-keeping,Bee products .Silkworms and Sericulture &Pests of stored products and their management |
|  | **TotalLecturehours** | **60Hours** |
| **TextBooks** |
| 1 | Richards O.W. and R.G. Davies – Imms’ General Text Book of Entomology –Vol. I and I |
| 2 | Reference Books: 1. Shrivastava K. P., A Text book of Applied Entomology, Kalyani Publishers, New Delhi.- Vol.1 and Vol.2  |
| 3 | Dr. S. Manisegaran and Dr. R. P. Soundararajan, Pest Management In Field Crops (Principles And Practices)  |
| 4 | Saxena R. C. and Srivastava R. C., PrasadT. V, Entomology at a Glance, Third Edition. |
| 5 | Handbook of Entomology New Vishals Publication, Revised Edition e-reading: http://ecourses.iasri.res.in/ |
| **RelatedOnlineContents[MOOC,SWAYAM,NPTEL,Websitesetc.]** |
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| **MappingwithProgrammeOutcomes** |
| **Cos** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | S | S | S | S | S | S | M | S |
| **CO2** | S | S | S | M | S | S | S | S | S | S |
| **CO3** | S | S | S | M | S | S | M | S | M | S |
| **CO4** | S | S | M | S | M | S | S | S | S | S |
| **CO5** | S | S | S | S | S | M | S | M | M | S |
| **CO6** | S | S | S | S | S | S | S | M | S | M |

\***S**-Strong;**M**-Medium;**L**-Low

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| **Coursecode** | **ELECTIVEI** | **L** | **T** | **P** | **C** |
| **Core/Elective/Supportive** | **C:AGRICULTURAL MARKETING AND FINANCE** | **60** | **-** | **-** | **4** |
| **Pre-requisite** | **Basic knowledge of Agricultural marketing and finance.** |  |  |
| **CourseObjectives:**Themainobjectivesofthiscourseare:1. Optimization of Resource use and Output Management
2. Increase in Farm Income
3. Growth of Agro-based Industries
 |
| **ExpectedCourseOutcomes:** |
| Onthesuccessfulcompletionofthecourse,studentsareableto: |
| 1 | GetathoroughknowledgeaboutAgricultural Marketing | K1 |
| 2 | UnderstandingMarketing Functions and services | K2 |
| 3 | RecognizeExport and Import. | K3 |
| 4 | GetanideaaboutMeaning and Concept of Cooperation, principles of Cooperation. | K4 |
| 5 | GetanideaaboutNational cooperative federations. | K 5 |
| 6 | Inculcating Cooperative farming | K4 |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4**-Analyze; **K5**-Evaluate;**K6**–Create |
| **Unit:1** | **Agricultural Marketing** | **12Hours** |
| Agricultural Marketing: Market, Meaning, scope and classification of markets. Definition of agricultural marketing, demand, supply and price. Marketable surplus, marketed surplus. Integrated marketing. General theory of markets and marketing. Demand for agricultural products. Production and market supply. Price Determination and price analysis under different market structures |
| **Unit:2** | **Marketing Functions and services** | **12Hours** |
| Marketing Functions and services. Marketing costs, margins and efficiency. Defects of Present system of marketing of agricultural produce. Steps taken by the Indian Government and possibilities of improvements. Fixation of agricultural Prices. Marketing Institutions: Regulated and cooperative markets. Market Research |
| **Unit:3** | **Export and Import** | **12Hours** |
| Export: The concept of export as a district business activity in agricultural sector of the Indian economy, its importance and role in economic development. Policies of export of food grains and agricultural commodities pursued by the Indian Government. Import vs. export value of cereals and other agricultural commodities. Agencies engaged in exporting agricultural goods |
| **Unit:4** | **Cooperation** | **12Hours** |
| Cooperation: Meaning and Concept of Cooperation, principles of Cooperation (Equality, universality, distributive, justice, democracy, unity, honorary services and voluntarism). Place of thrift in cooperation, economic planning and cooperation. History and Progress of cooperative movement in India. Structure and organization of agricultural cooperation in India |

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| **Unit:5** | **National cooperative federations** | **12Hours** |
| National cooperative federations, courses of slow growth of agricultural cooperatives, suggestions for rapid development. National Bank for Agriculture and Rural development (1982). Cooperative farming: Meaning thereof, New classification cooperative farming, cooperative joint farming, cooperative collective farming. Advantages thereof. Reasons for apathy of farmers in adopting cooperative joint farming.  |
| **TotalLecturehours** | **60Hours** |

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| **Textbooks** |
| 1 | Acharya, S. S. And N. L. Agrawal. Agricultural marketing in India.(fifth edition) oxfordand IBH publishing company pvt. Ltd., 66 Janpath, new Delhi - 110001 |
| 2 | S. S. China. Agricultural marketing in India. kalyani publisher, New Delhi 100 002 |
| **Referencesbooks** |
| 1 | S. Subbareddy*et al .*agriculture economics.(2010) oxford and ibh publishing company Pvt. Ltd., 66 , Janpath, New Delhi – 110001 |
| **RelatedOnlineContents[MOOC,SWAYAM,NPTEL,Websitesetc.]** |
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| **MappingwithProgrammeOutcomes** |
| **Cos** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | M | S | M | S | S | M | M | S |
| **CO2** | S | S | S | M | M | S | S | M | S | S |
| **CO3** | S | S | S | M | S | S | M | M | S | S |
| **CO4** | S | M | S | S | S | M | M | M | S | M |
| **CO5** | S | S | M | S | S | M | S | S | S | S |
| **CO6** | S | M | M | S | S | M | M | S | S | M |

\***S**-Strong;**M**-Medium;**L**-Low

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| **Coursecode** | **ELECTIVEPAPERII** | **L** | **T** | **P** | **C** |
| **Core/Elective/Supportive** | **A:AGRICULTURAL PEST AND PEST CONTROL** | **75** | **-** | **-** | **4** |
| **Pre-requisite** | **Basicknowledge onagricultural pest and pest controlling techniques.** |  |  |
| **CourseObjectives:**Themainobjectivesofthis courseareto:1. Trained to differentiate the crop damage caused by pathogens, pests and disorder
2. Gained knowledge on various pests of locally cultivated various types of crops.
3. Acquired skills in ecologically sustainable integrated pest management.
 |
| **ExpectedCourseOutcomes:** |
| Onthesuccessfulcompletionofthecourse,studentsareableto: |
| 1 | Studyabouttheplant pathogens and their impacts. | K1 |
| 2 | Understandthe History pest management, and about Integrated Pest Management. | K2 |
| 3 | UnderstandvariousComponents/Tools of IPM. | K3 |
| 4 | Overview of IPM strategies | K4 |
| 5 | KnowAdvantages of IPM. Food safety standards Pesticide residue and their management | K5&K6 |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4**-Analyze; **K5**-Evaluate;**K6**–Create |
| **Unit:1** | **Introduction to Plant pathogens** | **15Hours** |
| Introduction to Plant pathogens, pests and disorders, their impact on agriculture global, Indian and Tamilnadu scenario. Common pests of field crops, cash crops and plantation crops in Tamilnadu.  |
| **Unit:2** | **History of pest management** | **15Hours** |
| History of pest management and ecological backlashes. Integrated Pest Management (IPM)- definition, Scope, Importance, principles of IPM |
| **Unit:3** | **Components/Tools of IPM** | **15Hours** |
| Components/Tools of IPM-(Cultural / agronomic method, Physical method, Mechanical Method, Biological method, Legal method-Insecticide Act-1968, HPR, Chemical method, - , Genetic and Regulatory methods, Resent trends (NCIPM))IPM. |
| **Unit:4** | **IPM strategies** | **15Hours** |
| IPM strategies for–(Cash crops- Sugarcane, cotton. Cereals- Paddy,Jawar,Bajra. Pulses- Pigeon pea.Oilseed crops- Ground nut, Fruits- Mango, Grapes, Pomegranate, Citrus, Banana, Vegetable crops- Brinjal, Okra, Tomato, Chilly, Onion, Cabbage and cauliflower, Cash crops- coconut, arecanut, Plantation crops- tea, coffee, cocoa. |

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| **Unit:5** | **Advantages of IPM** | **15Hours** |
| Advantages of IPM, Food safety standards Pesticide residue and their management |
| **TotalLecturehours** | **75Hours** |

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|  | **Textbooks** |
| 1 | Dhaliwak, G. S. and R. Arora. Integrated Pest Management- Concepts and Approaches. Kalyani Publishers, New Delhi |
| 2 | Shrivastava K. P., A Text book of Applied Entomology, Kalyani Publishers, New Delhi.- Vol.1 and Vol.2 |
| 3 | Saxena R. C. and Srivastava R. C., Entomology At a Glance, Agrotech Pub., Udaipur  |

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| **Referencebooks** |
| 1 | Dhaliwal G. S., Ram sing and Vikas Jindal. A text book of Integrated Pest Management, Kalyani Publishers, New Delhi  |
| **RelatedOnlineContents[MOOC,SWAYAM,NPTEL,Websitesetc.]** |
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| **MappingwithProgrammeOutcomes** |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **M** | **S** |
| **CO2** | **S** | **S** | **M** | **S** | **S** | **S** | **S** | **S** | **S** | **M** |
| **CO3** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **M** | **S** |
| **CO4** | **S** | **S** | **M** | **S** | **S** | **S** | **S** | **S** | **S** | **M** |
| **CO5** | **S** | **S** | **M** | **S** | **S** | **S** | **S** | **S** | **S** | **S** |

\***S**-Strong;**M**-Medium;**L**-Low

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| **Coursecode** | **ELECTIVEPAPERIII** | **L** | **T** | **P** | **C** |
| **Core/Elective/Supportive** | **A:AGRICULTURAL FINANCE AND BUSINESS MANAGEMENT** | **75** | **-** | **-** | **4** |
| **Pre-requisite** | **Knowledgeon.** |  |  |
| **CourseObjectives:**Themainobjectivesofthis courseareto:1. Understand Agricultural Finance – Credit and its importance
2. Learn about Types of loans and classification of agricultural credit, Budgeting, Time Management
 |
| **ExpectedCourseOutcomes:** |
| Onthesuccessfulcompletionofthecourse,studentsareableto: |
| 1 | Understand Agricultural Finance – Credit and its importance | K1&K2 |
| 2 | Learn about Types of loans and classification of agricultural credit. | K3 |
| 3 | KnowaboutTypes of Loan, according to liquidity | K4 |
| 4 | Gainknowledgeon Business Management, | K5 |
| 5 | OverviewonBudgetin**g,** Time Management, Financial Management | K6 |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4**-Analyze; **K5**-Evaluate;**K6**–Create |
| **Unit:1** | **Agricultural Finance** | **15Hours** |
| Agricultural Finance - Credit - Meaning, Importance and credit control. - Definition, need for finance in agriculture, characteristics of good agricultural finance (credit). - Decision on the use of credit, Principles of farm credit (Equity or Increasing Risk, Added Cost and Added Return, Cost of Credit and no loss no profit goal of farming and opportunity cost Principle. |
| **Unit:2** | **Types of loans and classification of agricultural credit** | **15Hours** |
| Types of loans and classification of agricultural credit. - Qualifications of a borrower, Analysis and three R’s and credit (Return, Repayment Capacity and Risk-bearing Capacity). Analysis of three C’s of Credit (Character, Capacity and Capital).  |
| **Unit:3** | **Types of Loan, according to liquidity** | **15Hours** |
| Types of Loan, according to liquidity, budgeted loan, loan amortization, even payment method, decreasing method. - Crop index reflecting use and farm finance. - Role and Rural Credit Institutions (Recommendations of the Banking Commission, Integrated Scheme of Rural Finance (Credit), Institutional Agencies, Taccan. - Sources of agricultural finance (Commercial banks, RRB, Lead Bank, NABARD, Cooperative Credit (PACs, Land Development Banks, National Cooperative Federation, Farmers’ Service Cooperatives). |
| **Unit:4** | **Business Management** | **15Hours** |
| Business Management - Meaning of management, functions of management, role of managers and scope of management in agricultural business. Role and objectives in management references. - Decision making by individuals as well as by groups. - Functional areas of management and their relationship with agriculture production, finance, marketing and human resources as coordination thereof. -Importance and nature of planning, useful generalization of planning forecasting technique with the help of a planning model, components of strategic management. |
| **Unit:5** | **Budgeting** | **15Hours** |
| Budgeting in a basic planning technique. Time management, a technique for planning use of manager’s own time. - Leadership in Management, Types and Leadership for production, planning and control activities (inventory, control, quality control, cost control) and financial management, financial forecasting and planning acquisition of funds. - Acquaintance of book-keeping and cash account(s). Knowledge of business environment for operation of bank account cheques, bank draft etc. |
| **TotalLecturehours** | **75Hours** |
| **TextBooks** |
| 1 | Patnkar, S.V. Financial Management. Everest Publishing House Everest, Pashuram Apartment, 12, Sankalp Society, PaudPhata Road, Opp. Jog Hospital, Pune- 411 038 |
| 2 | Jain, S.C. Management in Agriculture Finance. Vora and Company. Publishers Pvt. Ltd., 3 Round Building, Kalbadevi, Mumbai – 400 002. |
|  | **Referencesbooks** |
| 1 | Prasana Chandra. Financial Management. Tata McGraw Hill Publishing Co. Ltd., New Delhi |
| 2 | Kahlon, A. S. and Karam Singh. Managing Agricultural Finance - Theory and Practice. Allied Publisher Pvt. Lt., 165, J. N. Heredia Marg, Ballard Estate, Mumbai – 400 038. |
| **RelatedOnlineContents[MOOC,SWAYAM,NPTEL,Websitesetc.]** |
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| **MappingwithProgrammeOutcomes** |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **M** | **S** |
| **CO2** | **S** | **S** | **M** | **S** | **S** | **S** | **S** | **S** | **S** | **M** |
| **CO3** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **M** | **S** |
| **CO4** | **S** | **S** | **M** | **S** | **S** | **S** | **S** | **S** | **S** | **M** |
| **CO5** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **M** | **S** |

\***S**-Strong;**M**-Medium;**L**-Low

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| **Coursecode** | **ELECTIVEIII** | **L** | **T** | **P** | **C** |
| **Core/Elective/Supportive** | **B:TRENDS IN FARM MACHINERY** | **75** | **-** | **-** | **4** |
| **Pre-requisite** | **BasicknowledgeonFarm Machinery.** |  | **-** |
| **CourseObjectives:**Themainobjectivesofthis courseareto:1. To learn the scope of mechanization to modernize the agropracticesover traditional machinery.
2. To understand the I.C. engines, working principles and repair of two stroke and four stroke engines.
3. To get trained in selection and operation of tractor, tillage implements, seed drill, paddy transplanters, plant protection equipment and harvesting equipment.
4. To acquire operating skills of equipment for land development and soil conservation**.**
 |
| **ExpectedCourseOutcomes:** |
| Onthesuccessfulcompletionofthecourse,studentsareableto: |
| 1 | Gain informationaboutFarm Power | K1 |
| 2 | UnderstandMechanization, Benefits, Limitations and suggestions | K2 |
| 3 | Understand about Tractors and its types | K3&K4 |
| 4 | GetathoroughknowledgeaboutImplementation of intercultural operations. Harvesting and Threshing Equipments | K5 |
| 5 | Learn aboutthePlant protection equipments. Equipment for land development and soil conservation. | K5&K6 |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4**-Analyze; **K5**-Evaluate;**K6**–Create |
| **Unit:1** | **Farm Power** | **15Hours** |
| Farm Power in India: Sources Farm Power in India : Sources 1) Human Power 2) Animal Power 3) Mechanical Power 4) Electrical Power 5) Renewable Energy. Traditional farm equipments and machines employed in agriculture practices. Pros and cons of traditional farm machinery.  |
| **Unit:2** | **Mechanization** | **15Hours** |
| Scope of Mechanization-Benefits of Farm Mechanization, Limitations & Suggestions. I.C. Engines, Working Principles, Two stroke and Four stroke engines .Components of I.C. Engine. I.C. Engine Terminology, Different Systems of I.C Engine |
| **Unit:3** | **Tractors and its types** | **15Hours** |
| Tractors, Types, Selection of tractor, Tillage implements, Primary and secondary tillage implements, Sowing and Planting, Paddy Transplanter |
| **Unit:4** | **Intercultural operations** | **15Hours** |
| Implements for intercultural operations. Harvesting and Threshing Equipments |
| **Unit:5** | **Plant protection equipments** | **15Hours** |
| Plant protection equipments. Equipment for land development and soil conservation |
| **TotalLecturehours** | **75Hours** |
| **Textbooks** |
| 1 | Elements of Agricultural Engineering. Dr. JagadishwarSahay. Forth Edition, 2004 |
| 2 | Principles of Agricultural Engineering. Vol-I. T. P. Ojha and A. M. Michael. Jail Brothers, New Delhi |
| 3 | Farm Tractor –Repair and Maintenance by S.C. Jain and C.R. Rai. |
| 4 | Elements of Farm Machinery. A. C. Shrivastava. Oxford & IBH Publishing.  |
| 5 | Farm Machinery and Equipment. Smith and Wilkes |
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| **RelatedOnlineContents[MOOC,SWAYAM,NPTEL,Websitesetc.]** |
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| **MappingwithProgrammeOutcomes** |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **M** | **S** |
| **CO2** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **M** |
| **CO3** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **M** | **S** |
| **CO4** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **M** |
| **CO5** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **M** | **S** |

\***S**-Strong;**M**-Medium;**L**-Low

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| **Coursecode** | **ALLIED-I** | **L** | **T** | **P** | **C** |
| **Core/Elective/Supportive** | **PLANT DIVERSITY** | **75** | **-** | **-** | **4** |
| **Pre-requisite** | **Basicknowledgeondiversity of plant kingdom. Knowledge in Thallus organization, reproduction and classification.** |  | **-** |
| **CourseObjectives:**Themainobjectivesofthis courseareto:1. To understand the structural diversity of plant kingdom
2. To learn the thallus organization, reproduction and classification of members of major divisions of plant kingdom with help of few type species
3. To gain knowledge on angiosperm taxonomy
 |
| **ExpectedCourseOutcomes:** |
| Onthesuccessfulcompletionofthecourse,studentsareableto: |
| 1 | A thorough knowledge of general characters and classification of algae, bryophytes and Peteridophytes | K1 |
| 2 | Gained knowledge about general characters and classification of fungi and lichens | K2 |
| 3 | Overall view about Gymnosperms and its type species | K3&K4 |
| 4 | Appreciate Palaeobotany and geological timescale | K5 |
| 5 | A thorough knowledge of descriptive term used in taxonomy and its classification | K5&K6 |
| 6 | Able to understand the descriptive characters of families along with their economic importance | K2 |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4**-Analyze; **K5**-Evaluate;**K6**–Create |
| **Unit:1** | **Domain Classification** | **15Hours** |
| Highlights of Five kingdom and three domain classification. Major divisions of plant kingdom. Differentiation of non-vascular and vascular plants, spore and seed producing plants |
| **Unit:2** | **Classification of Algae** | **15Hours** |
| Algae :Range of thallus organization, pigmentation, reserve food and reproduction; Classification of Algae - G.M. Smith, Study of the structure, reproduction and life cycle of Spirulina, Nostoc and Caulerpa .Bryophytes; Classification of Bryophytes (Rothmaler 1951). Structure and reproduction of Riccia . |
| **Unit:3** | **Fungi and Lichen** | **15Hours** |
| Fungi and Lichen : Range of thallus organization, nutrition and reproduction of fungi; Classification of fungi (Alexopoulos& Mims 1973) structure and reproduction of Saccharomyces and Aspergillus. Types and ecological significance of Lichens |
|  **Unit:4** | **Pteridophytes** | **15Hours** |
| Pteridophytes ;Classification of Pteriodophytes (K.R.Sporne) Stelar evolution, Structure and Reproduction of Azolla. Gymnosperms; Classification of Gymnosperms (K.R.Sporne) Structure and Reproduction of Cycas . Brief introduction to Paleobotany and Geological time scale. |
| **Unit:5** | **Angiosperm taxonomy** | **15Hours** |
| Morphology -Descriptive terms used in Angiosperm taxonomy –Parts of plant, Phyllotaxy, Inflorescence, floral parts and arrangement, fruits. Taxonomy and its significance. Systems of classification - Natural - Bentham & Hooker, Modern Takhtajan (outline only). Detailed study on Fabaceae, Asteraceae, Poaceae. |
| **TotalLecturehours** | **75Hours** |
| **Textbooks** |
| 1 | Algae-S.Sundararajan.,AnmolPublications.,New Delhi |
| 2 | Cryptogamic Botany. Vol.I- G.M. Smith.Tata McGraw Hill.,New Delhi |
| 3 | A text Book of Botany - Algae - B.P. Pandey. S.Chand & Co., NewDelhi |
| 4 | Algae - B.P. PandeyS.Chand& Co., NewDelhi |
| 5 | Fungi- SKSingh.,Campus Books Int.,NewDelhi |
| **Reference books** |
| 1 | Botany for degree students, Bryophyta B.R Vashista. S. Chand & Co New Delhi  |
| 2 | Bryophytes-Morphology,growth and differentiation PremPuri- Atma Ram & Sons Delhi |
| 3 | A text Book of Botany - Pteridophytes - B.P. Pandey. S.Chand & Co., NewDelhi |
| 4 | Pteridophyta - Vashishta, P.C S.Chand & Co., NewDelhi |
| 5 | Morphology of Pteridohytes - K.R. Sporne. BI Publications NewDelh |
| 6 | An introduction of Embryophyta - Pteridophyta - N.S.Parihar |
| 7 | Cryptogamic Botany. Vol.II- G.M. Smith. Tata McGraw Hill, New Delhi |
| 8 | Morphology of Gymnosperms .- K.R. Sporne.BI Publications NewDelhi |
| 9 | An introduction of Palaeobotany - Arnold.,Agrobios., Jodhpur |
| 10 | Gymnosperms - P.C. VashishtaS.Chand& Co., NewDelhi |
| 11 | Phytogeography and Paleobotany.,Kumar.,N.C.,EmkayPublication.,Delhi |
| 12 | Taxonomy of Angiosperms. Singh, V. and D.K. Jain, S.Chand & Co., NewDelhi |
| 13 | An Introduction to Systematic Botany. AK Ganguly&NCKumar.,EmkayPub.,Delhi |
| 14 | Flowering Plants. Orgin and Despersal.,A M Takhtajan., Oliver Boyd Ltd.,Edinburgh |
| 15 | Taxonomy of vascular plants Lawrence, G.H.M., 1951. Tata McGrw-Hill, New Delhi |
| **RelatedOnlineContents[MOOC,SWAYAM,NPTEL,Websitesetc.]** |
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| **Coursecode** | **ALLIED-I** | **L** | **T** | **P** | **C** |
| **Core/Elective/Supportive** | **PLANT DIVERSITY** | **75** | **-** | **-** | **4** |
| **Pre-requisite** | **Basicknowledgeondiversity of plant kingdom. Knowledge in Thallus organization, reproduction and classification.** |  | **-** |
| **CourseObjectives:**Themainobjectivesofthis courseareto:1. To understand the structural diversity of plant kingdom
2. To learn the thallus organization, reproduction and classification of members of major divisions of plant kingdom with help of few type species
3. To gain knowledge on angiosperm taxonomy
 |
| **ExpectedCourseOutcomes:** |
| Onthesuccessfulcompletionofthecourse,studentsareableto: |
| 1 | A thorough knowledge of general characters and classification of algae, bryophytes and Peteridophytes | K1 |
| 2 | Gained knowledge about general characters and classification of fungi and lichens | K2 |
| 3 | Overall view about Gymnosperms and its type species | K3&K4 |
| 4 | Appreciate Palaeobotany and geological timescale | K5 |
| 5 | A thorough knowledge of descriptive term used in taxonomy and its classification | K5&K6 |
| 6 | Able to understand the descriptive characters of families along with their economic importance | K2 |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4**-Analyze; **K5**-Evaluate;**K6**–Create |
| **Unit:1** | **Domain Classification** | **15Hours** |
| Highlights of Five kingdom and three domain classification. Major divisions of plant kingdom. Differentiation of non-vascular and vascular plants, spore and seed producing plants |
| **Unit:2** | **Classification of Algae** | **15Hours** |
| Algae :Range of thallus organization, pigmentation, reserve food and reproduction; Classification of Algae - G.M. Smith, Study of the structure, reproduction and life cycle of Spirulina, Nostoc and Caulerpa .Bryophytes; Classification of Bryophytes (Rothmaler 1951). Structure and reproduction of Riccia . |
| **Unit:3** | **Fungi and Lichen** | **15Hours** |
| Fungi and Lichen : Range of thallus organization, nutrition and reproduction of fungi; Classification of fungi (Alexopoulos& Mims 1973) structure and reproduction of Saccharomyces and Aspergillus. Types and ecological significance of Lichens |
|  **Unit:4** | **Pteridophytes** | **15Hours** |
| Pteridophytes ;Classification of Pteriodophytes (K.R.Sporne) Stelar evolution, Structure and Reproduction of Azolla. Gymnosperms; Classification of Gymnosperms (K.R.Sporne) Structure and Reproduction of Cycas . Brief introduction to Paleobotany and Geological time scale. |
| **Unit:5** | **Angiosperm taxonomy** | **15Hours** |
| Morphology -Descriptive terms used in Angiosperm taxonomy –Parts of plant, Phyllotaxy, Inflorescence, floral parts and arrangement, fruits. Taxonomy and its significance. Systems of classification - Natural - Bentham & Hooker, Modern Takhtajan (outline only). Detailed study on Fabaceae, Asteraceae, Poaceae. |
| **TotalLecturehours** | **75Hours** |
| **Practicals** |
| 1. Study of types mentioned in the
2. Algae- Spirulina, Caulerpa, Gracillaria
3. Bryophytes- Riccia
4. Fungi and Lichens- Saccharomycetes, Aspergillus, Lichens
5. Pteridopytes – Azolla
6. Gymnosperms- Cycas
7. Paleobotany
8. Angiosperms- Fabaceae, Asteraceae, Poaceae
 |
| **Textbooks** |
| 1 | Algae-S.Sundararajan.,AnmolPublications.,New Delhi |
| 2 | Cryptogamic Botany. Vol.I- G.M. Smith.Tata McGraw Hill.,New Delhi |
| 3 | A text Book of Botany - Algae - B.P. Pandey. S.Chand & Co., NewDelhi |
| 4 | Algae - B.P. PandeyS.Chand& Co., NewDelhi |
| 5 | Fungi- SKSingh.,Campus Books Int.,NewDelhi |
| **Reference books** |
| 1 | Botany for degree students, Bryophyta B.R Vashista. S. Chand & Co New Delhi  |
| 2 | Bryophytes-Morphology,growth and differentiation PremPuri- Atma Ram & Sons Delhi |
| 3 | A text Book of Botany - Pteridophytes - B.P. Pandey. S.Chand & Co., NewDelhi |
| 4 | Pteridophyta - Vashishta, P.C S.Chand & Co., NewDelhi |
| 5 | Morphology of Pteridohytes - K.R. Sporne. BI Publications NewDelh |
| 6 | An introduction of Embryophyta - Pteridophyta - N.S.Parihar |
| 7 | Cryptogamic Botany. Vol.II- G.M. Smith. Tata McGraw Hill, New Delhi |
| 8 | Morphology of Gymnosperms .- K.R. Sporne.BI Publications NewDelhi |
| 9 | An introduction of Palaeobotany - Arnold.,Agrobios., Jodhpur |
| 10 | Gymnosperms - P.C. VashishtaS.Chand& Co., NewDelhi |
| 11 | Phytogeography and Paleobotany.,Kumar.,N.C.,EmkayPublication.,Delhi |
| 12 | Taxonomy of Angiosperms. Singh, V. and D.K. Jain, S.Chand & Co., NewDelhi |
| 13 | An Introduction to Systematic Botany. AK Ganguly&NCKumar.,EmkayPub.,Delhi |
| 14 | Flowering Plants. Orgin and Despersal.,A M Takhtajan., Oliver Boyd Ltd.,Edinburgh |
| 15 | Taxonomy of vascular plants Lawrence, G.H.M., 1951. Tata McGrw-Hill, New Delhi |
| **RelatedOnlineContents[MOOC,SWAYAM,NPTEL,Websitesetc.]** |
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| **Coursecode** |  | **ALLIED PAPER II** | **L** | **T** | **P** | **C** |
| **Core/Elective/Supportive** | **BOTANY II- EMBRYOLOGY AND REPRODUCTIVE BIOLOGY** | **120** |  |  | **4** |
| **Pre-requisite** | **BasicknowledgeinAgro-meteorology andbasicknowledgeinhostpathogen interactiongainedin previousclasses.** |  |  |
| **CourseObjectives:** |
| Themainobjectivesofthiscourseare to:1. To learn the biology of reproductive process in plant kingdom
2. To understand the structure and development of micro and megasporangium
3. To study the agents of pollination and the adaptive features of flowers.
4. To understand the process of double fertilization and its significance
5. To learn embryo development, seed dispersal and fruit types
 |
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| **ExpectedCourseOutcomes:** |
| Onthesuccessfulcompletionofthecourse,students areable: |
| 1 | Figure out embryology | K2 |
| 2 | A thorough knowledge of fertilization | K2 |
| **K1**-Remember;**K2** -Understand;**K3** -Apply;**K4**-Analyze; **K5**-Evaluate;**K6**-Create |
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| **Unit:1** | **Meristems** | **30hours** |
| Structure and function of Apical Meristems - Root Apex and Shoot Apex - Theories of Meristems. Structure and function of simple and permanent tissues - Parenchyma, Collenchyma, Sclerenchyma, Xylem and Phloem. Structure and types of stomata.Types of reproduction (Vegetative, asexual and sexual), Alternation of generation in cryptogams and phanerogames, Heterospory and origin of seed habit. |
| **Unit:2** | **Morphology of angiosperm flower** | **15hours** |
| Morphology of angiosperm flower. Structure and development of microsporangium, male gametophyte, Types of ovules, megasporangium, female gametophyte (Polygonum type)  |
| **Unit:3** | **Pollination** | **30hours** |
| Pollination- types and structural adaptations of flowers. The ecological importance of pollinators and pollination modes. Conserving Pollinators For Agriculture, Forestry And Nature |
| **Unit:4** | **Double fertilization** | **30hours** |
| Double fertilization, endosperm - Structure, development and types of endosperm. Structure and development of dicot embryo (Capsella) and Monocot embryo ( Paddy). Polyembryony, Parthenocarpy and Apomixis |

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| **Unit:5** | **Seed** | **15hours** |
| Seed- Structure - Types - Importance -Seed dormancy –Stages of Seed Development - Dispersal mechanism. Fruit- Formation, Parts and Types |
| **TotalLecturehours** | **120hours** |
| **Practicals:** |
| 1. Morphology of angiosperm flowers
2. Structure of Microsporangium
3. Microsporogenesis
4. Pollen germination
5. Structure of megasporangium
6. Megasporogenesis
7. Endosperm, types, haustorium
8. Embryo development – 3 stages.
9. Seed structure- seed coat anatomy
 |
| **TextBooks** |
| 1 | An introduction to the Embryology of Angiosperms - P.Maheswari |
| 2 | The Embryology of Angiosperms,S.S.Bhojwani&Bhatnagar,S.P. Vani Educational Books New Delhi |

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| **RelatedOnlineContents[MOOC,SWAYAM,NPTEL,Websitesetc.]** |
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| **SKILL BASED COURSE** | **UNDER NAAN MUDHALVAN SCHEME** | [www.naanmudhalvan.tn.gov.in](http://www.naanmudhalvan.tn.gov.in) |
| 01 | Organic farming | NPTEL / IIT Kharagpur |